

CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

## **Request for Proposals**

to provide

## **Construction Management Services**

for the

## **City of Folsom Community Facilities District No. 18 Phase 2A Water Improvements**

**Release Date: June 14, 2024**

**Due: July 11, 2024, 4:00 pm**

**City of Folsom  
City Clerk's Office  
50 Natoma Street  
Folsom, CA 95630**



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

June 14, 2024

TO: Qualified Engineering and Construction Management Consultants

**Subject: CFD No. 18 Phase 2A Improvements – Construction Management Services**

Dear Qualified Consultant:

Notice is hereby given that Proposals will be received at the City of Folsom City Clerk's Office located at 50 Natoma Street, Folsom, CA 95630 **until July 11, 2024, at 4:00 pm** local time for furnishing all labor, materials and equipment, and performing all work necessary and incidental to:

Provide Construction Management Services including Resident Engineer, inspection, materials testing, construction staking quality control, coordination of environmental monitoring and compliance, and contract administration services for the locally funded Community Facilities District No. 18 Phase 2A Water Improvements.

Construction work will include construction and placement of a new 24" water transmission main, necessary tie-ins and connections throughout, grading, paving, striping, storm drain improvements, and tree protection associated with the construction of the project.

Proposals shall be addressed to:

City of Folsom  
City Clerk's Office  
50 Natoma Street  
Folsom, CA 95667

Consultants wishing to propose are invited to notify the City of their intent by emailing Marcus Yasutake and Rebecca Neves at the email addresses provided below to be added on the Proposer List. The City reserves the right to amend this RFP by addendum prior to the final submittal dates and will post any addendums through Public Purchase and the City's website with email notifications to consultants on the proposer list. Questions shall be addressed to the City in writing according to the timelines indicated herein and at the address indicated above. Any verbal explanation or instructions shall not be considered binding by the City of Folsom. This RFP does not commit the City of Folsom to award a contract or pay any costs associated with the preparation of a proposal. The City reserves the right to cancel this solicitation at any time or to extend the submittal deadline.

Best Regards,

Marcus Yasutake  
Environmental & Water Resources Director  
Email: [myasutake@folsom.ca.us](mailto:myasutake@folsom.ca.us)

Rebecca Neves, P.E.  
City Engineer  
Email: [rebeccaneves@folsom.ca.us](mailto:rebeccaneves@folsom.ca.us)

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Attachment A – Scope of Services

Attachment B – 100% Plans dated June 2024

Attachment C – Draft Technical Specifications

Attachment D – City Standard Specifications

Attachment E – City Sample Contract

## I. INTRODUCTION

The City of Folsom (City), in partnership with the Folsom Plan Area Owners Group is requesting proposals from qualified firms (Consultant) to provide a professional Resident Engineer, inspection services, materials testing, construction survey quality control, quality assurance, environmental monitoring coordination, and contract administration services for the construction of the Community Facilities District No. 18 Phase 2A Water Improvements (Project).

Through the ongoing development located in the southern part of the City, known as the Folsom Plan Area (FPA), this project is funded by bonding proceeds from the established Community Facilities District No. 18. Phase 1 of the FPA is nearly complete and to allow for continuation of planned growth and development, expansion of the water supply to the area is needed. The proposed project will construct a new 24” diameter pipeline that extends from an existing manifold located at the intersection of East Bidwell and Iron Point, on the northerly side of US 50, and extends north to the City’s Water Treatment Plant located on Natoma Street by ways of the rail and trail shoulder located on East Bidwell to Oak Avenue Parkway and placement within Oak Avenue Parkway. An exhibit of the alignment is provided in the following section. The work on Project is shown in the attached plans and specifications and consists generally of the following:

- Additional potholing as needed to identify utility conflicts.
- Development of Traffic Control Plans for work covered in the project plans and specifications.
- Construction of approximately 19,000 L.F. of new 24” pipeline along the Oak Avenue and East Bidwell corridors.
- Construction of tie-ins to existing pipelines at the WTP, Scholar Way and Broadstone Parkway.
- Trail modifications, grading, paving, drainage system modifications, and tree protection.

It is the intent of the City to have the project constructed in accordance with the approved plans and specifications. As of the release date of this RFP, the project plans and specifications have not yet been approved by the City but are near completion. The tentative project schedule is as follows:

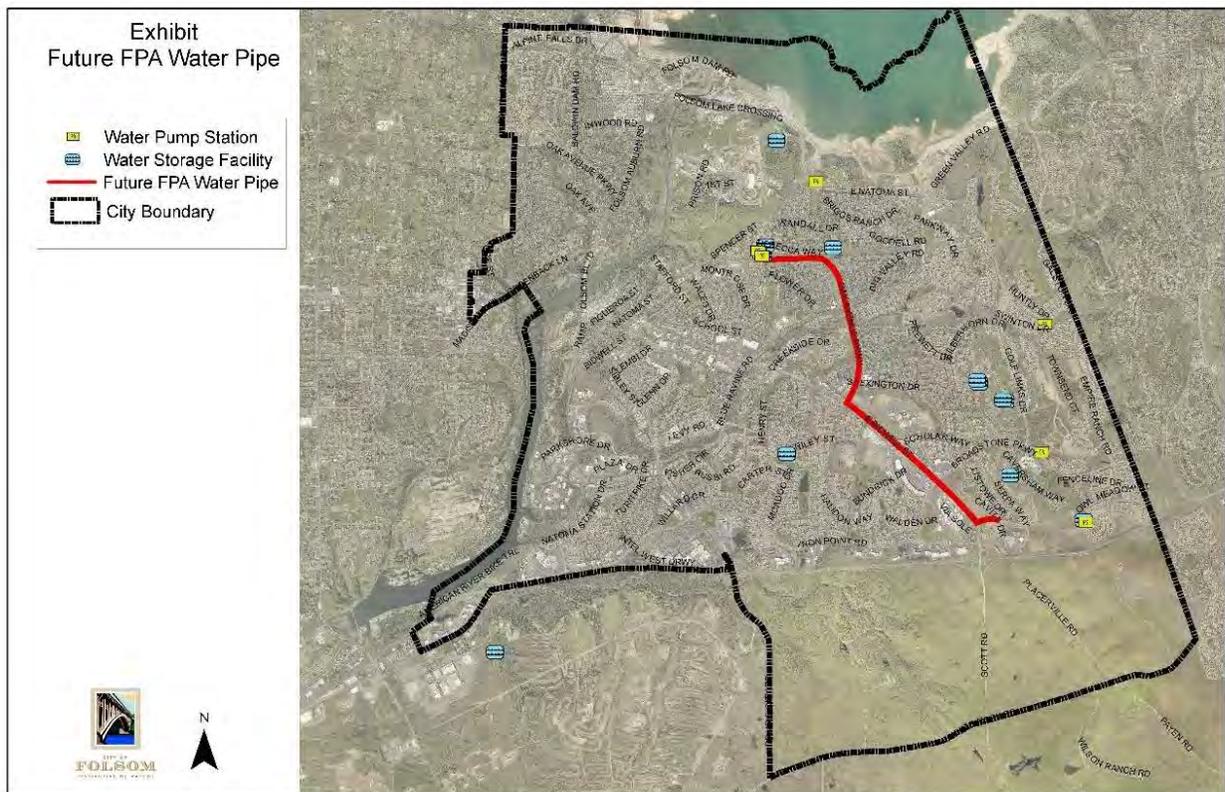
1. RFP for Construction Management Released: June 14, 2024
2. Question on the RFP Due Date: July 3, 2024
3. CM Proposals Due: July 11, 2024, 4:00 pm
4. CM Interviews (If Necessary): July 23, 2024
5. Award CM Contract: August 27, 2024 or September 10, 2024
6. Advertise Construction Contract: July 29, 2024
7. Bid Opening/Initiating Bonding: August 28, 2024
8. Award Construction Contract: September 24, 2024 or October 8, 2024
9. Begin Construction: January 2025

10. End Construction:  
11. Project Close Out:

July 2026  
September 2026

## II. BACKGROUND

The City of Folsom currently supplies treated and untreated water to an array of residential, commercial, institutional, and industrial users for over 25,000 connections. Based on land use, water demand, and water supply detailed in the City’s Water Master Plan, the ultimate Folsom Plan Area (FPA) maximum daily demand is 8.8 million gallons per day (MGD), which does not include the 0.4 MGD demand within the El Dorado Irrigation District service area. The following figure illustrates the approximate alignment of the proposed project pipeline.



## I. CONTACT

Proposals shall be addressed to the information provided in section V. SUBMISSION OF PROPOSALS. Questions on the content and scope of this RFP can be directed to both:

Attn: Marcus Yasutake, P.E.  
EWR Director  
Email: [myasutake@folsom.ca.us](mailto:myasutake@folsom.ca.us)

Rebecca Neves, P.E.  
City Engineer  
[rebeccaneves@folsom.ca.us](mailto:rebeccaneves@folsom.ca.us)

### **III. SCOPE OF WORK**

The intent of the project scope is to provide construction management consulting services for the CFD No. 18 Phase 2A Water Improvements Project. A detailed Scope of Services is provided as Attachment A to this Request for Proposals. It is not intended to be a complete or exclusive list of the items needed for the Consultant to successfully complete the Project but is intended as a guide to the Consultant in development of the scope and corresponding fee. Where appropriate, the consultant is encouraged to recommend modifications to the scope of services to best reflect successful delivery and management of the project.

### **IV. SUBMISSION OF PROPOSALS**

Consultants wishing to propose in response to this RFP are invited to notify the City of their intent to propose by emailing the project managers to be added on the Proposer List. The City reserves the right to amend this RFP by addendum prior to the final submittal date and will email any addendums to the RFP directly to the Consultants on the Proposer List as well as post to Public Purchase and the City's website.

Firms responding to this RFP shall submit six (6) hard copies and one (1) electronic copies. Proposals shall be submitted in sealed envelopes or containers that bear the name and business address of the firm and shall also be plainly labeled as follows:

**City of Folsom  
CFD No. 18 Phase 2A Water Improvements Project  
Construction Management Services Proposal**

Proposals may be hand-delivered or mailed via U.S. Post Office or overnight service. The City of Folsom will NOT accept proposals submitted via email. If mail delivery is used, the Consultant should mail the proposal early enough to provide for arrival by this deadline. The City will not accept any Proposal after the deadline date and time, regardless of the circumstances.

Firm shall submit Proposals to the City Clerk's Office, 2<sup>nd</sup> Floor:

City of Folsom  
50 Natoma Street  
Folsom, CA 95630  
Attention: Marcus Yasutake, EWR Director and  
Rebecca Neves, City Engineer

**Deadline for receipt of Proposals is July 11, 2024, 4:00 pm local time.**

If all required information is not provided, a Proposal may be considered incomplete and non-responsive and rejected without evaluation. Late submittals, submittals to the wrong location, or submittals with inadequate copies are considered non-responsive. Submittal of additional

information after the deadline will not be allowed. The City of Folsom reserves the right to reject any or all Proposals and to waive any and all irregularities and to choose the firm which, in its opinion, best serves its interests through its qualifications. The City makes no representation that any contract will be awarded in response to this RFP. The City will not be liable for any costs incurred by the Proposers incidental to the preparation and presentation of qualifications either orally or in the Proposal. Any costs incurred in the preparation of the Proposal, in the submittal of additional information, and/or in any other aspect of the Proposal prior to the award of a written agreement will be borne by the Proposer. Proposals shall remain in effect for a period of 120 days from the submittal deadline. Should this contract be awarded, it will be funded through various City local funds from CFD 18, CFD 17, and other sources as deemed necessary and appropriate by the City of Folsom.

## **V. PROPOSAL FORMAT REQUIREMENTS**

Each response to this RFP shall include the information described in this section. Provide the information in the specified order. Failure to include all of the elements specified may be cause for rejection. Additional information may be provided but should be succinct and relevant to the goals of this RFP. Excessive information will not be considered favorably.

The Consultant's Proposal package shall be limited to 20 double-sided 8.5-inch by 11-inch pages. Charts, exhibits, and schedules may be included in 11-inch by 17-inch page format and shall be folded to fit into an 8.5-inch by 11-inch sheet and will count as one (1) page. The page limit does not include the outside cover, section dividers, cover letters, resumes, and sub consultant commitment memorandum, Scope of Services, or contract comments. Proposals that do not contain the required information as described in this RFP or do not contain the required number of copies (6 copies) may be rejected. The proposal must include the following items:

### **1. Cover Letter with the following information:**

- Title of this RFP
- Name and Mailing Address (include physical location if mailing address is a PO Box)
- Contact Person, Telephone Number, Fax Number, and Email Address
- A statement that the submitting firm will perform the services and adhere to the requirements described in this RFP, including any addenda (reference the addenda by date and/or number).
- Acknowledgement that all proposals may be considered public information. Subsequent to award of a contract, or rejection of all proposals, all of part of any submittal may be released to any person or firm who may request it. Therefore, proposers shall specify in their Cover Letter if any portion of their submittal should be treated as proprietary and not releasable as public information. Proposers should be aware that all such requests may be subject to legal review and challenge.

- The Cover Letter must be signed by an officer empowered by the Consultant to sign such material and thereby commit the Consultant to the obligations contained in the RFP response. Further, the signing and submission of a response shall indicate the intention of the proposer to adhere to the provisions described in this RFP and a commitment to enter into a binding contract.

## **2. Capabilities of Firm / Team**

Provide a brief narrative of your firm's approach to the project. Include information related to the Firm's Organization, including its constituent parts, and size variation of staffing levels over the past five years.

Provide relevant summaries of the firm's experience with similar projects. The summaries should include the dates and duration of the project, one reference and a brief description of the project. The description is to include, at a minimum, an outline of the complexities of the project and the firm's approach to completing the project. Related experience to locally administered projects using local and state standards of similar size and magnitude should be included in this summary, including consultant staff that worked on the project. Preference is given to project references that demonstrate an understanding by staff proposed for this project of the type of work relevant in this RFP.

## **3. Qualifications and Availability of Proposed Staff**

Identify specific staff members to be assigned to the project and a table showing the percentage of time key staff members are available during the course of the project.

Provide a brief summary of the qualifications and experience of each team member assigned, including length of service with the firm and résumé, and the qualifications/experience of any sub consultant staff on your project team. Include an organization chart. Resumes should not be more than two (2) pages for key team members and one page or less for support staff. Describe current and anticipated workload of each team member; include a discussion of project commitments made to other agencies and a table showing the percentage of time key staff members are available during the course of the project. The proposing team shall also provide a statement explaining why the Consultant provides the best value to the City for this project.

Include qualifications and experience of any subconsultant(s) to be used. Identify the services which would be completed by your firm's staff and any subconsultant(s).

## **4. Project Understanding & Approach**

Provide a detailed discussion of your firm's approach to the successful implementation of the project. Include thorough discussions of methodologies you believe are essential to accomplishing this project including engineering constraints, milestones, and required approvals relating to the projects. Include a proposed work schedule to accomplish all of the required tasks within the desired timeline; the schedule should include submittal

review/approval times for the City and other project stakeholders. Identify the staff who would be assigned to each task, including sub consultants.

Provide an outline, from the details in the Scope of Services in Attachment A, of your firm's plan to accomplish the project and include any special services your firm offers to meet the City's need for a timely completion and overall success.

Illustrate to the City how your firm will manage the construction of the project effectively from the initial plan, specification and estimate review to the final punch list and close-out.

Provide a quality assurance review of the 100% Plans and Technical Specifications provided as Attachments B and C to this RFP. Provide written comments in the form of a summary memorandum and "redline" markups of the plans and specifications. The review must be completed and submitted with the proposal.

#### 5. Contract Exceptions/Deviations

Provide a written discussion of any objections or concerns relative to the Sample Agreement for Consulting Services (see Attachment E, City Sample Contract). If the Consultant has ever been terminated from a contract, describe the facts and circumstances in detail on a separate sheet.

## VI. PROPOSAL CONTENT, ORGANIZATION, AND EVALUATION CRITERIA

### 1. Proposal Deliverables:

- a. The proposal shall include a fee schedule that covers all items listed in order to facilitate the construction outlined in contract documents. Assumed Quantities and Values for the Scope of Work and the project scope as outlined previously in this request for proposals. The **fee schedule and total proposed cost shall be submitted separately** from the cover letter, proposal, quality assurance review, project team, resumes, relevant experience, etc.
- b. The proposal shall contain the content outlined in the previous sections. And include the cover letter as outlined. The proposal shall include the names and resumes of the project team that will be performing the work including the Resident Engineer and Construction Inspector that will be assigned to the project that the City will be directly working with.
- c. Proposals will be evaluated by City staff and scored on capabilities of firm/team, qualifications and availability of proposed staff, and project understanding and approach. The primary objective of the City is to select a qualified Consultant CM to perform necessary professional services to successfully manage the construction of the project at a fair and reasonable cost. The City has established the following criteria for the selection process:

- The selection process shall be fair, open, and competitive.
- Selection shall be based upon demonstrated competence, professional qualifications, experience, and capabilities to perform the required services at a fair and reasonable price. Ranking of the Proposals shall follow the scoring criteria described below.
- After the Proposals are reviewed, a short list will be prepared by the selection panel.
- The short-listed firms may be interviewed. If oral interviews are held, at the completion of the interviews, the firms will be rated and ranked. Negotiations will commence with the top-ranked firm. If negotiations are unsuccessful, then the City will begin negotiations with the second-ranked firm. The City reserves the right to reject any and all Proposals and to negotiate with any responsible, responsive firm. The City is under no obligation to issue contracts for the services described in this RFP.
- If only one proposal is received or if because of some disqualifying action only one responsive and responsible proposal remains to be considered, The City will determine whether such a proposal is fair and reasonable. The City may perform a cost and price analysis to make such a determination. If there is only one responsive Proposer, that Proposer must permit the City or its designee to review its cost records at reasonable times to determine whether the proposal is fair and reasonable.

The following evaluation criteria and rating schedule will be used to determine the most highly qualified firm(s):

<b>Evaluation Criteria</b>	<b>Maximum Points Possible</b>
1. Overall Approach to Project	5
2. Capabilities of Firm / Team	15
3. Qualifications and Availability of Proposed Staff	35
4. Project Understanding and Approach	35
5. Ability to Meet Contract Requirements	10
<b>Total Possible Points:</b>	<b>100</b>

Reference checks will be performed at the sole discretion of the selection committee for the top teams selected for interviews.

- d. The Project Manual, consisting of the 100% Bid Plan Set, Technical Specifications, Special Provisions, and other front-end documents are included on the City's OneDrive file share site. Additional access can be requested via email to the city's representative.

**Attachment A – Scope of Services**

# **ATTACHMENT A**

## **SCOPE OF SERVICES**

### **PROJECT DESCRIPTION**

The CITY is contracting with CONSULTANT to provide professional construction management, inspection, survey quality control, environmental monitoring coordination, materials testing and administrative services during construction. Work shall be performed in accordance with applicable CITY standards and standard practice.

### **Construction Period-Workload**

1. Construction Period: The construction period is estimated to be 540 calendar days with considerations for work sequencing and milestone achievements.
  - a. Inspector assumed for 100% of on-site construction operations
  - b. Resident Engineer assumed for minimum 50% of period duration
  - c. Weekly construction meetings:
  
2. Pre/post-construction Period: 3 months (submittals, closeout, etc.)
  - a. Inspector assumed onsite for 50% of period duration
  - b. Resident Engineer assumed onsite for 25% of period duration
  
3. Night Work:
  - a. Discretionary amounts of night work is anticipated. For the scope of work assume 8 weeks of night work.
  
4. Materials Testing and Special Inspections
  - a. Compaction testing (30 times)
  - b. Assume minor concrete testing.
  - c. If steel pipe is procured, weld inspections will be required.

### **ITEMS OF WORK**

The CITY contracts with the CONSULTANT to provide all required construction engineering services necessary to provide project inspection (including survey quality control and environmental monitoring coordination), materials testing, and construction management services for the Construction Project. The intent of the contract is to have the CONSULTANT provide a Resident Engineer, necessary support staff, equipment and materials for the required services. The work product shall meet the minimum requirements identified in this Attachment B.

### **General**

The intent of this scope of work is to set forth the requirements and responsibilities of the CONSULTANT for construction management, inspection, material testing, verification, and recommendation for acceptance of improvements of the proposed construction project to assure consistent and satisfactory quality of such improvements in accordance with the approved construction documents.

The CONSULTANT will provide a Construction Manager (CM) and sufficient staff to perform construction administration oversight and inspection services during the construction of the Construction Project. All CONSULTANT staff shall work under the supervision of the CM. These services will encompass serving as the CITY'S Resident Engineer (RE) to the Construction Contractor and the public with regard to activities at the construction site, interpretation of the requirements of the Construction Contract Documents, assessing the acceptability of the Contractor's work, construction staking quality control and materials testing. The CONSULTANT's CM shall be a licensed Professional Civil Engineer registered in the State of California.

The CONSULTANT's services will include review and analysis of construction documentation prior to bid opening, documentation of pre-construction site conditions, interpretation of and Contractor's conformance to the project plans, specifications, contract documents and regulatory permits. The CONSULTANT will assess the acceptability of the Contractor's work by contract requirements and standards, visual observation, photo and video documentation and all applicable soil and material testing. When necessary, the CONSULTANT shall issue Notices of Non-Compliance and/or take other action to ensure correction of deficiencies. If safety violations are observed, the CONSULTANT shall take appropriate action to ensure correction of deficiencies. The CONSULTANT shall also manage requests for information/clarification, coordinate work with the design engineer, as required, and manage the project changes, evaluate Contractor's claims, and prepare progress pay estimates.

The CONSULTANT will not be responsible for the construction staking but will be required to provide quality assurance and verification for vertical and horizontal control accuracy, as necessary; construction staking will be handled through the construction contractor.

All construction management, materials testing, inspection and related activities shall be completed as described in the Construction Management Plan (CMP) Manual prepared by the CONSULTANT specifically for this project and approved by the CITY. In addition to the approved CMP Manual, the CONSULTANT shall perform its activities in accordance with, but not limited to, the following documents:

- a) Project Plans and Specifications
- b) Regulatory Agency Permits
- c) City of Folsom Specifications and Standard Details
- d) Folsom Municipal Code
- e) Public Contract Code
- f) California Labor Code
- g) Caltrans Standard Test Methods
- h) Caltrans Manual of Traffic Control for Construction & Maintenance Work Zones
- i) California Manual of Uniform Traffic Control Devices

Time required by the CONSULTANT to reach the designated construction office will not be considered part of the services for which payment will be made.

Time charged by each individual to a contract executed as a result of this Proposal shall be properly documented. A copy of each time sheet shall be turned in to the CITY no less than every month. Billing shall be on a four-week interval as designated by the CITY.

There shall be no reimbursable expenses on this project unless approved in writing, in advance, by the CITY.

Project inspection, materials testing, construction management, and related construction engineering services shall include the following tasks:

### **Task 1 Construction Management Plan**

The CONSULTANT shall prepare a Construction Management Plan (CMP) for the project for CITY approval. The plan shall indicate the standards and level of effort that the CONSULTANT's staff will adhere to during all phases of this work and describe deliverables to be received by the CITY. At a minimum, the plan shall include the sections listed below:

- a) Project Organization

- b) Meetings
- c) Communications Management
- d) Preparation of Management Reports
- e) Clarifications and Contract Interpretations of Specifications
- f) Submittals/Shop Drawings
- g) Design Modifications
- h) Change Orders
- i) Schedule Management
- j) Claims Management and Resolution
- k) Testing and Testing Documentation
- l) Progress Pay Estimate Preparation
- m) Inspection and Inspection Reporting
- n) Defective Work Correction
- o) Record Drawings
- p) Complaint & Community Relations Procedures
- q) Safety
- r) Photo/Video Documentation
- s) Certified Payroll Review
- t) Special Inspections
- u) Other Tasks

The plan shall describe the level of effort anticipated to be maintained by the Construction Manager (CM) and inspectors for the various activities during the construction period and project closeout. The plan shall describe all deliverables and timing for periodic reports.

**Deliverables:**

- *Three copies of final Construction Management Plan due prior to the construction contract award.*

**Task 2 Administration**

The Consultant is to provide construction administration of the project to facilitate the ongoing construction efforts and maintain State and CITY regulations. At a minimum the consultant shall:

- a) Comply with Cal-OSHA regulations regarding safety equipment and procedures, and safety instructions issued by the State.
- b) Provide administrative, management and related services as required to coordinate the work of the contractor, to complete the project in accordance to contract documents, State regulations and in with the CITY's objectives for cost, time and quality. Provide weekly status reports to CITY. Weekly status reports shall include summaries of work with photos that is currently being performed, behind schedule, unresolved deficiencies and defective work, outstanding change orders and status of any claims.
- c) Coordinate with the CITY and all other involved agencies to obtain and comply with all required permits.
- d) Recommend necessary or desirable changes in the construction contractor's scope of work to the CITY, review and evaluate contractor's request for changes, assist in negotiating contractor's proposals, submit recommendations to the CITY supported by field data, and if they are accepted, prepare change orders for signature and the CITY's authorization.
- e) Maintain strict cost accounting records on authorized work performed under unit costs, additional work performed on the basis of actual costs of labor and materials, or other work requiring accounting records.
- f) Develop and implement procedures for the review and processing of applications by contractor for progress and final payments. Make written recommendations to the CITY for Contractor payments.

- g) Consult with the CITY and potentially the design engineer if the contractor requests interpretations of the meaning and intent of the drawings and specifications, and assist in the resolution of questions, which may arise.
- h) Provide a staffing schedule each month for the following month. This schedule is subject to the CITY's approval.
- i) Manage any utility work to be performed by utility agencies (work not part of contractor's responsibilities): typically SMUD, PG&E, AT&T and Comcast.

**Deliverables:**

- *Weekly Status Reports*
- *Required permits*
- *Cost Control Program*
- *Cost Accounting Records*
- *Progress Payment Recommendations*
- *Draft and Final Change Orders*
- *Staffing Schedules*
- *Other reports as required*

**Task 3 Pre-Bid Contract Document and Constructability Review**

CONSULTANT shall perform a quality assurance review the 100% PS&E package and provide written comments in the form of a summary memorandum and "redline" markups of the plans and specifications. This review will be completed and submitted with the proposal.

CONSULTANT shall review final contract plans, specifications, permits, agreements, easements, environmental documents and the Resident Engineer files consisting of design engineer memos to Resident Engineer, and technical reports and studies.

CONSULTANT shall prepare a project schedule which includes all preconstruction and construction utility relocations, and notification timelines noted on all permits, agreements, and contract documents. Upon receipt of contractor's schedule, the RE's schedule will be updated.

**Deliverables:**

- *Quality Assurance review memorandum, comment matrix, and markups*
- *Schedule*

**Task 4 Documentation of Pre-Construction Conditions**

CONSULTANT shall document pre-construction site conditions using photographs, written notes and video. Special or sensitive areas shall be noted and extra documentation may be required for these special or sensitive areas. Each photo shall be labeled with date, location, detailed description and photographer's name. Copies of all documentation, including photographs, notes, and video, shall be submitted to the CITY's Engineer and become the property of the CITY.

**Deliverables:**

- *Copies of all documentation, including photographs, notes, and video.*

**Task 5 Documentation and Record Keeping**

The Consultant shall maintain all documents to provide a detailed account of the construction effort, progress and contractual obligations. The consultant shall provide at a minimum the services below:

- a) Verify that all required certificate of bonds and insurance have been received from the contractor and forwarded to the CITY for approval.

- b) Maintain at the provided office, on a current basis and in good order: a record copy of all contracts, drawings, specifications, addenda, change orders and other modifications; shop drawings, product data, samples, submittals, purchases, materials, equipment, applicable handbooks, maintenance and operating manuals and instructions; and other related documents and revisions which are relevant to the contract work.
- c) During the course of construction, maintain one set of plans with markings and dimensions in red ink to denote field changes or other corrections.
- d) A detailed photographic history of all phases of the project will be maintained on a daily basis. Each photograph will be labeled as to location, direction of view, date, time and items of interest. The photographs will be maintained in an album and the photographs will be indexed for ease of retrieval. Photos will also be taken of the following:
  - Traffic Control
  - Disputed work items
  - Work that has to be duplicated, replaced or removed
  - Completed work
  - Extra work

**Deliverables:**

- *Documents required by this section*

## **Task 6 Meetings**

Anticipated meetings include project review meeting with the CITY and Design Engineer; and a pre-construction meeting with the Contractor, CITY, Design Engineer, regulatory agencies, and utility companies. Periodic meetings shall include daily discussions between the CM or designated representative and the Contractor; weekly meetings between the CM and CITY; and meetings scheduled as needed with regulatory agencies, other groups, or agencies. Consultant shall take minutes of the meetings and distribute them to attendees within one week of the meeting. Meetings shall be held at the offices of the CITY Engineering Department or at a mutually agreeable location determined during the pre-construction meeting.

**Deliverables:**

- *Project Review Meeting with CITY and Design Engineer*
- *Pre-construction meeting with CITY and all applicable parties related to the project.*
- *Weekly meetings with CITY and all applicable parties related to the project.*
- *Any meetings necessary to immediately resolve project issues related to scope, cost, or schedule.*
- *Meeting minutes*

## **Task 7 Environmental, Permitting, and SWPPP Support**

The Consultant shall review and perform all activities in conformance with the regulatory permits for the project.

CONSULTANT shall have a Qualified Storm Water Pollution Prevention Plan Developer (QSD) which shall make any necessary changes to the Storm Water Pollution Prevention Plan (SWPPP) during design. The QSD shall also review a site specific Construction Site Monitoring Plan (CSMP) submitted by the contractor. The CSMP shall include all monitoring procedures and instructions, monitoring locations, weather and rain event tracking requirements, visual monitoring frequencies, visual monitoring triggers, visual monitoring documentation requirements, effluent monitoring frequencies, effluent monitoring triggers for routine and non-visible pollutants, sampling taking and handling procedures, identify Quality Assurance (QA) & Quality Control (QC), follow up procedures for violations and action thresholds, location maps, forms, and checklists as required by the Construction General Permit (2009-0009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ). The QSD shall also assist the City prepare a post-construction storm water operation and management plan. The consultant shall also assist the CITY in the filing of the Notice of Intent (NOI) into the State Water Resources Control Board S.M.A.R.T.S System. This includes all necessary work to determine the Risk Level of the project. (Most likely this will be a Risk Level 2 project).

The Consultant shall also provide a Qualified SWPPP Practitioner (QSP) for the duration of the construction of the project and will be responsible to comply with and enforce the contractor of all requirements of the current Construction General Permit (2009-0009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ). This shall include but not be limited to the following for the entire length of the construction of the project:

- a) Documented weekly Run-off and Run-on BMP inspections.
- b) Documented Runoff and Run-on monitoring.
- c) Preparation of all Quarterly Reports as required by the Construction General Permit (2009-0009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ).
- d) Preparation of all Annual Reports as required by the Construction General Permit (2009-0009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ).
- e) Preparation of a Rain Event Action Plan (REAP) every time NOAA predicts a 50% chance or more of rain 48 hours in advance of a storm event in the project area.
- f) Documented pre-storm, storm, and post storm visual inspections/monitoring along with site photographs before, during, and after each Qualifying Rain Event when NOAA predicts a probability of rain of 50% or more in the project area.
- g) Documented quarterly non-storm water discharge inspections/monitoring.
- h) All required sampling and analysis of construction site runoff, non-storm water discharges, receiving waters, and contained runoff as required by the Construction General Permit (2009-0009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ). This includes but is not limited to Turbidity, Suspended Solids Concentration (SSC), pH, and for other pollutants as mandated by the Regional Water Quality Control Board.
- i) Preparation of all Numeric Action Level (NAL) and Numeric Effluent Limitation (NEL) Exceedance Reports.
- j) Ensure the proper implementation of the post-construction storm water operation and management plan at the end of construction.
- k) Complete extensive photo documentation at the end of construction necessary for the successful filing of the Notice of Termination (NOT).

The Consultant's QSD and QSP shall be involved in the duration of the construction of the project and will ensure and enforce that the project is completed to the satisfaction of the State Water Resources Control Board and the appropriate Notice of Termination (NOT) is filed and approved by the State Water Resources Control Board. The consultant shall demonstrate final stabilization of the project area at the end of construction, which is necessary for approval of the NOT, by showing either 70% vegetation coverage, use of the RUSLE 2 method as computational proof, or the custom method through sampling that turbidity is 100NTU or less. The consultant shall assist the CITY in the filing of the NOT.

**Deliverables:**

- *Weekly, Quarterly & Annual Inspection and Monitoring Reports*
- *Preparation of REAP*
- *NAL and NEL Reports*
- *NOT*

## **Task 8      Schedule Review**

The CONSULTANT shall review the Contractor's construction schedule, request updates on a weekly basis and track delays or accelerations based on actual Contractor operations as defined in the CMP. Work with the Contractor to maintain the project schedule to show current conditions and suggest revisions that may be required.

**Deliverable:**

- *Weekly Schedule Review Documentation*

## **Task 9 Cost Control and Monthly Progress Payments**

The CM shall implement necessary procedures for an effective system of cost control to track progress payments, contract change orders, quantity overruns, claims and extra work requests. The Construction Manager shall prepare quantities and estimates for monthly progress payments on or around the 19th of the month, and recommend approval to the CITY. CONSULTANT shall maintain cost accounting records (progress payments, CCO status, etc.) in accordance with CITY Engineering Department procedures. The calculations of quantities and documentation shall be in a form approved by the CITY.

### **Deliverable:**

- *Cost Control Tracking Documentation*

## **Task 10 Contract Modifications and Extra Work, Contract Change Orders, Claims**

The CM shall perform the evaluation and administration of all contract modifications, Requests for Information (RFI), contract change orders (CCOs), and claims. The CM shall review all requests for merit, perform an independent estimate, and make recommendations to the CITY for consideration. All contract modifications, extra work, and contract change orders shall be approved by the CITY. If approved, the CM will complete all required documentation to process the change. If the CM receives a notice of claim from the Contractor, the CM shall immediately notify the CITY and work toward a timely resolution of the claim with the Contractor. Status of any outstanding claims will be included with the CONSULTANT's weekly report to the CITY. The CONSULTANT shall support the CITY in any post-completion dispute with the Contractor, rendering reasonable assistance, providing access to its records, but is not intended to retain independent experts.

### **Deliverables:**

- *Contract Modification & Extra Work Documentation*
- *Draft CCOs with Recommendation Memorandum*
- *Final CCOs*

## **Task 11 Submittals and Clarifications**

The CM shall issue necessary clarifications and interpretations of the Contract Project Documents in response to Requests for Information (RFI) by the Contractor in a manner as described in the CMP. The CM shall also accept and process submittals, including but not limited to shop drawings, product data and product samples. The CM shall draft a list of required submittals in accordance with the project Specification for the CITY to review. The list shall be submitted to the CITY no later than 15 days after award of the Contract. The CM shall review those submittals that are appropriate. Submittals requiring review by the CITY or CITY's design engineer shall be logged and transmitted for formal review. Updated submittal logs shall be made available to the CITY upon request. The CM shall be responsible for tracking submittals to assure the submittals are reviewed and returned to the Contractor in a timely manner.

### **Deliverables:**

- *Submittal and RFI logs*
- *Documentation for clarification and interpretation of the Project Plans and Specifications*

## **Task 12 Field Inspection and Quality Assurance**

The CONSULTANT shall review the work of the Contractor, trade and specialty contractors on the project as it is being performed, until final completion and acceptance by the CITY, to assure that the work performed and materials furnished are in accordance with the Contract Documents.

The CONSULTANT shall provide sufficient inspectors (who are acceptable to the CITY) to adequately inspect all Contractor's construction work. The CM or inspectors shall provide field inspection of Contractor's construction work on a daily basis. The CM or inspectors will review all construction prior to

burial, and provide for observation of all tests required to be performed by the Contractor or referenced in the Contract Documents. The CM and field inspectors shall monitor the Contractor's performance from the perspective of quality, cost, and schedule, and shall enforce the requirements of applicable Specifications. Daily Inspection Reports and diaries of Contractor's construction activities shall be completed daily and be available to the RE at any time. The CM or designated representative shall compare notes with the Contractor's representative at the end of each day to confirm work that was accomplished or quantities placed.

The CM shall prepare and submit written weekly reports to the CITY describing updates of project process, percent of work completed, percent of funds expended, listing of change orders, and community relations issues. All outstanding deficiencies and claims shall also be noted in the weekly reports until resolved or settled. The CM shall document any defective work until it is repaired to the CM's satisfaction and in accordance with the Contract Documents' applicable specification. Copies of the daily reports from the previous week will be included with the weekly written report.

Daily inspection reports and diaries of Contractor's construction activities shall be completed daily by each inspector and available to the CITY on the next day. The CONSULTANT will document special situations by photograph or video. CONSULTANT shall document any defective work until it is repaired to the CONSULTANT'S and CITY's satisfaction and quality of work is in accordance with the Contract Documents.

Daily inspection reports shall include, at a minimum, the following information: Contractor's activities, weather conditions, discussions with the Contractor, problems and issues dealt with, approved changes, and any other information necessary to create a satisfactory record of the day's activities at the project site in accordance with standard inspection practice.

The CM shall maintain a "hotline" phone number and answering service and/or official website and email for the public for the purpose of public outreach and tracking complaints which shall have an automatic forward to the CITY.

**Deliverables:**

- *Daily Inspection Reports*
- *Weekly Reports*
- *Monthly Complaint Log*

### **Task 13     Testing**

The CONSULTANT shall provide, coordinate, and monitor all fields and laboratory testing of soils, backfill, structural backfill, aggregate base, asphalt, concrete, and other testing required by law, or the Construction Specifications. Caltrans certified technicians shall complete all testing work and all laboratory facilities shall be Caltrans certified to perform the respective tests and be approved by the CITY. The CM will review results of tests, forward copies to the CITY as a part of the weekly reports and work with the Contractor to resolve deficiencies or defective work. All test procedures will be in accordance with the Contract Documents and applicable Specifications.

**Deliverables:**

- *Copies of all testing results*

### **Task 14     Construction Surveying**

CONSULTANT shall provide all necessary construction control staking for the project in accordance with Chapter 12 of the Caltrans Surveys Manual and provide proper monument preservation per County standards. All Construction staking shall be done under the direction of a Professional Land Surveyor.

In addition, the CONSULTANT shall implement a Survey Quality Assurance Program as described in the approved CMP. At a minimum the program will provide for a qualified licensed surveyor to assist the CM in verifying the following vertically and horizontally:

- a) Check Station Line
- b) Check drainage layout

- c) Check subgrade
- d) Check AB grade
- e) Check final road grades
- f) As-built survey

## **Task 15 Final Completion and Acceptance**

After the project is substantially complete, the CM will schedule a walk through with the CITY and shall coordinate preparation of a “punch list” of incomplete or unsatisfactory items and submit the list to the Contractor. Once all work is complete, the CONSULTANT will deliver a statement to the CITY indicating that to the best of the CONSULTANT’S knowledge and belief, after diligent investigation including satisfaction of its other obligations under the agreement, that the project has been completed in accordance with the Project Construction Contract Documents and CONSULTANT recommends acceptance. A Proposed Final Estimate signed by the CM and the Contractor shall accompany the recommendation for acceptance.

### **Deliverables:**

- *Notice of Substantial Completion*
- *Punch Lists*
- *Proposed Final pay Estimate*

## **Task 16 Other Tasks**

As part of the inspection and construction administration activities, the CONSULTANT shall include the tasks listed below as part of the overall project activities:

- a) Inspect traffic control and erosion control measures as often as necessary to assure activities meet with the approved plans and submittals.
- b) Provide community relations outreach effort by providing information on areas to be under construction to CITY for publication in newspapers and radio and tracking and resolving community complaints.
- c) Inspect landscaping and other improvements within the right of way and public easements for damage.
- d) Any damage identified shall be documented and tracked until the Contractor repairs the damage to pre-project conditions or to plans and specifications.
- e) Review weekly certified payrolls for compliance with State and Federal wage rate requirements as required by Contract Documents. The CONSULTANT shall enforce the requirements of the California Labor Code as they pertain to the Project. The detailed description of the Labor Code requirements is described in Section 7 of the State Standard Specifications. The CONSULTANT shall also review the certified payrolls submitted by the Contractor for full conformance with Section 7 of the State Standard Specifications.
- f) Notify the CITY of any errors or omissions that are found on the plans or specifications during construction within one working day after such errors are discovered.
- g) Perform routine evaluations of project-related off-road and heavy duty on-road equipment emissions for compliance by personal ARB certified to perform Visible Emission Evaluations.
- h) CONSULTANT shall monitor Contractor's coordination with various utility companies, if needed.
- i) CONSULTANT shall take appropriate action to ensure correction of observed safety violations under the requirements of the CAL OSHA Construction Safety Orders.

### **Deliverable:**

- *Documentation of Activities per CMP*

## **Task 17 Project Close Out**

The CONSULTANT shall verify any operating and/or Regulatory Agency permits are obtained and inspections are complied with and completed.

The CONSULTANT will submit to the CITY the following close out items:

- a) All records, maps, and plans maintained by the CONSULTANT during construction.
- b) All approved shop drawings, submittals and manufacturer's literature maintained by the CONSULTANT during the construction project.
- c) One complete electronic set of annotated project progress photographs, ordered chronologically, and videotapes taken before and during construction.
- d) The original set of all inspection reports, summaries, testing documents, meeting minutes, clarifications, schedules, correspondence and other documents related to the construction work as it was being installed.
- e) A set of red line Record Drawings documenting any changes and/or substitutions that have been reviewed for accuracy and completeness by the CONSULTANT and a recommendation for the CITY to accept the Record Drawings.
- f) Claim waiver form and all necessary forms to complete the project close out and final invoice process in accordance with Chapter 17 of the LAPM.

### **Deliverables:**

- *All records, maps and plans maintained during construction.*
- *All shop drawings, submittals, and manufacturer's literature maintained during construction.*
- *Annotated project progress photographs and videotapes taken of construction project.*
- *Record drawings of field changes.*
- *Original inspection reports, summaries, testing documents, meeting minutes, clarifications, schedules, correspondences and other documents of construction.*
- *Red-line record drawings.*

### **CONSULTANT STAFFING**

The CONSULTANT proposes to use       (name to be proposed as part of response to RFP)       as the on-site Construction Manager/Resident Engineer for this contract. Additional staff and subconsultants are to be brought in on an as-needed basis. The CITY maintains the right to request additional staff if, in its opinion, there is inadequate coverage during any phase of the project. In the event there is a need to substitute key personnel by the CONSULTANT for construction management or inspection responsibility, the CONSULTANT shall only substitute personnel after submitting resumes and obtaining specific written approval by the CITY for the replacement staff in these key positions.

The CITY Engineer or designated representative shall have the authority to reject the Construction Manager, field inspection personnel, or testing technicians in the event of unsatisfactory performance by said personnel in the opinion of the CITY. The CONSULTANT shall provide qualified replacement staff acceptable to the CITY.

**Attachment B – 100% Plans dated June 2024**



DRAWING INDEX					
SHEET NO.	DRAWING NO.	DRAWING TITLE	SHEET NO.	DRAWING NO.	DRAWING TITLE
<b>GENERAL</b>			<b>CIVIL (CONTINUED)</b>		
1	G001	TITLE SHEET, VICINITY MAP & LOCATION MAP	44	C130	GRADING AND DRAINAGE PLAN
2	G002	DRAWING INDEX	45	C131	GRADING AND DRAINAGE PLAN
3	G003	PIPELINE AND TREE PROTECTION KEY MAPS	46	C132	GRADING AND DRAINAGE PLAN AND SECTIONS
4	G004	STANDARD SYMBOLS & ABBREVIATIONS	47	C150	TREE PROTECTION PLAN - 1
5	G005	GENERAL NOTES - 1	48	C151	TREE PROTECTION PLAN - 2
6	G006	GENERAL NOTES - 2	49	C152	TREE PROTECTION PLAN - 3
7	G007	MONUMENTS AND POTHOLE DATA	50	C153	TREE PROTECTION PLAN - 4
8	G008	LINE AND CURVE TABLE - 1	51	C154	TREE PROTECTION PLAN - 5
9	G009	LINE AND CURVE TABLE - 2	52	C155	TREE PROTECTION PLAN - 6
10	G010	BIDDING QUANTITIES	53	C156	TREE PROTECTION PLAN - 7
<b>CIVIL</b>			54	C157	TREE PROTECTION PLAN - 8
11	C010	CITY STANDARD DETAILS - 1	55	C158	TREE PROTECTION PLAN - 9
12	C011	CITY STANDARD DETAILS - 2	56	C159	TREE PROTECTION PLAN - 10
13	C012	CITY STANDARD DETAILS - 3	57	C170	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 1
14	C013	CITY STANDARD DETAILS - 4	58	C171	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 2
15	C014	CATHODIC PROTECTION DETAILS - 1	59	C172	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 3
16	C015	CATHODIC PROTECTION DETAILS - 2	60	C173	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 4
17	C016	TRENCH DETAILS - 1	61	C174	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 5
18	C017	TRENCH DETAILS - 2	62	C175	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 6
19	C018	CIVIL DETAILS - 1	63	C176	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 7
20	C019	CONNECTION DETAILS - 1	64	C177	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 8
21	C020	WELDED STEEL DETAILS - 1	65	C178	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 9
22	C100	PLAN & PROFILE - STA 0+00 TO 7+50 - OAK AVENUE EXTENSION	66	C179	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 10
23	C101	PLAN & PROFILE - STA 7+50 TO 17+00 - OAK AVENUE EXTENSION	67	C180	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 11
24	C102	PLAN & PROFILE - STA 17+00 TO 25+50 - OAK AVENUE EXTENSION	68	C181	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 12
25	C103	PLAN & PROFILE - STA 25+50 TO 34+81 - OAK AVENUE EXTENSION	69	C182	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 13
26	C104	PLAN & PROFILE - STA 100+00 TO 108+50 - OAK AVENUE PKWY	70	C183	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 14
27	C105	PLAN & PROFILE - STA 108+50 TO 118+00 - OAK AVENUE PKWY	71	C184	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 15
28	C106	PLAN & PROFILE - STA 118+00 TO 128+00 - OAK AVENUE PKWY	72	C185	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 16
29	C107	PLAN & PROFILE - STA 128+00 TO 138+00 - OAK AVENUE PKWY	73	C186	ASBESTOS DUST CONTROL / EROSION CONTROL PLAN - 17
30	C108	PLAN & PROFILE - STA 138+00 TO 148+00 - OAK AVENUE PKWY	74	C200	WATER TREATMENT PLANT - EXISTING CONDITIONS
31	C109	PLAN & PROFILE - STA 148+50 TO 158+50 - OAK AVENUE PKWY	75	C201	WATER TREATMENT PLANT - DEMOLITION & PROTECTION PLAN
32	C110	PLAN & PROFILE - STA 158+50 TO 168+30 - OAK AVENUE PKWY	76	C202	WATER TREATMENT PLANT - HORIZONTAL CONTROL & PAVING PLAN
33	C111	PLAN & PROFILE - STA 200+00 TO 209+50 - E. BIDWELL ST	77	C203	WATER TREATMENT PLANT - GRADING & DRAINAGE PLAN
34	C112	PLAN & PROFILE - STA 209+50 TO 219+50 - E. BIDWELL ST	78	C204	WATER TREATMENT PLANT - YARD PIPING PLAN
35	C113	PLAN & PROFILE - STA 219+50 TO 229+50 - E. BIDWELL ST	79	C205	WATER TREATMENT PLANT - PIPING PROFILES
36	C114	PLAN & PROFILE - STA 229+50 TO 239+50 - E. BIDWELL ST	80	C206	WATER TREATMENT PLANT - CIVIL DETAILS - 1
37	C115	PLAN & PROFILE - STA 239+50 TO 246+50 - E. BIDWELL ST	81	C207	WATER TREATMENT PLANT - CIVIL DETAILS - 2
38	C116	PLAN & PROFILE - STA 246+50 TO 255+50 - E. BIDWELL ST	<b>STRUCTURAL</b>		
39	C117	PLAN & PROFILE - STA 255+50 TO 265+50 - E. BIDWELL ST	82	S100	GENERAL NOTES
40	C118	PLAN & PROFILE - STA 265+50 TO 275+50 - E. BIDWELL ST	83	S101	GENERAL NOTES
41	C119	PLAN & PROFILE - STA 265+50 TO 275+50 - E. BIDWELL ST	84	S200	RETAINING WALL DETAILS
42	C120	PLAN & PROFILE - STA 281+50 TO 287+34 - E. BIDWELL ST	85	S300	HUMBUG CREEK PIPE CROSSING
43	C121	PARTIAL PLANS	86	S301	WILLOW CREEK PIPE CROSSING



741 ALLSTON WAY  
BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE



**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

DRAWN BY: RWCI/AP DATE: 6/3/24	DESIGN BY: CML PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C59049 DATE: 6/3/24
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**CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT**

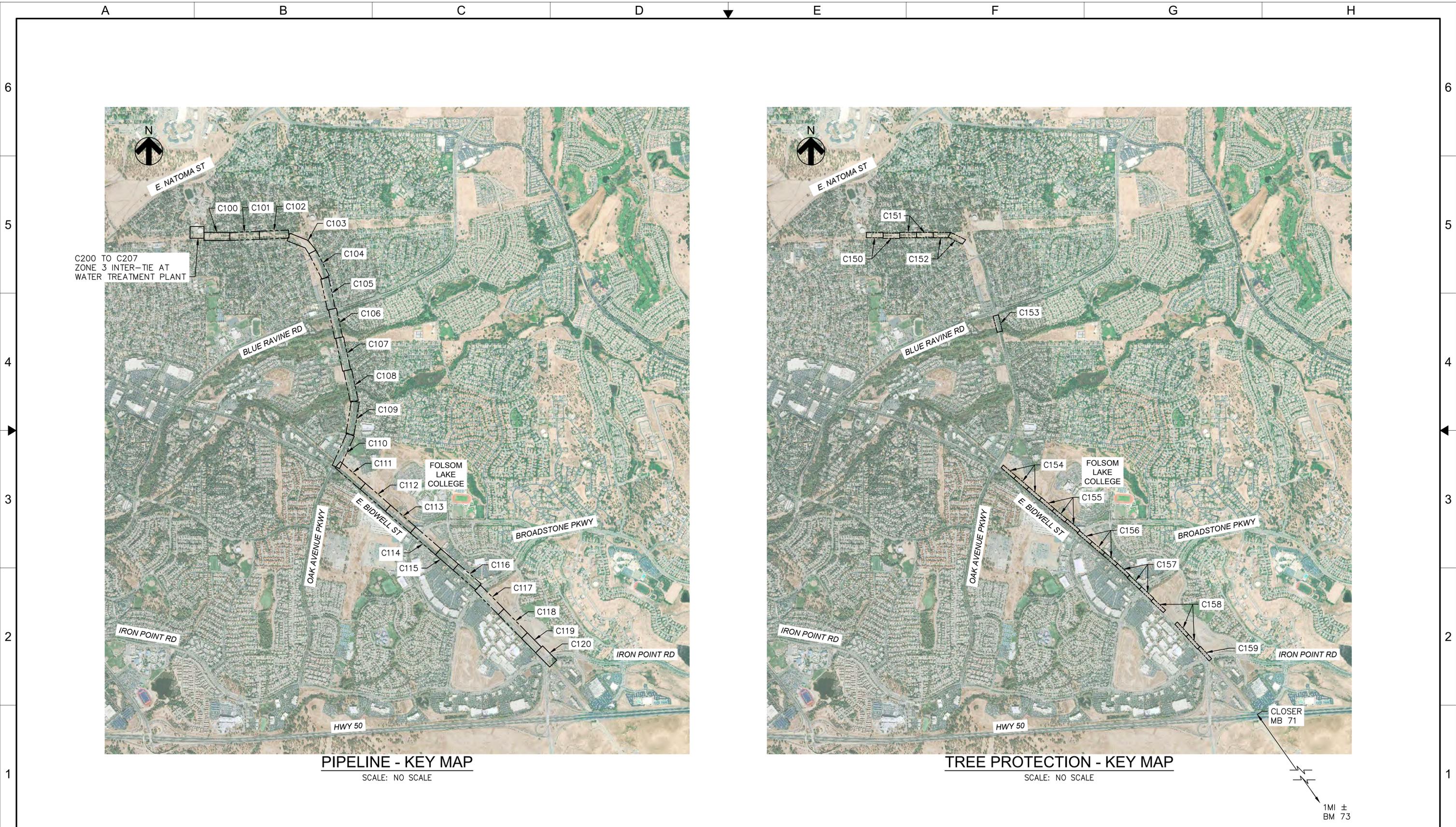
**DRAWING INDEX**



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<b>G002</b>	SHEET 2 OF 86
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**PIPELINE - KEY MAP**  
SCALE: NO SCALE

**TREE PROTECTION - KEY MAP**  
SCALE: NO SCALE

1MI ±  
BM 73

**HydroScience**  
741 ALLSTON WAY  
BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGNED BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

PIPELINE AND TREE PROTECTION  
KEY MAPS

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
5/5/2024

PAPER SIZE: 22x34 (ANSI D)  
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G003 SHEET 3 OF 86

### STANDARD SYMBOLS

	PROPERTY BOUNDARY
	RIGHT OF WAY \ PUBLIC UTILITY EASEMENT
	CENTERLINE PIPELINE
	LIMIT OF CONSTRUCTION
	MATCH LINE
	IN PLACE REHABILITATION
	NEW TRENCH CUT\EXPOSED PIPE CROSSING
	FENCE
	EX WATER LINE
	EX GAS LINE
	EX SANITARY SEWER LINE
	EX STORM DRAIN LINE
	EX ELECTRICAL LINE
	EX TELEPHONE/CABLE LINE
	EX AT&T COMMUNICATION FIBER OPTIC
	EX FIBEROPTIC LINE
	EX OVER HEAD
	EX COMMUNICATION VERIZON
	EX SMUD ELECTRICAL
	EX SMUD FIBER OPTIC

	EX SMUD OVER HEAD
	EX UNDERGROUND UTILITY
	EX WESTERN AREA POWER UTILITY
	EX REDUCER
	DEMOLITION OR ABANDONMENT
	PLUG EX WATER LINE
	BLOWOFF/HYDRANT VALVE (PROFILE)
	BALL VALVE
	GATE VALVE (NORMALLY OPEN)
	POTHOLE (PH)
	CHECK VALVE
	BUTTERFLY VALVE
	PNEUMATIC ACTUATED BUTTERFLY VALVE
	REDUCER OR INCREASER
	COUPLING
	RESTRAINED FLANGED COUPLING ADAPTER

	RESTRAINED FLANGED COUPLING ADAPTER
	AIR VACUUM RELIEF VALVE (MECHANICAL)
	(E) AIR RELIEF VALVE
	(E) WATER VALVE
	MONUMENT OR CONTROL POINT
	BLOWOFF/HYDRANT VALVE (PLAN)
	AIR VAC (P&P)
	FO PULLBOX
	FO SPLICE VAULT (JUNCTION BOX)
	EX SSMH
	EX SDMH

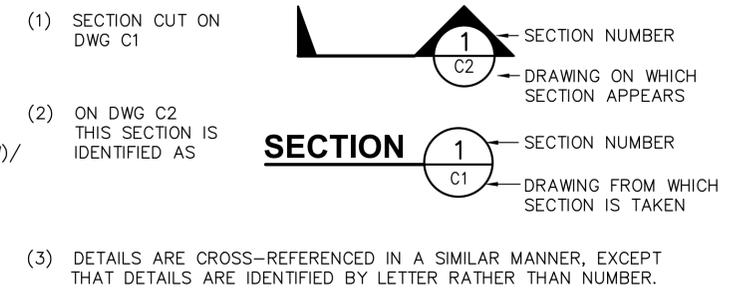
### PATTERN LEGEND

	DEMOLITION AREA
	CONCRETE
	AGGREGATE BASE (SECTION VIEW)/ROCK (PLAN AND PROFILE)
	AGGREGATE BASE
	COMPACTED BACKFILL
	NATURAL GROUND OR GRADE
	DECOMPOSED GRANITE
	WETLANDS

### PROFILE BAND LEGEND

	PROPOSED GRADE
	EXISTING GRADE
	PIPE INVERT
	STATION

### SECTION AND DETAIL NUMBERING SYSTEM



### SERVICE ABBREVIATIONS

FO	FIBEROPTIC	SS	SANITARY SEWER
E	ELECTRICAL	T	TELEVISION/CABLE
GAS	GAS	UGU	UNDERGROUND UTILITY
RW	RECYCLED WATER	W	POTABLE WATER
SD	STORM DRAIN		

NOTE:  
ABBREVIATIONS AND SYMBOLS ARE FOR REFERENCE ONLY, NOT ALL ABBREVIATIONS ARE USED IN THESE CONTRACT DRAWINGS.

### STANDARD ABBREVIATIONS

<b>A</b>	AB AGGREGATE BASE	AC ASPHALT CONCRETE	ADA AMERICANS WITH DISABILITIES ACT	APPROX APPROXIMATE(LY)	APN ASSESSOR'S PARCEL NUMBER	AVE AVENUE	ARV AIR RELIEF VALVE	AVRV AIR VACUUM RELEASE VALVE	ASTM AMERICAN SOCIETY FOR TESTING AND MATERIALS	AWS AMERICAN WELDING SOCIETY	AWWA AMERICAN WATER WORKS ASSOCIATION				
<b>B</b>	BFV BUTTERFLY VALVE	BLDG BUILDING	BLVD BOULEVARD	BOV BLOWOFF VALVE	BV BALL VALVE										
<b>C</b>	CA CALIFORNIA	CAVRV COMBINATION AIR AND VACUUM RELIEF VALVE	CAV COMBINATION AIR VACUUM VALVE	CCP CONCRETE CYLINDER PIPE	CCTV CLOSED CIRCUIT TELEVISION	CI CAST IRON	CITY CITY OF FOLSOM	CIP CAST IRON PIPE	CL CENTERLINE	CLR CLEAR	CLSM CONTROLLED LOW STRENGTH MATERIALS	CMLC CEMENT MORTAR LINED AND COATED	CMP CORRUGATED METAL PIPE	CO CLEANOUT	COF CITY OF FOLSOM
<b>D</b>	COM COMMUNICATION	CONC CONCRETE	CONN CONNECTION	CONT CONTINUED(OUS)	CP CONTROL POINT	CPLG COUPLING	COURT COURT	CVR COVER	CY CUBIC YARDS	C&G CURB & GUTTER					
<b>E</b>	EA EACH	ECC ECCENTRIC	EG EXISTING GROUND	EL ELEVATION	E, ELEC ELECTRICAL	ELL ELBOW	ENGR'D ENGINEERED	EP EDGE OF PAVEMENT	EQ EQUAL	EX, (E), EXIST EXISTING	EXIST EXISTING	EXPY EXPRESSWAY			
<b>F</b>	FCA FLANGE COUPLING ADAPTER	FC FRONT OF CURB													
<b>G</b>	G GAS	GAL GALLON	GALV GALVANIZED	GB GRADE BRAKE	GPM GALLON PER MINUTE	GV GATE VALVE									
<b>H</b>	H HEIGHT	HD HOT DIPPED	HDPE HIGH DENSITY POLYETHYLENE	HEX HEXAGONAL	HORIZ HORIZONTAL	HP HIGH POINT	HWY HIGHWAY								
<b>I</b>	IE INVERT ELEVATION	IN INCH	INV INVERT	IPS IRON PIPE SIZE											
<b>J</b>	JT JOINT OR JOINT TRENCH														
<b>K</b>	KSI 1,000 PSI														
<b>L</b>	LBS POUNDS	LF LINEAR FEET	LG LARGE	LIP LIP OF GUTTER											
<b>M</b>	M METER	M&S MAG & STAKE	MAX MAXIMUM	MFR MANUFACTURE(R)	MH MANHOLE	MIN MINIMUM	MJ MECHANICAL JOINT	MON MONUMENT	MUTCD MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES						
<b>N</b>	N NORTH, NITROGEN	NIC NOT IN CONTRACT	NPT NATIONAL PIPE THREAD	NSF NATIONAL SAFETY FOUNDATION	NTS NOT TO SCALE										
<b>O</b>	OC ON CENTER	OD OUTSIDE DIAMETER	OH OVERHEAD												
<b>P</b>	PE PLAIN END	PG&E PACIFIC GAS & ELECTRIC	PH POTHOLE	PKWY PARKWAY											
<b>PL OR P</b>	PROPERTY LINE, PIPELINE, PLATE														
<b>POC</b>	POINT OF CONNECTION														
<b>PREP</b>	PREPARATION														
<b>PROP</b>	PROPOSED														
<b>PRV</b>	PRESSURE REDUCING VALVE														
<b>PSI</b>	POUNDS PER SQUARE INCH														
<b>PUE</b>	PUBLIC UTILITY EASEMENT														
<b>PVC</b>	POLYVINYL CHLORIDE														
<b>R</b>	RCP REINFORCED CONCRETE PIPE	RCCP REINFORCED CONCRETE CYLINDER PIPE	RCPP REINFORCED CONCRETE PRESSURE PIPE	RD ROAD	RDIP RESTRAINED DUCTILE IRON PIPE	REHAB REHABILITATION	REINF REINFORCEMENT	REQ'D REQUIRED	REQ'TS REQUIREMENTS	RFCA RESTRAINED FLANGE COUPLING ADAPTER	ROW RIGHT-OF-WAY	RSPM RESTRAINED SELECTED PIPELINE MATERIAL	RW RECYCLED WATER	RED REDUCER	
<b>S</b>	S SOUTH	SCH SCHEDULE	SCJ SHRINKAGE CONTRACTION JOINT	SD STORM DRAIN	SDMH STORM DRAIN MANHOLE	SECT SECTION	SHT SHEET	SMUD SACRAMENTO MUNICIPAL UTILITY DISTRICT	SPM SELECTED PIPE MATERIAL	SPEC SPECIFICATION(S)					
<b>SS</b>	SANITARY SEWER														
<b>SSMH</b>	SANITARY SEWER MANHOLE														
<b>SST</b>	STAINLESS STEEL														
<b>STL</b>	STEEL														
<b>ST</b>	STREET														
<b>STA</b>	STATION														
<b>STD</b>	STANDARD														
<b>STL</b>	STEEL														
<b>STRUCT</b>	STRUCTURAL														
<b>SWPPP</b>	STORM WATER POLLUTION PREVENTION PLAN														
<b>T</b>	TC,TOC TOP OF CURB/ CONC	TV TELEVISION	TYP TYPICAL	TW TOP OF WALL											
<b>U</b>	UB UTILITY BOX														
<b>V</b>	V VALVE, VOLTS, VENT	VAR VARIES, VARIABLE	VB VALVE BOX	VCP VITRIFIED CLAY PIPE	VERT VERTICAL	VG VALLEY GUTTER	VRZ VERIZON								
<b>W</b>	W WATER, WIDTH	WAPA WESTERN AREA POWER ADMINISTRATION	W/ WITH	W/O WITHOUT	WY WAY										

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BERKELEY, CA 94710  
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REV	DESCRIPTION	DATE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGNED BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

STANDARD SYMBOLS &  
ABBREVIATIONS

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

G004 SHEET 4 OF 86

**GENERAL NOTES**

- THE CONTRACTOR SHALL OBTAIN ALL NECESSARY CONSTRUCTION PERMITS, RIGHTS OF ENTRY, APPROVALS AND LICENSES PRIOR TO BEGINNING CONSTRUCTION, INCLUDING A CITY ENCROACHMENT PERMIT FOR WORK PERFORMED WITHIN CITY RIGHTS-OF-WAY AND EASEMENTS. ALSO, CONTRACTOR SHALL OBTAIN A CITY BUILDING PERMIT FOR THE PUMP STATION.
- ALL WORKMANSHIP, MATERIALS, AND CONSTRUCTION SHALL CONFORM TO THE CITY OF FOLSOM'S LATEST REVISED IMPROVEMENT STANDARDS, TECHNICAL PROVISIONS, STANDARD CONSTRUCTION SPECIFICATIONS, AND STANDARD DRAWINGS; THE AWWA STANDARDS; THE ASTM STANDARDS; THE STATE STANDARD SPECIFICATIONS AND STANDARD PLANS AS WELL AS ANY FEDERAL AND LOCAL CODES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR UNDERSTANDING ALL STANDARDS PERTAINING TO THIS PROJECT. WHERE CONFLICTS ARE ENCOUNTERED BETWEEN THE CITY OF FOLSOM'S LATEST IMPROVEMENT STANDARDS, SPECIFICATIONS, CITY STANDARD DRAWINGS, AND THE CONTRACT DRAWINGS AND SPECIFICATIONS, THE CITY'S STANDARD DOCUMENTS SHALL PREVAIL.
- CONSTRUCTION BIDS SHALL BE BASED ON THE WORK REQUIRED BY THIS PLAN SET AND SPECIFICATIONS, WHETHER OR NOT SPECIFICALLY ITEMIZED ON THE BID SHEET TO CONSTRUCT ALL FACILITIES, UTILITIES, AND EQUIPMENT THAT ARE SUITABLE FOR THEIR INTENDED PURPOSE.
- IF CONSTRUCTION INSPECTION FOR VARIOUS CONSTRUCTION RELATED COMPONENTS OF THE PROJECT IS REQUIRED BY THE CITY OF FOLSOM, BEFORE BACKFILLING OR COVERING THE RELATED WORK, THE CONTRACTOR SHALL NOTIFY THE CITY OF FOLSOM COMMUNITY DEVELOPMENT DEPARTMENT FIVE WORKING DAYS IN ADVANCE. CALL CITY OF FOLSOM COMMUNITY DEVELOPMENT DEPARTMENT AT (916) 461-6212.
- THE CONTRACTOR MUST OBTAIN WRITTEN PERMISSION FROM THE OWNER OF ANY PRIVATELY OWNED PROPERTY PRIOR TO BEGINNING ANY WORK, STORING MATERIALS OR OTHERWISE CONDUCTING ANY OPERATIONS ON SAID PROPERTY. THE WRITTEN APPROVAL FROM THE PROPERTY OWNER MUST BE ON FILE WITH THE CITY BEFORE ANY OPERATIONS WILL BE PERMITTED ON SAID PROPERTY.
- ANY CITY OR PRIVATE PROPERTY INCLUDING LANDSCAPING, IRRIGATION OR OTHER IMPROVEMENTS, WHICH IS DAMAGED BY THE CONTRACTOR'S OR PROPERTY OWNER OPERATIONS SHALL BE REPAIRED OR REPLACED, IN KIND, AT NO ADDITIONAL COST TO THE CITY AND TO THE SATISFACTION OF THE ENGINEER.
- THE CONTRACTOR IS RESPONSIBLE FOR HAVING A COMPLETE SET OF CONTRACT PLANS AND SPECIFICATIONS, CITY PERMITS, AND THE LATEST GOVERNING STANDARD SPECIFICATIONS AT THE PROJECT SITE DURING WORK HOURS.
- THE CONTRACTOR SHALL KEEP UP-TO-DATE, A COMPLETE RECORD SET OF RED-LINED PRINTS OF THE CONTRACT DRAWINGS SHOWING EVERY CHANGE FROM THE ORIGINAL DRAWINGS MADE DURING THE COURSE OF CONSTRUCTION, INCLUDING EXACT LOCATIONS, SIZES, MATERIALS, AND EQUIPMENT. A COMPLETE SET OF CORRECTED AND COMPLETED RECORD DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE OF THE WORK BY THE CITY.
- THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL POWER, UTILITIES, AND TEMPORARY FACILITIES THAT ARE NECESSARY TO COMPLETE THE WORK.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECYCLING/DISPOSAL OF ALL BITUMINOUS PAVEMENT, CONCRETE, REINFORCEMENT, AND SPOILS NOT NEEDED FOR BACKFILL PER THE SPECIFICATIONS. MATERIAL DISPOSED OF SHALL ALSO CONFORM TO THE CITY OF FOLSOM MUNICIPAL CODE SECTION 14.29.
- THE CONTRACTOR SHALL COVER ALL TRENCHES WITHIN IMPROVED AREAS AT THE END OF EACH WORKDAY PER CITY SPECIFICATIONS AND ANY SPECIAL PROVISIONS.
- THE CONTRACTOR SHALL MAINTAIN ALL TRAFFIC CONTROL AND PEDESTRIAN USE DURING CONSTRUCTION IN ACCORDANCE WITH THE LATEST CA MUTCD. PEDESTRIAN TRAFFIC SHALL ALSO CONFORM TO THE REQUIREMENTS OF THE AMERICAN DISABILITIES ACT (ADA) AND SHALL ACCOMMODATE PEDESTRIAN TRAFFIC THROUGH OR AROUND THE WORK ZONES.
- NO TRENCHING WHATSOEVER SHALL BE ALLOWED WITHIN THE DRIPLINES OF EXISTING TREES NOT AUTHORIZED FOR REMOVAL FROM THE CITY, INCLUDING ISSUANCE OF AN APPROVED TREE PERMIT BY THE CITY ARBORIST, IF NECESSARY. IF IT IS NECESSARY TO INSTALL UNDERGROUND UTILITIES WITHIN THE DRIPLINE OF AN EXISTING TREE NOT AUTHORIZED FOR REMOVAL, THE UTILITY LINE SHALL BE EITHER BORED OR DRILLED. IF BORING OR DRILLING IS DETERMINED TO BE IMPOSSIBLE BY THE ENGINEER, THE UTILITY LINE TRENCH MAY BE HAND DUG UNDER THE DIRECT SUPERVISION OF A CERTIFIED ARBORIST. PROJECT ARBORIST KRISSEY WALKER OF ECORP CONSULTING 2525 WARREN DR, ROCKLIN, CA 95677 (916)782-9100.
- THE CONTRACTOR SHALL PROTECT AND PRESERVE CITY MONUMENTS PER CITY STANDARDS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF MONUMENTS ENCOUNTERED, AND SHALL NOT REMOVE OR DAMAGE SAID MONUMENT UNTIL THE MONUMENT CAN BE CROSS REFERENCED AND TIED OUT BY THE SURVEY PARTY. THE CONTRACTOR SHALL ALLOW A MINIMUM OF ONE WORKING DAY FOR SUCH REFERENCING TO BE ACCOMPLISHED.
- OVERHEAD UTILITY SERVICE DROPS ARE NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL INVESTIGATE THE SITE AND BE AWARE OF ANY POSSIBLE LIMITED OVERHEAD CLEARANCES.
- WHERE APPLICABLE, ALL UTILITY COVERS SHALL BE BROUGHT TO GRADE WITHIN 48 HOURS OF PAVING. ALL EXISTING UTILITY VAULTS AND/OR PULL BOXES THAT ARE LOOSE AND/OR BROKEN SHALL BE RE-SECURED AND/OR REPLACED TO THE CITY'S SATISFACTION.

- CONTRACTOR SHALL BE LICENSED AS A CLASS A – GENERAL ENGINEERING CONTRACTOR AT THE TIME OF THE BID AND AT THE TIME OF THE EXECUTION OF THE CONTRACT.
- CONTRACTOR SHALL OBTAIN A PERMIT FROM THE COUNTY OR CITY DIVISION OF OCCUPATIONAL SAFETY & HEALTH PRIOR TO ANY TRENCHING AND EXCAVATION 5 FEET OR MORE IN DEPTH. A COPY OF THIS PERMIT WILL BE AVAILABLE AT THE CONSTRUCTION SITE AT ALL TIMES.
- THE CONSTRUCTION SITE SHALL BE KEPT CLEAN AT ALL TIMES. AT NO TIME SHALL THE CONTRACTOR OR PERMIT HOLDER BE ALLOWED TO LEAVE THE SITE PRIOR TO THOROUGHLY CLEANING SIDEWALKS, CURBS, GUTTERS, AND STREET SURFACES. CLEANING SHALL BE ACCOMPLISHED BY HAND OR MACHINE SWEEPING, AS REQUIRED. IN NO EVENT SHALL THE CONTRACTOR BE ALLOWED TO FLUSH THE STREETS WITH WATER OR UTILIZE THE STORMWATER CONVEYANCE SYSTEM TO REMOVE DEBRIS AND SILT.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES ON OR OFF THE PROJECT SITE AS A RESULT OF LACK OF DUST CONTROL.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY, 24-HOURS A DAY, 7-DAYS A WEEK, AND MAINTAIN PROJECT SPECIFIC CONTACT INFORMATION FOR THE DESIGNATED RESPONSIBLE PEOPLE POSTED OUTSIDE THE PROJECT LIMITS IN CASE OF AN EMERGENCY. DESIGNATED RESPONSIBLE PEOPLE SHALL BE IN CHARGE OF RESPONDING TO ALL PROJECT-RELATED EMERGENCIES AND ISSUES IN A TIMELY MANNER. CONTRACTOR SHALL ALSO POST EMERGENCY TELEPHONE INFORMATION FOR LOCAL POLICE, FIRE, AMBULANCE, AND RESPONSIBLE PEOPLE WITHIN THE CITY. CONTRACTOR SHALL KEEP THE PROJECT SITE SECURE AT ALL TIMES AND INSTALL A SECURITY SYSTEM SHOULD THE CONTRACTOR DEEM NECESSARY. THE PROJECT SITE SHALL BE SECURE AND INACCESSIBLE TO THE GENERAL PUBLIC AND KEPT FREE OF CONSTRUCTION SPOILS, DEBRIS, TRASH, VALUABLES, EQUIPMENT, LIGHTWEIGHT MACHINERY, AND HAND TOOLS.
- THE CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY AND TO MAINTAIN SMOOTH FLOW OF TRAFFIC AT ALL TIMES.
- ALL SITE GRADING AND PIPING LENGTHS ARE HORIZONTAL PROJECTIONS, UNLESS OTHERWISE SHOWN.
- THE CONTRACTOR SHALL IMMEDIATELY REPORT ANY SOIL OR WATER CONTAMINATION NOTICED DURING CONSTRUCTION TO THE ENGINEER.
- CONTRACTOR SHALL REFERENCE THE PROJECT GEOTECHNICAL REPORT PROVIDED AS APPENDIX A OF THE SPECIFICATIONS, FOR ADDITIONAL INSTRUCTIONS NOT STATED HEREIN. "GEOTECHNICAL ENGINEERING STUDY FOR SOUTH FOLSOM AREA GROUP TRANSMISSION PIPELINE AND PUMP STATION PROJECT, FOLSOM CA, APRIL 2020." THE STUDY WAS PERFORMED BY BLACKBURN CONSULTING 2491 BOATMAN AVE, WEST SACRAMENTO, CA 95691.
- AS TO THE ACCURACY BETWEEN THE RELATED WORK SET FORTH IN THESE PLANS AND THE WORK PERFORMED IN THE FIELD, ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. SHOULD THE ENGINEER DEEM THE PERFORMED WORK TO BE UNACCEPTABLE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH RECONSTRUCTING THE AFFECTED ITEMS.
- CONTRACTOR SHALL REFERENCE THE PROJECT ARBORIST REPORT, PROVIDED AS APPENDIX B OF THE SPECIFICATIONS, FOR ADDITIONAL INSTRUCTIONS NOT STATED HEREIN. "ARBORIST REPORT FOR SOUTH FOLSOM SOUTH AREA GROUP PIPELINE AND PUMP STATION PROJECT, FOLSOM CA, 2/22/2021." THE REPORT WAS PREPARED BY KRISSEY WALKER-BERRY OF ECORP CONSULTING 2525 WARREN DR, ROCKLIN, CA 95677 (916)782-9100.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES TO ADJACENT OR CROSSING UTILITIES WHEN MARKED OR PREVIOUSLY IDENTIFIED AND IS RESPONSIBLE TO PROTECT IN PLACE DURING ALL CONTRACTED WORK.
- CONTRACTOR IS REQUIRED TO NOTIFY ALL UTILITIES SCHEDULE PRECUR, BEFORE STARTING WORK IN THE EASEMENT.

**GRADING NOTES**

- ALL GRADING SHALL CONFORM TO THE CITY OF FOLSOM STANDARDS AND SPECIFICATIONS AND TO THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER REPORT PROVIDED BY: BLACKBURN CONSULTING, AND DATED APRIL 28, 2020. APPENDIX A OF SPECIFICATIONS).
- WATER SHALL BE SPRAYED ON ALL EXPOSED EARTH SURFACES DURING CLEARING, EARTH MOVING, AND OTHER SITE GRADING ACTIVITIES. THE EXPOSED EARTH MATERIAL SHALL BE WATERED THROUGHOUT THE DAY TO MINIMIZE DUST.
- ALL UNPAVED CONSTRUCTION AREAS SHALL BE SPRAYED WITH WATER AS OFTEN AS NECESSARY TO ASSURE THAT FUGITIVE DUST FROM THIS PROJECT DOES NOT IMPACT ADJACENT PROPERTIES. SPRAYING SHALL OCCUR MORE FREQUENTLY UNDER HOT, WINDY CONDITIONS.
- STOCKPILES OF SOIL OR OTHER FINE MATERIALS BEING LEFT FOR PERIOD IN EXCESS OF ONE DAY DURING SITE CONSTRUCTION AND GRADING SHALL BE SPRAYED AND TRACK-WALKED AFTER THE STOCKPILE IS COMPLETED. TARPULINS OR OTHER EFFECTIVE COVERS SHALL BE USED ON ALL STOCKPILES OF EARTH MATERIAL AND HAUL TRUCKS TO MINIMIZE DUST.
- CONSTRUCTION EQUIPMENT ACCESS SHALL BE RESTRICTED TO A DEFINED ENTRY AND EXIT POINT TO CONTROL THE AMOUNT OF SOIL DEPOSITION.
- PAVED AREAS AT THE CONTROLLED ACCESS POINTS SHALL BE SWEEP AND/OR WASHED, IF APPROVED BY THE CITY, A MINIMUM OF ONCE EACH DAY OR MORE FREQUENTLY AS NECESSARY.

- HAUL TRUCKS USED FOR MOVING MATERIALS OFF THE PROJECT SITE SHALL EMPLOY APPROPRIATE MEASURES TO MINIMIZE SPILLAGE.
- THE CITY SHALL HAVE THE AUTHORITY TO STOP ALL GRADING OPERATIONS, IF IN THE OPINION OF THE CITY, INADEQUATE DUST CONTROL MEASURES ARE BEING PRACTICED OR EXCESSIVE WIND CONDITIONS CONTRIBUTE TO EXCESSIVE DUST EMISSION.
- STREET FRONTAGES SHALL BE SWEEP DAILY TO REMOVE SILT AND OTHER DIRT WHICH IS EVIDENT FROM CONSTRUCTION ACTIVITIES.
- SHOULD GRADING OPERATIONS UNCOVER HAZARDOUS MATERIALS, OR WHAT APPEARS TO BE HAZARDOUS MATERIAL, THE CITY OF FOLSOM FIRE DEPARTMENT SHALL BE CONTACTED IMMEDIATELY AT (916) 984-2280.
- THE CONTRACTOR IS EXPECTED TO COMPLY WITH THE REGULATIONS OF THE SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT.

**EROSION AND SEDIMENTATION CONTROL NOTES**

- ALL EROSION AND SEDIMENT CONTROL MEASURES FOR THIS PROJECT SHALL BE IN COMPLIANCE WITH THE CITY OF FOLSOM SPECIFICATIONS AND DESIGN STANDARDS.
- EROSION AND SEDIMENT CONTROL MEASURES FOR THIS PROJECT SHALL BE IN SUBSTANTIAL COMPLIANCE AT ALL TIMES WITH THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THE PROJECT IN ACCORDANCE WITH THE STATE OF CALIFORNIA GENERAL PERMIT FOR CONSTRUCTION ACTIVITIES. ACCORDING TO STATE LAW, IT IS THE RESPONSIBILITY OF THE PROPERTY OWNER THAT THE SWPPP IS KEPT UP-TO-DATE TO REFLECT CHANGING SITE CONDITIONS AND IS AVAILABLE ON THE PROJECT SITE AT ALL TIMES FOR REVIEW AND APPROVAL BY LOCAL AND STATE INSPECTORS. WDDID #: -----
- EROSION CONTROL BEST MANAGEMENT PRACTICES (BMPS) SHALL BE INSTALLED AND MAINTAINED YEAR ROUND AND AN EFFECTIVE COMBINATION OF EROSION AND SEDIMENT CONTROL BMPS SHALL BE INSTALLED AND MAINTAINED DURING THE WET SEASON (OCTOBER 1 THROUGH APRIL 30) AND PRIOR TO THE ONSET OF ANY STORM. ALL AREAS DISTURBED DURING CONSTRUCTION BY GRADING, TRENCHING, OR OTHER ACTIVITIES, SHALL BE PROTECTED FROM EROSION DURING THE WET SEASON BETWEEN SEPTEMBER 15 TO APRIL 30. HYDROSEED PLACED DURING THE WET SEASON SHALL BE USED AS A SECONDARY EROSION PROTECTION METHOD.
- ALL STORM DRAIN INLETS WITHIN THE WORK AREA, AND OFFSITE STORM DRAIN INLETS WITH THE POTENTIAL TO RECEIVE RUNOFF FROM THE PROJECT SITE, SHALL BE ADEQUATELY PROTECTED WITH SEDIMENT CONTROL BMPS TO EFFECTIVELY REMOVE SEDIMENT FROM RUNOFF PRIOR TO DISCHARGE TO THE STORM DRAIN. ADDITIONAL BMPS SHALL BE USED AS NEEDED TO REMOVE SEDIMENT FROM RUNOFF. UPON COMPLETION OF THE PROJECT AND ACCEPTANCE OF THE IMPROVEMENTS BY THE CITY, ALL SEDIMENT CONTROL BMPS SHALL BE REMOVED.
- ALL STABILIZED CONSTRUCTION ACCESS LOCATIONS SHALL BE CONSTRUCTED PER THE LATEST EDITION OF THE SACRAMENTO COUNTY STANDARDS TO EFFECTIVELY PREVENT TRACKING OF SEDIMENT TO PAVED AREAS. THE STABILIZED ACCESS SHALL BE MAINTAINED ON A YEAR-ROUND BASIS UNTIL ALL AREAS ARE FINALLY STABILIZED.
- PROTECTED AREAS AND AREAS WHERE EXISTING VEGETATION IS BEING PRESERVED SHALL BE PROTECTED WITH ORANGE CONSTRUCTION FENCING. ADDITIONAL SIGNAGE MAY BE REQUIRED TO IDENTIFY THE RESOURCE BEING PROTECTED AND/OR PROVIDE ADDITIONAL INSTRUCTIONS TO CONSTRUCTION PERSONNEL. EROSION, SEDIMENT, AND DIVERSION CONTROL BMPS SHALL BE INSTALLED AND MAINTAINED TO ENSURE THAT CONSTRUCTION RUNOFF DOES NOT ENTER THE PROTECTED AREAS.
- SEDIMENT CONTROL BMPS SHALL BE PLACED ALONG THE PROJECT PERIMETER WHEREVER THERE IS A POTENTIAL FOR DRAINAGE TO LEAVE THE PROJECT SITE. PERIMETER SEDIMENT CONTROL BMPS SHALL BE MAINTAINED YEAR ROUND UNTIL THE CONSTRUCTION IS COMPLETE OR THE DRAINAGE PATTERN HAS BEEN CHANGED AND NO LONGER LEAVES THE SITE AT THOSE LOCATIONS.
- CONTRACTOR SHALL MAINTAIN A LOG AT THE SITE OF ALL INSPECTIONS OR MAINTENANCE OF BMPS, AS WELL AS ANY CORRECTIVE CHANGES TO THE BMPS OR TO THE EROSION AND SEDIMENT CONTROL PLAN.
- SEDIMENT AND TRASH ACCUMULATED IN DRAINAGE OR DETENTION BASINS SHALL BE REMOVED AS SOON AS POSSIBLE. IN ADDITION, OIL AND MATERIAL FLOATING ON WATER SURFACE SHALL BE SKIMMED WEEKLY AND THE DEBRIS PROPERLY DISPOSED OF.
- THE CONTRACTOR SHALL ESTABLISH A SPECIFIC SITE WITHIN THE DEVELOPMENT FOR MAINTENANCE AND STORAGE OF EQUIPMENT OR ANY OTHER ACTIVITY THAT MAY ADVERSELY CONTRIBUTE TO THE WATER QUALITY OF THE RUNOFF. THIS AREA SHALL HAVE A BERM LOCATED AROUND ITS PERIMETER. THIS AREA SHALL BE RESTORED TO ACCEPTABLE CONDITION UPON COMPLETION OF PROJECT.
- THE PROJECT IS LOCATED WITHIN AREAS THAT ARE KNOWN TO CONTAIN NATURALLY OCCURRING ASBESTOS. THE OWNER/APPLICANT SHALL BE REQUIRED TO OBTAIN APPROVAL FROM THE SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT (SMAQMD) PRIOR TO APPROVAL OF ANY GRADING AND/OR CONSTRUCTION ON THE PROJECT SITE. THE OWNER/APPLICANT SHALL PROVIDE TO THE COMMUNITY DEVELOPMENT DEPARTMENT A COPY OF THE WRITTEN APPROVAL FROM SMAQMD PRIOR TO APPROVAL OF THE IMPROVEMENT PLANS.

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BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

DRAWN BY: AGP DATE: 6/3/24	DESIGN BY: CML PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C59049 DATE: 6/3/24
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CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

GENERAL NOTES - 1

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

G005 SHEET 5 OF 86

**GENERAL UTILITY NOTES**

- ONLY CITY PERSONNEL SHALL OPERATE VALVES ON EXISTING PUBLIC OWNED, OPERATED, AND MAINTAINED, UTILITIES. CONTRACTOR SHALL COORDINATE WITH CITY FOR SCHEDULING.
- CUT-IN TEES AND FINAL WATER MAIN TIE-INS SHALL BE DONE UNDER THE INSPECTION OF AUTHORIZED CITY PERSONNEL. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE ENGINEER FOR SCHEDULING INSPECTIONS.

**SURVEY NOTES**

- EROSION AND SEDIMENT CONTROL MEASURES FOR THIS PROJECT SHALL BE IN SUBSTANTIAL COMPLIANCE AT ALL TIMES WITH THE STORE WATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THE PROJECT IN ACCORDANCE WITH THE STATE OF CALIFORNIA GENERAL CONSTRUCTION PERMIT. THIS PERMIT REQUIRES THAT SWPPP BE KEPT UP TO DATE TO REFLECT THE CHANGING SITE CONDITIONS AND THE SWPPP IS AVAILABLE ON SITE AT ALL TIMES FOR REVIEW BY STATE AND LOCAL INSPECTORS. THE CONTRACTOR SHALL BE REQUIRED TO MEET AND FOLLOW ALL NPDES REQUIREMENTS IN EFFECT AT THE TIME OF CONSTRUCTION.
- CONTRACTOR IS RESPONSIBLE FOR ALL SURVEY WORK REQUIRED TO LOCATE EXISTING OR NEW FACILITIES.
- THE SURVEYS USED IN THESE DRAWINGS WERE PERFORMED BY O'DELL ENGINEERING. PHONE NUMBER: (209) 571-1765.
- HORIZONTAL DATUM  
NORTH AMERICAN DATUM OF 1983 (NAD83) 2011 (EPOCH 2010.00), AS DETERMINED BY GPS TIES TO PASSIVE HORIZONTAL CONTROL STATIONS MAINTAINED BY THE NATIONAL GEODETIC SURVEY (NGS) AND IDENTIFIED BY THE FOLLOWING PERMANENT IDENTIFIERS: DK2879, DK2880, AND DK2881.
- COORDINATE SYSTEM  
THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83), ZONE II.
- VERTICAL DATUM  
NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)  
CITY OF FOLSOM BENCHMARK "73"  
ELEVATION = 500.02
- PROJECT BENCHMARK  
BRASS DISK STAMPED "CITY OF FOLSOM BM73" ON THE NORTHWEST CORNER OF A CONCRETE DRAINAGE STRUCTURE. LOCATION OF SITE IS APPROXIMATELY 300 FEET SOUTHEASTERLY OF GRAND PRAIRIE ROAD AND 50 FEET EAST OF THE SPTC-JPA RAILROAD TRACKS.  
APPROXIMATE LATITUDE: N38° 37' 58.89" LONGITUDE: W121° 05' 54.25"

**GENERAL PIPELINE NOTES**

- THE CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH ALL EXISTING SURFACE/SUBSURFACE CONDITIONS PRIOR TO THE BEGINNING OF WORK. THE CONTRACTOR SHALL POTHOLE AND LOCATE (AT OWN COST) ALL BURIED PIPELINES, CONDUITS, AND FACILITIES WHICH WILL BE WITHIN EXCAVATED AREAS ASSOCIATED WITH CONSTRUCTION OPERATIONS. CONTRACTOR RESPONSIBLE TO FIND UTILITIES EVEN WHERE IDENTIFICATION ON PLANS WHAT UTILITIES WERE NOT FOUND. NOTE THAT THRUST BLOCKS MAY EXIST BUT ARE NOT SHOWN.
- UNDERGROUND SERVICE ALERT (USA) SHALL BE NOTIFIED A MINIMUM OF 48 HOURS, BUT NOT MORE THAN 14 DAYS MAXIMUM PRIOR TO ANY EXCAVATION BY CALLING 811 OR (800) 227-2600.
- EACH RESIDENCE ALONG PIPELINE ALIGNMENT SHOULD BE ASSUMED TO HAVE AN EXISTING GAS SERVICE, WATER SERVICE, AND SANITARY SEWER LATERAL. THE CONTRACTOR SHALL TAKE CARE NOT TO CUT OR DAMAGE THE EXISTING SERVICES OR LATERALS.
- THE CONTRACTOR SHALL SHEET, SHORE, AND BRACE EXCAVATIONS AS NECESSARY TO PERFORM WORK IN A SAFE EFFECTIVE WORKMANLIKE MANNER. THE CONTRACTOR SHALL DESIGN SHEETING, SHORING, AND BRACING IN ACCORDANCE WITH ARTICLE 6 OF THE CAL/OSHA AND CALIFORNIA LABOR CODE. THE CONTRACTOR SHALL NOTE THAT UNDERGROUND SOIL CONDITIONS MAY CONTAIN UNSTABLE GRANULAR MATERIAL AND THAT EXCAVATIONS GREATER THAN FIVE (5) FEET IN DEPTH ARE REQUIRED.
- ALL PIPELINES SHALL BE CONSTRUCTED TO RESIST THRUST FORCES DEVELOPED DURING PRESSURE TESTING AND OPERATION. THRUST FORCES ARE DEVELOPED AT CHANGES IN DIRECTION, CHANGES IN PIPELINE DIAMETERS, AND AT CLOSED VALVES OR DEAD ENDS. RESISTANCE TO THRUST FORCES WILL BE ACCOMPLISHED BY MECHANICAL RESTRAINT AT ALL CHANGES IN DIRECTION, CHANGES IN PIPELINE DIAMETER, AND AT CLOSED VALVES OR DEAD ENDS PER THE PROJECT SPECIFICATIONS.
- ALL JOINTS SHALL BE RESTRAINED PUSH-ON JOINTS EXCEPT WHERE CONNECTING TO FITTINGS AND VALVES. CONNECTIONS TO FITTINGS AND VALVES SHALL BE RESTRAINED MECHANICAL JOINTS.
- ALL FLEXIBLE CONNECTORS OR FLANGED COUPLING ADAPTERS SHALL BE PROVIDED WITH THRUST TIES, UNLESS OTHERWISE SHOWN OR APPROVED BY ENVIRONMENTAL AND WATER RESOURCES (EWR).

- ALL BURIED DUCTILE IRON PIPE FITTINGS AND APPURTENANCES SHALL BE DOUBLE ENCASED WITH 8 MIL V-BIO™ POLYETHYLENE ENCASEMENT. CONTRACTOR TO PERFORM CONTINUITY TESTING OF THE CATHODIC PROTECTION WIRING PRIOR TO BACKFILL AND PROVIDE THIRD PARTY TESTING OF THE CATHODIC PROTECTION SYSTEM PRIOR TO FINAL ACCEPTANCE OF THE PROJECT.
- LOCATIONS OF EXISTING SANITARY SEWER, WATER, & STORM DRAIN SYSTEM COMPONENTS AND TIE-INS SHOWN ON THE PLANS HAVE BEEN COORDINATED. SHOULD THE ESSENTIAL ELEMENTS REQUIRED FOR CONSTRUCTION SUCH AS PIPE STUBS, VALVES, OR APPURTENANCES BE LOCATED IN LOCATION THAT VARIES FROM THE CONTRACT DRAWINGS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY AND STOP WORK. THE CONTRACTOR SHALL SUPPLY ALL LABOR, FITTINGS, AND APPURTENANCES REQUIRED FOR CONSTRUCTION, AS INDICATED IN THE CONTRACT DOCUMENTS, WITH NO ADDITIONAL REIMBURSEMENT.
- THE CONTRACTOR SHALL TEST ALL PIPING SYSTEMS. TESTING SHALL BE DONE IN ACCORDANCE CITY OF FOLSOM STANDARD CONSTRUCTION SPECIFICATIONS, DATED FEBRUARY 2020, SECTION 4: DOMESTIC WATER SUPPLY SYSTEM CONSTRUCTION, SUBSECTION 4.14 - REQUIREMENTS FOR TESTING, STERILIZATION AND CONNECTION TO NEW WATER MAINS BACKFLOW ASSEMBLIES, DOMESTIC FIRE.
- THE MINIMUM DEPTH OF COVER OF WATER MAINS SHALL BE 30 INCHES OUTSIDE OF THE TRAVELED WAY AND 36" WITHIN THE TRAVELED WAY UNLESS OTHERWISE SHOWN ON THE PLANS. THE DEPTH OF COVER IS MEASURED FROM THE TOP OF THE PIPE TO FINISH GRADE OR PAVEMENT SURFACE. CONTROLLED LOW MATERIAL (CLSM) SHALL BE USED IN LOCATIONS WHERE MINIMUM COVER CANNOT BE MET.
- UNLESS OTHERWISE NOTED ON PLANS OR APPROVED BY ENVIRONMENTAL AND WATER RESOURCES (EWR), CONTRACTOR SHALL MAINTAIN VERTICAL AND HORIZONTAL SEPARATIONS FROM PARALLEL SEWERS, STORM AND WATER PIPELINES IN ACCORDANCE WITH CALIFORNIA WATERWORKS STANDARDS.
- PIPE DEFLECTION FOR ALIGNMENT CHANGES SHALL HAVE A MAXIMUM OF 2.5 DEGREES OR PER MANUFACTURER'S RECOMMENDATION, WHICHEVER IS LESS, FOR ALLOWABLE JOINT DEFLECTION.
- NO CONNECTION BETWEEN NEW AND EXISTING PIPELINE SHALL BE MADE UNTIL AUTHORIZED BY ENVIRONMENTAL AND WATER RESOURCES(EWR).
- AT LOCATIONS WHERE THERE IS NO FITTING SHOWN AND THE PIPELINE ALIGNMENT HAS A CHANGE IN DIRECTION OR ELEVATION, THE JOINTS HAVE BEEN DEFLECTED. ALL 24" PIPE MAY HAVE JOINT DEFLECTIONS TO A MAXIMUM OF 2.5 DEGREES OR PER MANUFACTURERS RECOMMENDATIONS, WHICHEVER IS LESS.
- DIMENSIONS AND PIPE CROSSINGS ARE BASED ON THE BEST INFORMATION AVAILABLE AT THE TIME OF DESIGN. CONTRACTOR TO AND FIELD VERIFY CROSSINGS AND FIELD FIT AS NEEDED.
- EXISTING GRADE ELEVATIONS ARE AT THE CENTERLINE OF THE PIPELINE.
- UTILITIES WERE LOCATED BASED ON TOPOGRAPHIC SURVEY, AS-BUILT DRAWINGS OR UTILITY LOCATING. NOT ALL UTILITIES WERE LOCATED. CONTRACTOR TO LOCATE UTILITIES AS NECESSARY TO CONFIRM HORIZONTALS AND VERTICAL LOCATION PRIOR TO SAW CUTTING PAVEMENT.
- RESTORE EXISTING MONUMENTS PER CITY STANDARDS. SEE NOTE 14, G005.
- UNDERGROUND INFORMATION ON TRAFFIC CONTROL FACILITIES IS NOT SHOWN. CONTRACTOR TO ASSUME UNDERGROUND TRAFFIC LOOPS END AT ALL SIGNALLED INTERSECTION APPROACHES. CUT TRAFFIC LOOPS SHALL BE RESTORED, IN KIND, BY CONTRACTOR. ALL WORK SHALL BE DONE IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN.

**TREE IMPACT NOTES**

- TREES PLANNED FOR REMOVAL ARE DESCRIBED HEREIN. FENCING AND ADDITIONAL PROTECTION MEASURES SHALL BE INSTITUTED AROUND TREES NOT PLANNED FOR REMOVAL.
- A CERTIFIED ARBORIST HAS BEEN RETAINED AND WILL BE PRESENT ON SITE AS PER THE FOLLOWING REQUIREMENTS:  
  
CERTIFIED ARBORIST: KRISSY WALKER - Ecorp CONSULTING 2525 WARREN DR, ROCKLIN, CA 95677, (916)782-9100.  
  
A. PRIOR TO CONSTRUCTION: TO ASSESS POTENTIAL IMPACTS TO TREES WITHIN THE LIMITS OF CONSTRUCTION WORK THAT ARE NOT IDENTIFIED FOR REMOVAL HEREIN, AND TO MAKE RECOMMENDATIONS FOR THEIR PRESERVATION.  
  
B. DURING CONSTRUCTION: ANY POTENTIAL FOR IMPACTS TO TREES WITHIN THE CRITICAL ROOT ZONE, MEASURED FROM THE TRUNK OF TREE TO ONE FOOT PAST THE LONGEST BRANCH, SHALL BE MONITORED BY THE ARBORIST DURING TRENCHING. CONTRACTOR SHALL ACCOMMODATE ARBORIST RECOMMENDATIONS FOR ROOT PROTECTION IN THESE AREAS, WHICH MAY INCLUDE BUT NOT BE LIMITED TO EXCAVATION LIMITED TO MINI-EXCAVATOR, HAND-DIGGING, ROOT REPAIR, OR OTHERWISE. APPROVAL SHALL BE REQUIRED BY THE CITY ARBORIST PRIOR TO ANY TREE REMOVAL.
- THE CONTRACTOR IS REQUIRED TO SUBMIT AND OBTAIN A TREE WORK PERMIT AND/OR TREE REMOVAL PERMIT FOR ALL TREES IMPACTED AND SUMMARIZED ON SHEET C150-C159.

**NATURALLY OCCURRING ASBESTOS NOTES**

- CONSTRUCTION VEHICLE SPEED AT THE WORK SITE MUST BE LIMITED TO FIFTEEN (15) MILES PER HOUR OR LESS.
- PRIOR TO ANY GROUND DISTURBANCE, SUFFICIENT WATER MUST BE APPLIED TO THE AREA TO BE DISTRIBUTED TO PREVENT VISIBLE EMISSIONS FROM CROSSING THE PROPERTY LINE.
- AREAS TO BE GRADED OR EXCAVATED MUST BE KEPT ADEQUATELY WETTED TO PREVENT VISIBLE EMISSIONS FROM CROSSING THE PROPERTY LINE.
- STORAGE PILES MUST BE KEPT ADEQUATELY WETTER, TREATED WITH A CHEMICAL DUST SUPPRESSANT, OR COVERED WHEN MATERIAL IS NOT BEING ADDED TO OR REMOVED FROM THE PILE.
- EQUIPMENT MUST BE WASHED DOWN BEFORE MOVING FROM THE PROPERTY ONTO A PAVED PUBLIC ROAD.
- VISIBLE TRACK-OUT ON THE PAVED PUBLIC ROAD MUST BE CLEANED USING WET SWEEPING OR A HEPA FILTER EQUIPPED VACUUM DEVISE WITHIN TWENTY-FOUR (24) HOURS. THE DUST MITIGATION PLAN MUST BE APPROVED BY THE CITY AND SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT (SMAQMD) PRIOR TO COMMENCEMENT OF ANY GRADING.
- PRIOR TO THE START OF ANY CONSTRUCTION OR GRADING ACTIVITY AN ASBESTOS DUST MITIGATION PLAN FOR OPERATION MUST BE APPROVED BY THE CITY AND SMAQMD AND A COPY IS AVAILABLE AT THE PROJECT SITE.
- THE PROVISIONS OF THE DUST MITIGATION PLAN ARE IMPLEMENTED AT THE BEGINNING AND MAINTAINED THROUGHOUT THE DURATION OF THE CONSTRUCTION OR GRADING ACTIVITY.
- STORM WATER POLLUTION PREVENTION PLAN MEASURES SHALL GOVERN IF NOTES ARE IN CONFLICT.

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BERKELEY, CA 94710  
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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

GENERAL NOTES - 2

DRAWN BY: AGP DATE: 6/3/24	DESIGN BY: CML PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C59049 DATE: 6/3/24
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PAPER SIZE: 22x34 (ANSI D)

**G006** SHEET 6 OF 86

DRAWING NUMBER

CONTROL POINT TABLE			
POINT NUMBER	NORTHING	EASTING	DESCRIPTION
15000	2011147.37	6807507.66	SET M&S
15001	2011555.67	6807202.23	SET 3/4" IP
15002	2011762.33	6806620.80	SET M&S
15003	2011799.66	6806328.07	SET M&S
15004	2011761.39	6806146.68	SET M&S
15005	2011742.46	6805783.18	SET M&S
15006	2011735.15	6805606.54	SET M&S
15007	2011774.98	6805098.50	SET M&S ON CONC PAD
15008	2011740.45	6804766.01	SET M&S
15009	2011691.20	6804115.19	SET M&S
15010	2010765.83	6807669.66	SET CUT X
15011	2010340.42	6807826.78	SET CUT X
15012	2009770.84	6807916.77	SET CUT X
15013	2009323.30	6808150.09	SET CUT X
15014	2009021.06	6808104.15	FD MAG NAIL/KW205
15016	2007169.68	6808697.92	SET MAG

POTHOLE INFO			
POTHOLE NO.	UTILITY	DEPTH	SHEET
EP1	GAS	36"	C104
PH2	2" FO	18"	C106
EP3	GAS	41"	C106
PH3	5" COMM	43"	C107
PH4	FO	45"	C107
PH5	4" GAS	51"	C107
PH5	6" ELEC	49"	C107
EP4	ELEC COND	59"	C107
EP6	ELEC COND	12"	C107
PH7	2" GAS	55"	C109
PH8	4" FO	44"	C110
PH9	6" GAS	52"	C110
PH9	6" GAS	57"	C110
PH10	2" COMM	49"	C110
PH11	2" COMM	25"	C110
EP8	ELEC COND	45"	C110
EP14	4" GAS	36"	C112
PH17	3" FO	75"	C113
PH19	4" GAS	80"	C114
EP21	FO	87"	C114
EP14	ELEC COND	38"	C116
EP18	ELEC COND	48"	C118

POTHOLE INFO			
POTHOLE NO.	UTILITY	DEPTH	SHEET
EP20	10" WATER	50"	C100
EP22	TRAFFIC CONDUIT	34"	C104
EP23	TRAFFIC CONDUIT	37"	C106
EP24	TRAFFIC CONDUIT	38"	C107
EP27	COMM	25"	C108
EP28	ELEC COND	60"	C109
EP29	2" GAS	49"	C109
EP30	HV ELEC	60"	C110
EP31	JOINT TRENCH	57"	C110
EP32	COMM	29"	C110
EP33	1" GAS	34"	C110
EP34	FO	72"	C113
EP35	FO	72"	C113
EP36	FO	72"	C113
EP37	COMM	72"	C117
EP38	HV ELEV	53"	C118
EP39	JOINT TRENCH	65"	C120



REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

DRAWN BY: AGP DATE: 6/3/24	DESIGN BY: CML PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C59049 DATE: 6/3/24
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CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

MONUMENTS AND POTHOLE DATA



PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**G007** SHEET 7 OF 86  
DRAWING NUMBER

6

5

4

3

2

1

6

5

4

3

2

1

LINE & CURVE TABLE

NO.	LENGTH (FT)	RADIUS (FT)	LINE/CHORD BEARING	Δ	CHORD LENGTH (FT)	START NORTHING/EASTING	END NORTHING/EASTING
L1	407.44		N89° 02' 25"E			N 2011766.44, E 6804214.72	N 2011773.26, E 6804622.10
C1	140.02	993.79	S86° 56' 14"E	8.07	139.91	N 2011773.26, E 6804622.10	N 2011765.79, E 6804761.81
L2	62.78		S82° 54' 11"E			N 2011765.79, E 6804761.81	N 2011758.03, E 6804824.11
C2	120.02	982.39	S79° 24' 11"E	7.00	119.95	N 2011758.03, E 6804824.11	N 2011735.97, E 6804942.01
C3	119.98	1374.92	S78° 24' 11"E	5.00	119.95	N 2011735.97, E 6804942.01	N 2011711.86, E 6805059.51
L3	6.07		S81° 54' 11"E			N 2011711.86, E 6805059.51	N 2011711.00, E 6805065.51
L4	27.09		N75° 05' 49"E			N 2011711.00, E 6805065.51	N 2011717.97, E 6805091.70
C4	99.99	1432.25	N72° 05' 49"E	4.00	99.97	N 2011717.97, E 6805091.70	N 2011748.70, E 6805186.83
C5	119.98	1374.92	N71° 35' 49"E	5.00	119.95	N 2011748.70, E 6805186.83	N 2011786.57, E 6805300.64
C6	99.99	1432.25	N88° 20' 49"E	4.00	99.97	N 2011786.57, E 6805300.64	N 2011789.45, E 6805400.57
L5	40.00		S88° 39' 11"E			N 2011789.45, E 6805400.57	N 2011788.51, E 6805440.55
L6	20.00		S89° 39' 11"E			N 2011788.51, E 6805440.55	N 2011788.39, E 6805460.55
L7	154.87		S68° 10' 37"E			N 2011788.39, E 6805460.55	N 2011730.82, E 6805604.32
L8	78.37		N66° 49' 23"E			N 2011730.82, E 6805604.32	N 2011761.67, E 6805676.37
L9	19.99		S89° 10' 40"E			N 2011761.67, E 6805676.37	N 2011761.38, E 6805696.35
L10	19.99		S86° 58' 40"E			N 2011761.38, E 6805696.35	N 2011760.32, E 6805716.32
L11	20.00		S84° 56' 20"E			N 2011760.32, E 6805716.32	N 2011758.56, E 6805736.24
C7	40.01	509.38	S82° 41' 20"E	4.50	40.00	N 2011758.56, E 6805736.24	N 2011753.47, E 6805775.91
L12	80.00		S80° 26' 20"E			N 2011753.47, E 6805775.91	N 2011740.18, E 6805854.80
L13	20.00		N87° 03' 40"E			N 2011740.18, E 6805854.80	N 2011741.21, E 6805874.77
L14	294.73		N86° 11' 05"E			N 2011741.21, E 6805874.77	N 2011760.82, E 6806168.85
L15	44.58		N41° 23' 41"E			N 2011760.82, E 6806168.85	N 2011794.26, E 6806198.32
L16	213.64		N86° 41' 17"E			N 2011794.26, E 6806198.32	N 2011806.60, E 6806411.61
L17	76.45		S48° 54' 11"E			N 2011806.60, E 6806411.61	N 2011756.35, E 6806469.22
L18	38.58		N86° 05' 49"E			N 2011756.35, E 6806469.22	N 2011758.97, E 6806507.71
L19	28.75		N41° 05' 49"E			N 2011758.97, E 6806507.71	N 2011780.64, E 6806526.61
L20	25.32		N86° 05' 49"E			N 2011780.64, E 6806526.61	N 2011782.37, E 6806551.87
L21	40.52		S71° 24' 11"E			N 2011782.37, E 6806551.87	N 2011769.45, E 6806590.27
L22	20.00		S72° 24' 11"E			N 2011769.45, E 6806590.27	N 2011763.40, E 6806609.34
L23	20.00		S73° 24' 11"E			N 2011763.40, E 6806609.34	N 2011757.69, E 6806628.50
C8	99.98	954.71	S66° 09' 11"E	6.00	99.93	N 2011757.69, E 6806628.50	N 2011717.28, E 6806719.90
L24	91.71		S80° 24' 11"E			N 2011717.28, E 6806719.90	N 2011701.99, E 6806810.33
L25	13.55		S69° 24' 11"E			N 2011701.99, E 6806810.33	N 2011697.23, E 6806823.01
L26	20.00		S68° 24' 11"E			N 2011697.23, E 6806823.01	N 2011689.87, E 6806841.61
C9	40.00	2291.77	S67° 54' 11"E	1.00	40.00	N 2011689.87, E 6806841.61	N 2011674.82, E 6806878.67
L27	20.00		S67° 24' 11"E			N 2011674.82, E 6806878.67	N 2011667.14, E 6806897.14
L28	40.00		S66° 24' 11"E			N 2011667.14, E 6806897.14	N 2011651.12, E 6806933.79
L29	40.00		S67° 24' 11"E			N 2011651.12, E 6806933.79	N 2011635.75, E 6806970.72
L30	91.02		S68° 24' 11"E			N 2011635.75, E 6806970.72	N 2011602.25, E 6807055.35
L31	25.73		S69° 24' 11"E			N 2011602.25, E 6807055.35	N 2011593.20, E 6807079.44
L32	41.14		S47° 18' 26"E			N 2011593.20, E 6807079.44	N 2011565.30, E 6807109.68
L33	81.69		S48° 18' 26"E			N 2011565.30, E 6807109.68	N 2011510.96, E 6807170.68
C10	139.98	1336.70	S44° 18' 26"E	6.00	139.91	N 2011510.96, E 6807170.68	N 2011410.84, E 6807268.41

LINE & CURVE TABLE

NO.	LENGTH (FT)	RADIUS (FT)	LINE/CHORD BEARING	Δ	CHORD LENGTH (FT)	START NORTHING/EASTING	END NORTHING/EASTING
L34	90.32		S40° 18' 26"E			N 2011410.84, E 6807268.41	N 2011341.96, E 6807326.84
L35	66.75		S39° 48' 26"E			N 2011341.96, E 6807326.84	N 2011290.69, E 6807369.57
C11	79.99	1527.77	S42° 18' 26"E	3.00	79.98	N 2011290.69, E 6807369.57	N 2011231.53, E 6807423.41
L36	31.24		S44° 49' 24"E			N 2011231.53, E 6807423.41	N 2011209.37, E 6807445.44
C12	219.94	1260.19	S38° 49' 24"E	10.00	219.67	N 2011209.37, E 6807445.44	N 2011038.24, E 6807583.15
L37	20.00		S32° 50' 34"E			N 2011038.24, E 6807583.15	N 2011021.43, E 6807593.99
L38	20.00		S31° 50' 34"E			N 2011021.43, E 6807593.99	N 2011004.44, E 6807604.55
C13	79.99	1527.77	S28° 36' 18"E	3.00	79.98	N 2011004.44, E 6807604.55	N 2010934.22, E 6807642.84
C14	219.94	1260.19	S20° 06' 18"E	10.00	219.67	N 2010934.22, E 6807642.84	N 2010727.94, E 6807718.35
L39	1747.33		S14° 06' 18"E			N 2010727.94, E 6807718.35	N 2009033.29, E 6808144.17
L40	69.28		S30° 52' 55"W			N 2009033.29, E 6808144.17	N 2008973.84, E 6808108.62
L41	79.41		S14° 06' 49"E			N 2008973.84, E 6808108.62	N 2008896.83, E 6808127.98
L42	71.20		N76° 50' 28"E			N 2008896.83, E 6808127.98	N 2008913.03, E 6808197.31
L43	1003.83		S14° 07' 05"E			N 2008913.03, E 6808197.31	N 2007939.52, E 6808442.17
L44	576.51		S14° 03' 04"E			N 2007939.52, E 6808442.17	N 2007380.26, E 6808582.14
C15	60.00	1718.79	S16° 03' 04"E	2.00	59.99	N 2007380.26, E 6808582.14	N 2007322.61, E 6808598.72
C16	99.99	1432.25	S14° 03' 04"E	4.00	99.97	N 2007322.61, E 6808598.72	N 2007225.63, E 6808623.00
L45	73.73		S11° 10' 47"E			N 2007225.63, E 6808623.00	N 2007153.30, E 6808637.29
L46	46.31		N80° 00' 38"E			N 2007153.30, E 6808637.29	N 2007161.33, E 6808682.90
L47	62.72		S9° 59' 22"E			N 2007161.33, E 6808682.90	N 2007099.56, E 6808693.78
L48	7.12		S25° 25' 52"W			N 2007099.56, E 6808693.78	N 2007093.14, E 6808690.72
L49	16.03		S6° 10' 57"E			N 2007093.14, E 6808690.72	N 2007077.19, E 6808692.45
L50	60.87		S36° 20' 36"W			N 2007077.19, E 6808692.45	N 2007028.16, E 6808656.38
L51	37.86		S7° 33' 04"E			N 2007028.16, E 6808656.38	N 2006990.63, E 6808661.35
L52	80.00		S6° 33' 04"E			N 2006990.63, E 6808661.35	N 2006911.15, E 6808670.48
L53	60.00		S5° 33' 04"E			N 2006911.15, E 6808670.48	N 2006851.43, E 6808676.28
C17	40.00	2291.77	S4° 03' 04"E	1.00	40.00	N 2006851.43, E 6808676.28	N 2006811.53, E 6808679.11
C18	40.00	2291.77	S3° 03' 04"E	1.00	40.00	N 2006811.53, E 6808679.11	N 2006771.59, E 6808681.24
C19	40.00	2291.77	S2° 03' 04"E	1.00	40.00	N 2006771.59, E 6808681.24	N 2006731.62, E 6808682.67
C20	40.00	2291.77	S2° 03' 04"E	1.00	40.00	N 2006731.62, E 6808682.67	N 2006691.65, E 6808684.10
C21	40.00	2291.77	S1° 03' 04"E	1.00	40.00	N 2006691.65, E 6808684.10	N 2006651.65, E 6808684.83
L54	40.00		S0° 33' 04"E			N 2006651.65, E 6808684.83	N 2006611.66, E 6808685.22
L55	20.00		S0° 26' 56"W			N 2006611.66, E 6808685.22	N 2006591.66, E 6808685.06
L56	60.00		S1° 26' 56"W			N 2006591.66, E 6808685.06	N 2006531.68, E 6808683.55
L57	20.00		S2° 26' 56"W			N 2006531.68, E 6808683.55	N 2006511.69, E 6808682.69
L58	80.00		S3° 26' 56"W			N 2006511.69, E 6808682.69	N 2006431.84, E 6808677.88
C22	80.00	4583.55	S4° 56' 56"W	1.00	80.00	N 2006431.84, E 6808677.88	N 2006352.14, E 6808670.98
L59	40.00		S5° 26' 56"W			N 2006352.14, E 6808670.98	N 2006312.32, E 6808667.18
C23	119.99	3437.57	S7° 26' 56"W	2.00	119.99	N 2006312.32, E 6808667.18	N 2006193.35, E 6808651.62
L60	40.00		S9° 26' 56"W			N 2006193.35, E 6808651.62	N 2006153.89, E 6808645.06
C24	279.96	2673.40	S12° 26' 56"W	6.00	279.83	N 2006153.89, E 6808645.06	N 2005880.64, E 6808584.73
L61	79.98		S16° 26' 56"W			N 2005880.64, E 6808584.73	N 2005803.93, E 6808562.09
C25	80.00	4583.55	S17° 56' 56"W	1.00	80.00	N 2005803.93, E 6808562.09	N 2005727.83, E 6808537.44

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REV	DESCRIPTION	DATE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGNED BY: AGP  
DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

LINE AND CURVE TABLE - 1



PAPER SIZE: 22x34 (ANSI D)

THIS BAR IS 1 INCH AT FULL SCALE

G008 SHEET 8 OF 86

LINE & CURVE TABLE							
NO.	LENGTH (FT)	RADIUS (FT)	LINE/CHORD BEARING	Δ	CHORD LENGTH (FT)	START NORTHING/EASTING	END NORTHING/EASTING
C26	279.96	2673.40	S21° 26' 56"W	6.00	279.83	N 2005727.83, E 6808537.44	N 2005467.38, E 6808435.11
C27	119.99	3437.57	S25° 26' 56"W	2.00	119.99	N 2005467.38, E 6808435.11	N 2005359.03, E 6808383.55
L62	40.00		S26° 26' 56"W			N 2005359.03, E 6808383.55	N 2005323.22, E 6808365.73
L63	200.00		S27° 26' 56"W			N 2005323.22, E 6808365.73	N 2005145.74, E 6808273.54
L64	40.00		S26° 26' 56"W			N 2005145.74, E 6808273.54	N 2005109.92, E 6808255.73
L65	40.00		S27° 26' 56"W			N 2005109.92, E 6808255.73	N 2005074.43, E 6808237.29
L66	63.98		S27° 23' 50"W			N 2005074.43, E 6808237.29	N 2005017.62, E 6808207.85
L67	75.01		S60° 05' 30"E			N 2005017.62, E 6808207.85	N 2004980.22, E 6808272.87
L68	74.01		S29° 15' 17"W			N 2004980.22, E 6808272.87	N 2004915.65, E 6808236.70
L69	7.38		S40° 06' 41"W			N 2004915.65, E 6808236.70	N 2004910.00, E 6808231.94
L70	6.27		S49° 25' 52"E			N 2004910.00, E 6808231.94	N 2004905.93, E 6808236.70
L71	50.00		S49° 25' 52"E			N 2004905.93, E 6808236.70	N 2004873.41, E 6808274.69
L72	230.20		S48° 57' 16"E			N 2004873.41, E 6808274.69	N 2004722.25, E 6808448.30
L73	512.88		S49° 46' 45"E			N 2004722.25, E 6808448.30	N 2004391.06, E 6808839.92
C28	40.00	1527.80	S47° 02' 19"E	1.50	40.00	N 2004391.06, E 6808839.92	N 2004363.80, E 6808869.19
L74	20.00		S46° 47' 19"E			N 2004363.80, E 6808869.19	N 2004350.11, E 6808883.76
C29	40.00	1145.80	S45° 47' 19"E	2.00	39.99	N 2004350.11, E 6808883.76	N 2004322.22, E 6808912.43
L75	20.15		S48° 21' 42"E			N 2004322.22, E 6808912.43	N 2004308.83, E 6808927.49
L76	36.85		S49° 11' 41"E			N 2004308.83, E 6808927.49	N 2004284.75, E 6808955.38
L77	149.92		S50° 03' 03"E			N 2004284.75, E 6808955.38	N 2004188.49, E 6809070.31
L78	121.92		S49° 17' 12"E			N 2004188.49, E 6809070.31	N 2004108.96, E 6809162.73
L79	20.04		S49° 35' 42"E			N 2004108.96, E 6809162.73	N 2004095.97, E 6809177.98
C30	79.99	1527.77	S51° 47' 19"E	3.00	79.98	N 2004095.97, E 6809177.98	N 2004046.50, E 6809240.83
L80	20.02		S54° 46' 11"E			N 2004046.50, E 6809240.83	N 2004034.95, E 6809257.18
L81	105.22		S55° 15' 39"E			N 2004034.95, E 6809257.18	N 2003974.99, E 6809343.64
C31	99.99	1432.25	S52° 15' 46"E	4.00	99.97	N 2003974.99, E 6809343.64	N 2003913.81, E 6809422.70
L82	15.26		S48° 31' 35"E			N 2003913.81, E 6809422.70	N 2003903.70, E 6809434.14
L83	829.49		S49° 15' 39"E			N 2003903.70, E 6809434.14	N 2003362.36, E 6810062.63
L84	37.34		S4° 17' 32"E			N 2003362.36, E 6810062.63	N 2003325.13, E 6810065.42
L85	268.57		S49° 15' 53"E			N 2003325.13, E 6810065.42	N 2003149.87, E 6810268.93
L86	8.86		S4° 17' 32"E			N 2003149.87, E 6810268.93	N 2003141.04, E 6810269.59
L87	91.63		S49° 15' 53"E			N 2003141.04, E 6810269.59	N 2003081.25, E 6810339.02
L88	57.76		S73° 01' 36"E			N 2003081.25, E 6810339.02	N 2003064.39, E 6810394.27
L89	281.33		S51° 03' 00"E			N 2003064.39, E 6810394.27	N 2002887.53, E 6810613.05
L90	37.92		S5° 37' 12"E			N 2002887.53, E 6810613.05	N 2002849.79, E 6810616.77
L91	147.39		S48° 11' 46"E			N 2002849.79, E 6810616.77	N 2002751.54, E 6810726.64
L92	30.83		N85° 36' 12"E			N 2002751.54, E 6810726.64	N 2002753.91, E 6810757.38
L93	271.88		S49° 16' 30"E			N 2002753.91, E 6810757.38	N 2002576.52, E 6810963.42
L94	39.99		S50° 14' 57"E			N 2002576.52, E 6810963.42	N 2002550.95, E 6810994.17
L95	197.40		S49° 16' 25"E			N 2002550.95, E 6810994.17	N 2002422.16, E 6811143.76
L96	241.70		S49° 23' 00"E			N 2002422.16, E 6811143.76	N 2002264.81, E 6811327.24
C32	40.00	2291.77	S47° 53' 00"E	1.00	40.00	N 2002264.81, E 6811327.24	N 2002237.98, E 6811356.91
L97	306.00		S47° 35' 43"E			N 2002237.98, E 6811356.91	N 2002031.63, E 6811582.85

LINE & CURVE TABLE							
NO.	LENGTH (FT)	RADIUS (FT)	LINE/CHORD BEARING	Δ	CHORD LENGTH (FT)	START NORTHING/EASTING	END NORTHING/EASTING
L98	40.97		S2° 36' 10"E			N 2002031.63, E 6811582.85	N 2001990.71, E 6811584.71
L99	72.91		S48° 25' 04"E			N 2001990.71, E 6811584.71	N 2001942.32, E 6811639.25
L100	25.09		S71° 03' 08"E			N 2001942.32, E 6811639.25	N 2001934.17, E 6811662.98
C33	40.00	1527.80	S47° 48' 08"E	1.50	40.00	N 2001934.17, E 6811662.98	N 2001907.31, E 6811692.61
L101	19.75		S46° 15' 04"E			N 2001907.31, E 6811692.61	N 2001893.65, E 6811706.88
L102	96.44		S47° 40' 07"E			N 2001893.65, E 6811706.88	N 2001828.71, E 6811778.17
L103	401.04		S46° 26' 46"E			N 2001828.71, E 6811778.17	N 2001552.37, E 6812068.82
L104	191.58		S46° 31' 23"E			N 2001552.37, E 6812068.82	N 2001420.56, E 6812207.84
L105	183.38		S47° 07' 08"E			N 2001420.56, E 6812207.84	N 2001295.77, E 6812342.21
L106	9.87		S0° 23' 27"W			N 2001295.77, E 6812342.21	N 2001285.90, E 6812342.15
L107	50.67		S45° 31' 23"E			N 2001285.90, E 6812342.15	N 2001250.40, E 6812378.30
L108	126.17		S46° 34' 00"E			N 2001250.40, E 6812378.30	N 2001163.66, E 6812469.92
C34	59.98	687.33	S51° 33' 31"E	5.00	59.96	N 2001163.66, E 6812469.92	N 2001126.38, E 6812516.89
L109	19.87		S53° 15' 40"E			N 2001126.38, E 6812516.89	N 2001114.50, E 6812532.81
L110	20.03		S51° 21' 41"E			N 2001114.50, E 6812532.81	N 2001101.99, E 6812548.45
L111	19.88		S48° 49' 40"E			N 2001101.99, E 6812548.45	N 2001088.90, E 6812563.42
L112	621.58		S46° 33' 12"E			N 2001088.90, E 6812563.42	N 2000661.46, E 6813014.69
C35	40.00	1145.80	S43° 33' 12"E	2.00	39.99	N 2000661.46, E 6813014.69	N 2000632.47, E 6813042.25
L113	80.00		S42° 33' 12"E			N 2000632.47, E 6813042.25	N 2000573.54, E 6813096.35
C36	40.00	1145.80	S43° 33' 12"E	2.00	39.99	N 2000573.54, E 6813096.35	N 2000544.56, E 6813123.91
L114	20.00		S44° 46' 32"E			N 2000544.56, E 6813123.91	N 2000530.36, E 6813137.99
L115	169.35		S46° 30' 43"E			N 2000530.36, E 6813137.99	N 2000413.81, E 6813260.86
C37	60.01	573.10	S49° 30' 43"E	6.00	59.99	N 2000413.81, E 6813260.86	N 2000374.86, E 6813306.48
L116	20.00		S52° 30' 42"E			N 2000374.86, E 6813306.48	N 2000362.69, E 6813322.35
C38	60.01	573.09	S49° 30' 42"E	6.00	59.99	N 2000362.69, E 6813322.35	N 2000323.74, E 6813367.97
C39	80.00	3055.60	S45° 45' 42"E	1.50	79.99	N 2000323.74, E 6813367.97	N 2000267.94, E 6813425.28
L117	20.06		S44° 34' 33"E			N 2000267.94, E 6813425.28	N 2000253.65, E 6813439.36
L118	35.87		S44° 30' 14"E			N 2000253.65, E 6813439.36	N 2000228.07, E 6813464.50
L119	105.26		S43° 16' 20"E			N 2000228.07, E 6813464.50	N 2000151.43, E 6813536.65
L120	108.31		S42° 15' 50"E			N 2000151.43, E 6813536.65	N 2000071.27, E 6813609.50
L121	180.13		S42° 10' 24"E			N 2000071.27, E 6813609.50	N 1999937.78, E 6813730.43
L122	540.99		S41° 56' 46"E			N 1999937.78, E 6813730.43	N 1999535.40, E 6814092.05
C40	59.99	1145.78	S38° 56' 46"E	3.00	59.99	N 1999535.40, E 6814092.05	N 1999488.75, E 6814129.75
C41	119.97	916.47	S42° 41' 46"E	7.50	119.88	N 1999488.75, E 6814129.75	N 1999400.64, E 6814211.04
C42	40.00	1527.80	S44° 11' 46"E	1.50	40.00	N 1999400.64, E 6814211.04	N 1999371.97, E 6814238.93
L123	165.66		S41° 56' 46"E			N 1999371.97, E 6814238.93	N 1999248.75, E 6814349.66
L124	30.41		S86° 56' 46"E			N 1999248.75, E 6814349.66	N 1999247.13, E 6814380.02
L125	20.00		S41° 56' 46"E			N 1999247.13, E 6814380.02	N 1999232.26, E 6814393.39
L126	19.59		S86° 56' 46"E			N 1999232.26, E 6814393.39	N 1999231.21, E 6814412.96
L127	114.49		N70° 44' 15"E			N 1999231.21, E 6814412.96	N 1999268.98, E 6814521.04
L128	154.49		S19° 42' 17"E			N 1999268.98, E 6814521.04	N 1999123.54, E 6814573.13



CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

LINE AND CURVE TABLE - 2



PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

G009 SHEET 9 OF 86  
DRAWING NUMBER

REV	DESCRIPTION	DATE

DRAWN BY: AGP  
DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

BID ITEM NO.	BID ITEM DESCRIPTION	QTY	UNIT
<b>GENERAL</b>			
1	Mobilization/Demobilization	1	LS
2	Storm Water Pollution Prevention Plan	1	EA
3	Traffic and Pedestrian Control	1	LS
4	Sheeting, Shoring and Bracing	1	LS
5	Survey Monument Perpetuation & Replacement	6	EA
6	Pedestrian Bridge Removal and 36" Storm Drain	1	LS
7	Grouted Cobble Erosion Control Ditch	39	CY
<b>TRANSMISSION PIPELINE</b>			
8	Tree Protection/Tree Removal	1	LS
9	Replace/New Trail Pavement & Aggregate Base	2075	SY
10	Itebis Radio/Video Detection System	3	EA
11	Replace Street Pavement & Aggregate Base	2588	SY
12	Pavement Striping and Marking	1	LS
13	Site Grading, Excavation, Hauling	1	LS
14	Rock Excavation	950	CY
15	24" Tie-In to Existing 24" at WTP PL	1	EA
16	24" Tie-In to 24" at Existing 30" Transmission Main (Iron Point)	1	EA
17	24" Ductile Iron Pipe (CMCL Welded Steel Pipe or DIP CL 250, Fully Restrained, Complete and Installed)	19,656	LF
18	Pipe Fittings	1	LS
19	24" Butterfly Valves, Complete and Installed	28	EA
20	Blowoff and Hydrant Assemblies	1	LS
21	6" Combination Air/Vacuum Release Valve (CAV)	10	EA
22	Aerial Pipe Installation at Creek Crossings	2	EA
23	Cathodic Protection System	1	EA
24	Fiber Optic Conduit with Pull Boxes and Splice Vaults	1	LS
<b>WATER TREATMENT PLANT</b>			
25	Mobilization/Demobilization	1	LS
26	Clearing and Grubbing	1	LS
27	Sitework	1	LS
28	CMU Retaining Wall	1	LS
29	Yard Piping	1	LS

**HydroScience**  
 741 ALLSTON WAY  
 BERKELEY, CA 94710  
 510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
 50 NATOMAS STREET  
 FOLSOM, CA 95630

**CITY OF FOLSOM**  
 DISTINCTIVE BY NATURE

DESIGN BY: CML  
 PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
 PCE: C59049 DATE: 6/3/24

DRAWN BY: AGP  
 DATE: 6/3/24

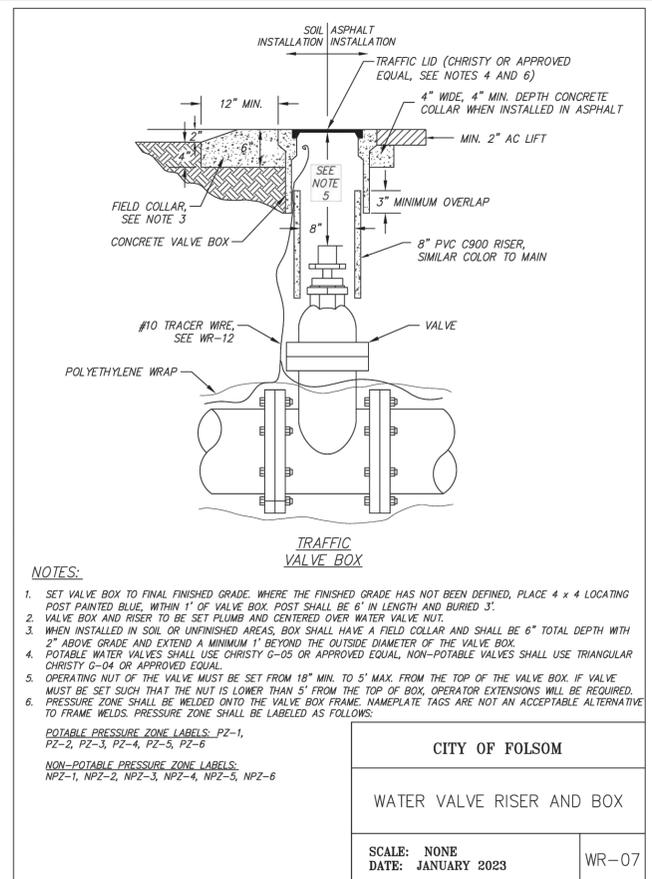
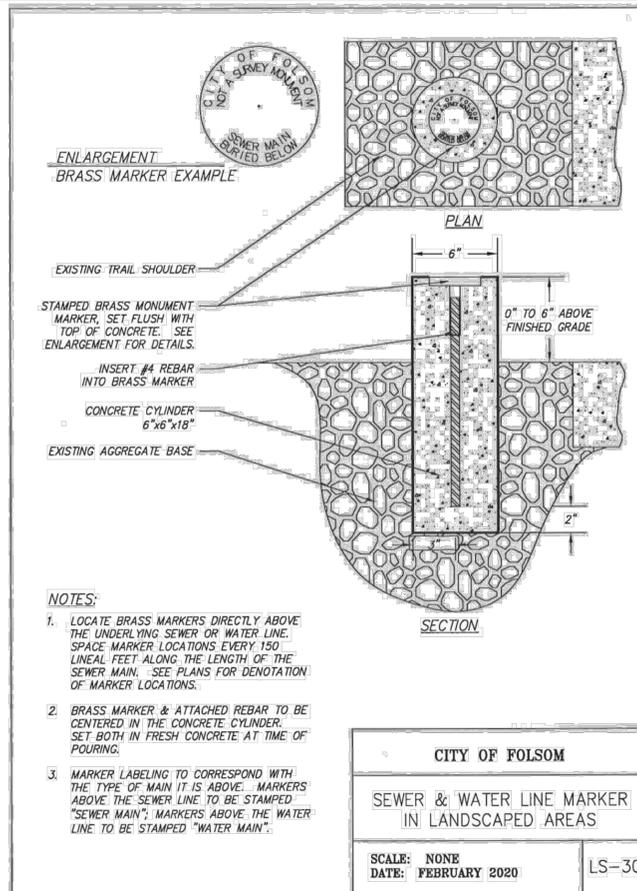
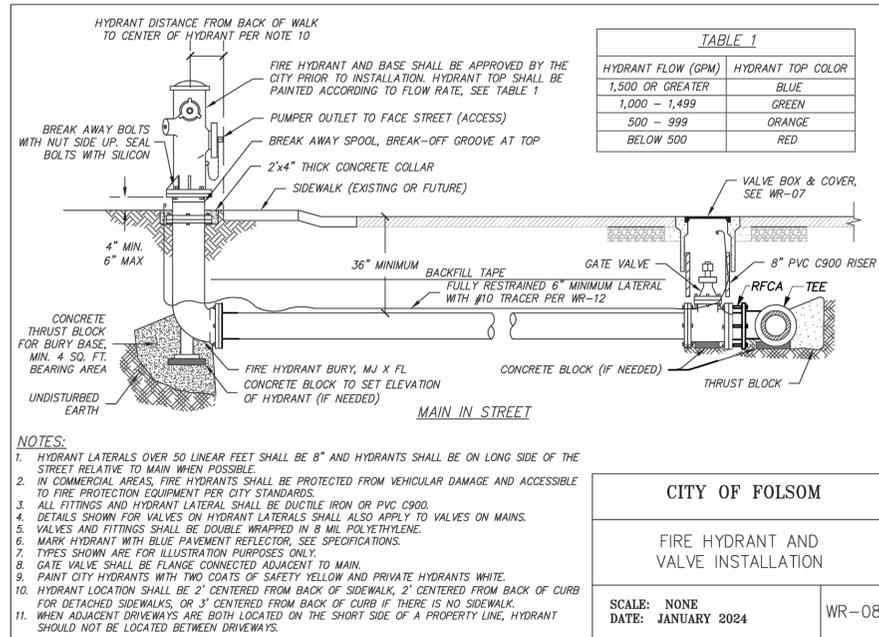
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

BIDDING QUANTITIES



PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE

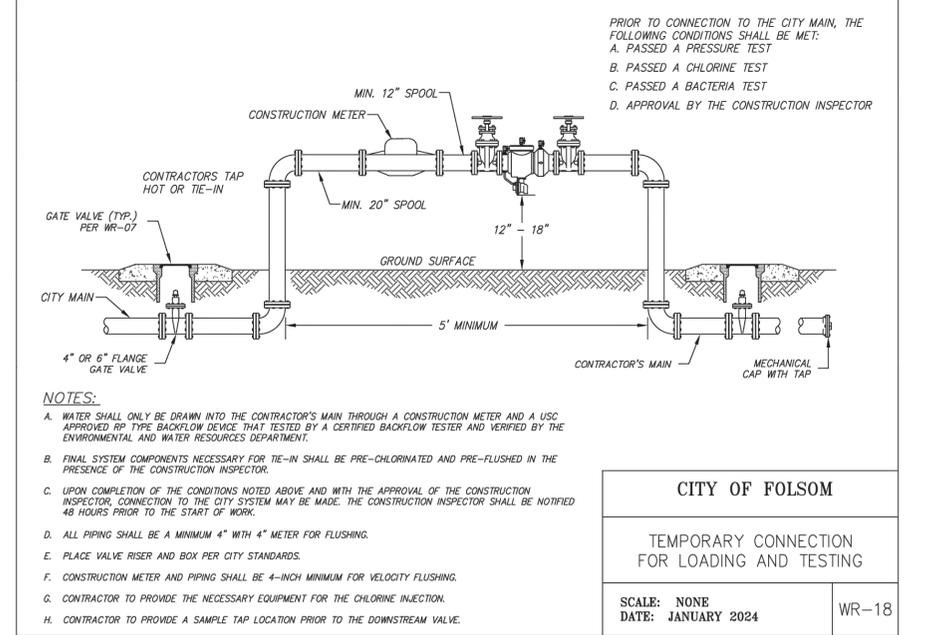
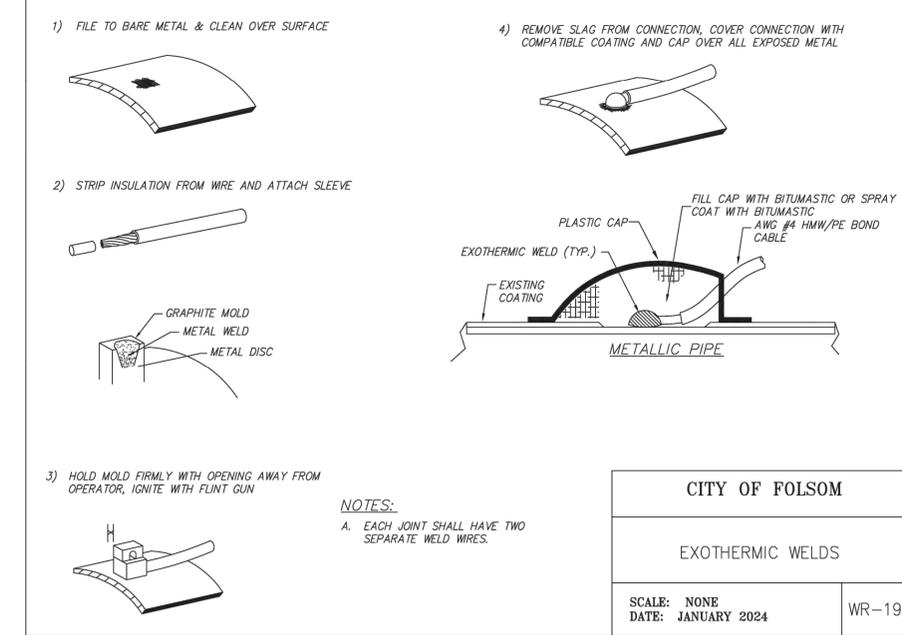
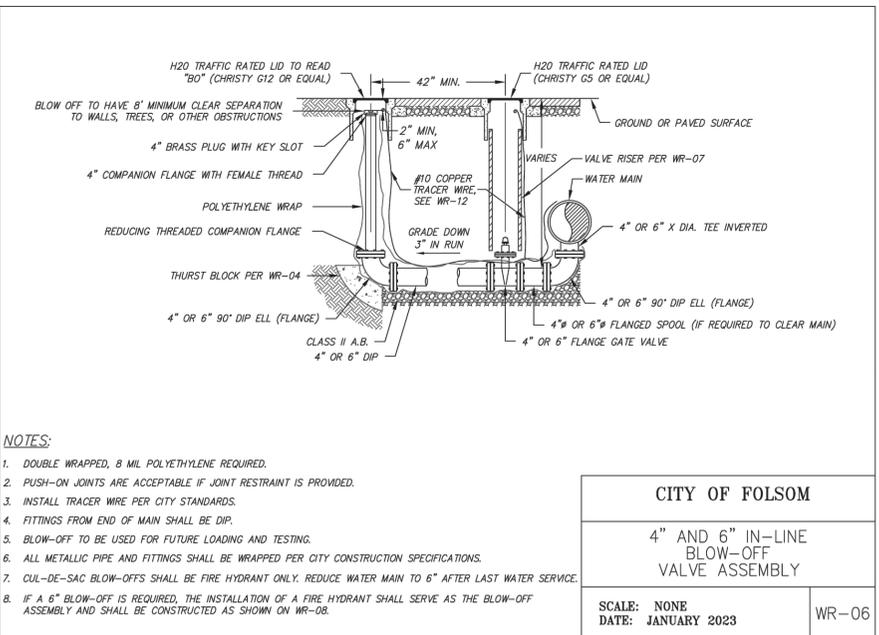
G010 SHEET 10 OF 86



**1 WR-08 FIRE HYDRANT AND VALVE INSALLATION**  
SCALE: NTS

**2 SEWER & WATER LINE MARKER IN LANDSCAPED AREAS**  
SCALE: NTS

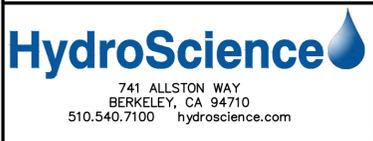
**3 WR-07 WATER VALVE RISER AND BOX**  
SCALE: NTS



**4 WR-06 4" AND 6" IN-LINE BLOWOFF VALVE ASSEMBLY**  
SCALE: NTS

**5 WR-19 EXOTHERMIC WELDS**  
SCALE: NTS

**6 WR-18 TEMP. CONNECTION FOR LOADING AND TESTING**  
SCALE: NTS



REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

CITY STANDARD DETAILS - 1

**CITY OF FOLSOM**  
EXOTHERMIC WELDS

SCALE: NONE  
DATE: JANUARY 2024  
WR-19

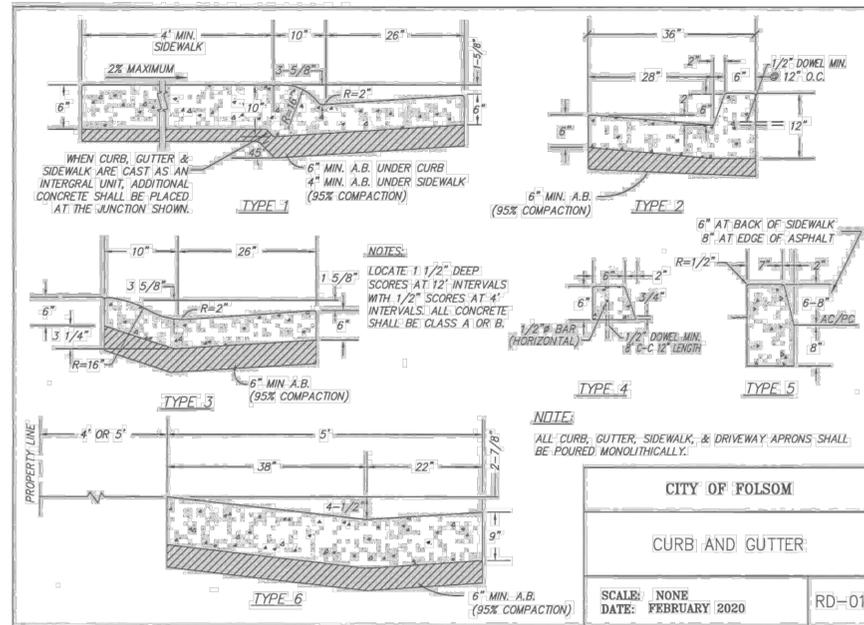
**CITY OF FOLSOM**  
TEMPORARY CONNECTION  
FOR LOADING AND TESTING

SCALE: NONE  
DATE: JANUARY 2024  
WR-18

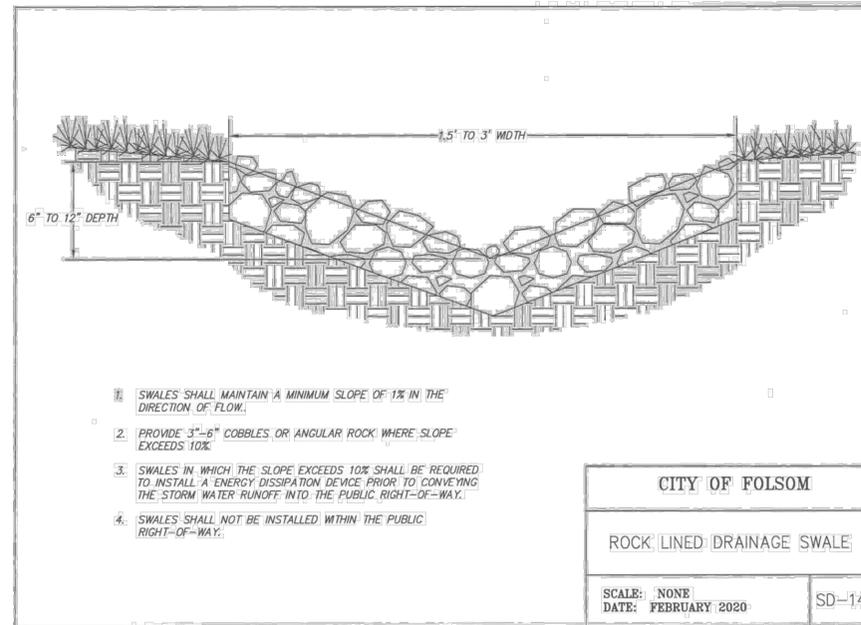
PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C010**  
DRAWING NUMBER

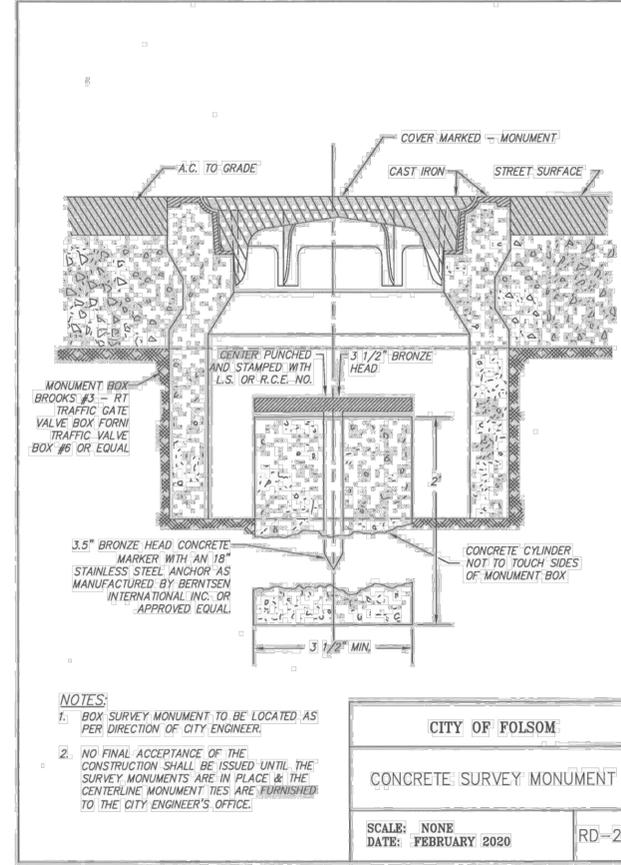
SHEET  
11 OF 86



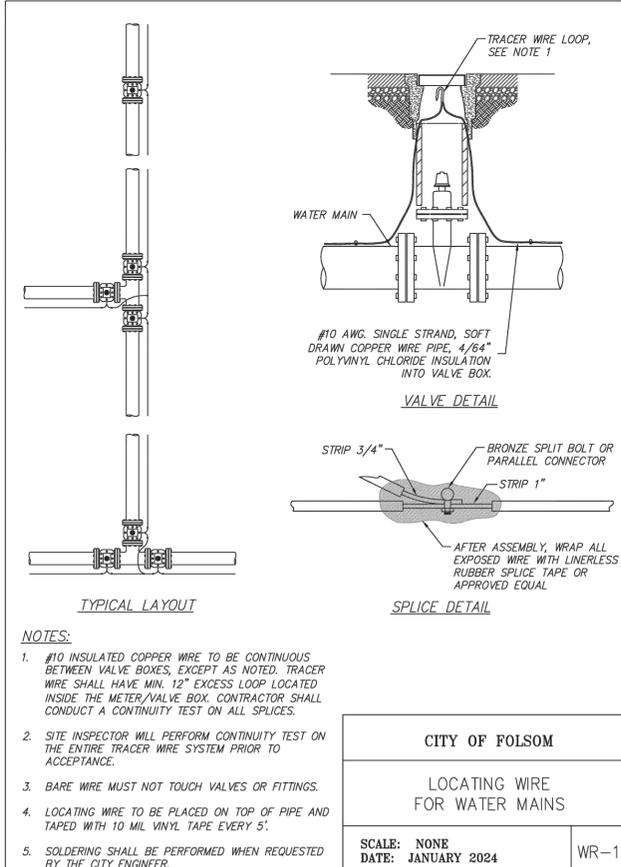
**1 RD-01 CURB AND GUTTER**  
 SCALE: NTS



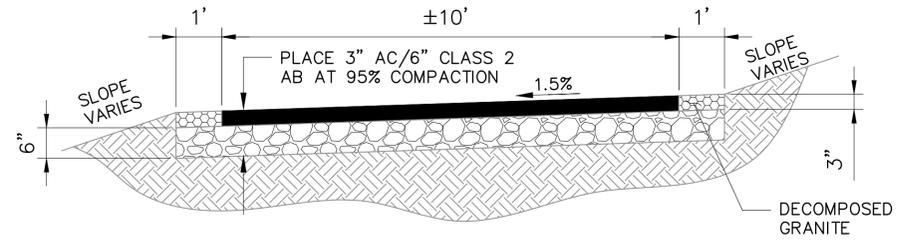
**2 SD-14 ROCK LINED DRAINAGE SWALE**  
 SCALE: NTS



**3 RD-23 CONCRETE SURVEY MONUMENT**  
 SCALE: NTS

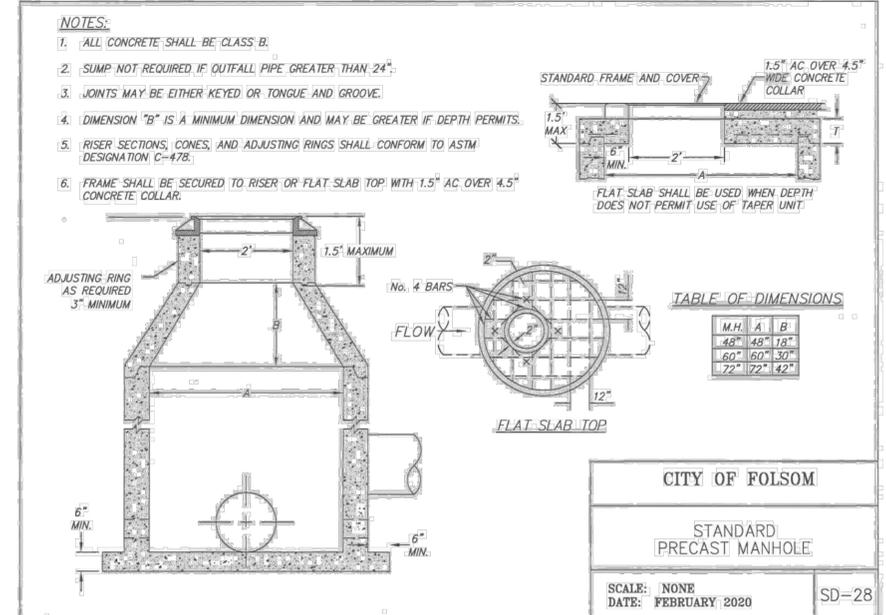


**4 WR-12 LOCATING WIRE, SEE NOTE 3. FOR WATER MAINS**  
 SCALE: NTS



- NOTES
- MATCH CONFORM GRADES AT TRAIL EDGES.
  - ASPHALT TRAIL SHALL BE RESTORED, EDGE TO EDGE, PROVIDING A UNIFORM TRAIL SURFACE PER CITY OF FOLSOM STANDARDS. NO JOINTS SHALL BE LEFT WITHIN THE PATH OF TRAVEL.
  - CUT SLOPES SHALL BE RESTORED TO 2.5:1 OR FLATTER; FILL SLOPES 3:1 OR FLATTER.
  - WHERE THE TREE PROTECTION ZONES EXIST ADJACENT TO TRAIL, DECOMPOSED GRANITE SECTIONS CAN BE REMOVED FROM STANDARD DETAIL.

**5 TRAIL RESTORATION**  
 SCALE: NTS



**6 SD-28 STANDARD PRECAST MANHOLE**  
 SCALE: NTS



CITY OF FOLSOM  
 50 NATOMAS STREET  
 FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

CITY STANDARD DETAILS - 2



PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE

C011 SHEET 12 OF 86  
 DRAWING NUMBER

REV	DESCRIPTION	DATE	DRAWN BY: AGP DATE: 6/3/24	DESIGN BY: CML PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C59049 DATE: 6/3/24

PULL BOX NO.	REINFORCED CONCRETE BOX				COMPOSITE BOX				REINFORCED CONCRETE OR COMPOSITE COVER							
	MIN. THICKNESS	MIN. DEPTH BOX AND EXTENSION	LO	WO	MIN. THICKNESS	MIN. DEPTH BOX & EXTENSION	L**	W**	R	EDGE THICKNESS	EDGE TAPER	L**	W**	R	EDGE THICKNESS	EDGE TAPER
3-1/2	7"	NO EXTENSION	20"	14"	5/16"	NO EXTENSION	15-3/4"	10-1/2"	7-1/2"	1-3/4"	1/8"	15-3/4"	10-1/2"	7-1/2"	1-3/4"	1/8"
5	7"	22"	28"	18"	5/16"	20"	23-1/2"	13-3/4"	7-3/4"	2"	1/8"	23-1/2"	13-3/4"	7-3/4"	2"	1/8"
5A	7"	22"	25-1/2"	15-3/4"	5/16"	20"	20-5/8"	10-1/2"	7-1/2"	2"	1/8"	20-5/8"	10-1/2"	7-1/2"	2"	1/8"
6	7-1/2"	24"	36"	23"	3/8"	20"	30-5/8"	17-3/4"	7-1/2"	2"	1/8"	30-5/8"	17-3/4"	7-1/2"	2"	1/8"

**NOTES:**

- IN UNIMPROVED AREAS AND PLANTERS, THE TOP OF PULL BOXES SHALL BE PLACED 0.10 FOOT ABOVE THE SURROUNDING GRADE OR, WHEN ADJACENT TO A CURB FLUSH WITH THE TOP OF THE CURB. THE SURROUNDING GRADE SHALL BE RAMPED UP TO MATCH THE TOP OF THE CONCRETE COLLAR, UNLESS OTHERWISE NOTED, AND WHERE PRACTICAL, PULL BOXES SHOWN IN THE VICINITY OF CURBS SHALL BE PLACED ADJACENT TO THE BACK OF CURB, AND PULL BOXES SHOWN ADJACENT TO STANDARDS SHALL BE PLACED ON THE SIDE OF THE FOUNDATION FACING AWAY FROM TRAFFIC.
- IN SIDEWALK AREAS, THE TOP OF PULL BOXES SHALL BE FLUSH WITH THE SIDEWALK GRADE.
- PLACEMENT OF PULL BOXES IN AREAS SUBJECT TO VEHICULAR TRAFFIC LOADS (INCLUDES TRAFFIC LANES, BIKE LANES, SHOULDERS, AND DRIVEWAYS) SHALL BE AVOIDED. WHENEVER POSSIBLE, IF UNAVOIDABLE, THEN A TRAFFIC RATED PULL BOX WITH STEEL TRAFFIC COVER SHALL BE USED. SEE STANDARD DETAIL SL-08.
- PULL BOXES SHALL NOT BE PLACED WITHIN THE BOUNDARIES OF SIDEWALK RAMP.
- PULL BOXES SHOULD NOT BE PLACED WITHIN PLANTER AREAS WHENEVER POSSIBLE.
- PULL BOX COVERS SHALL BE MARKED AS FOLLOWS:
  - TRAFFIC SIGNAL - TRAFFIC SIGNAL CIRCUITS WITH OR WITHOUT STREET LIGHTING CIRCUITS.
  - STREET LIGHTING - STREET LIGHTING CIRCUITS WHERE NO VOLTAGE IS ABOVE 600V.
  - STREET LIGHTING - HIGH VOLTAGE - STREET LIGHTING CIRCUITS WHERE VOLTAGE IS COLLAR TO BE ABOVE 600V.
  - SERVICE - SERVICE CIRCUITS BETWEEN SERVICE POINT AND SERVICE DISCONNECT.
  - SPRINKLER CONTROL - SPRINKLER CONTROL CIRCUITS, 50 VOLTS OR LESS.
  - IRIGATION - CIRCUITS TO IRRIGATION CONTROLLER, 120 VOLTS OR LESS.
  - RAMP METER - RAMP METER CIRCUITS.
  - COUNT STATION - COUNT AND/OR SPEED MONITOR CIRCUITS.
  - COMMUNICATION - COMMUNICATION CIRCUITS.
  - TELEPHONE - TELEPHONE SERVICE.
  - TOS COMMUNICATIONS - TOS COMMUNICATIONS TRUNK LINE.
  - TOS POWER - TOS POWER.
  - TDC POWER - TELEPHONE DEMARCATION CABINET POWER.
- COVERS SHALL FIT FLUSH WITH THE TOP OF PULL BOXES. THERE SHALL BE 1/4" MAXIMUM CLEARANCE ALL AROUND BETWEEN COVERS AND PULL BOX OPENINGS.
- ALL COVERS AND BOXES SHALL BE INTERCHANGEABLE WITH CALIFORNIA STANDARD MALE AND FEMALE GAUGES. WHEN INTERCHANGED WITH A STANDARD MALE OR FEMALE GAUGE, THE TOP SURFACES SHALL BE FLUSH WITHIN 1/8" INCH.
- ALL COVERS AND BOXES SHALL BE INTERCHANGEABLE WITH CALIFORNIA STANDARD MALE AND FEMALE GAUGES. WHEN INTERCHANGED WITH A STANDARD MALE OR FEMALE GAUGE, THE TOP SURFACES SHALL BE FLUSH WITHIN 1/8" INCH.
- STACKING OF PULL BOXES IS PERMITTED (TWO PULL BOXES MAXIMUM).
- STEEL REINFORCING SHALL BE AS REGULARLY USED IN THE STANDARD PRODUCTS OF THE RESPECTIVE MANUFACTURER.

**CITY OF FOLSOM**  
STANDARD PULLBOX  
SCALE: NONE  
DATE: FEBRUARY 2020  
SL-07

1 SL-07 - STANDARD PULLBOX  
SCALE: NTS

**NOTES:**

- STEEL COVER SHALL HAVE EMBOSSED NON-SKID PATTERN.
- STEEL REINFORCING SHALL BE AS REGULARLY USED IN THE STANDARD PRODUCTS OF THE RESPECTIVE MANUFACTURER.
- PULL BOX COVERS SHALL BE MARKED AS DESCRIBED IN NOTE 6 ON STANDARD DRAWING 5-34. MARKING SHALL BE APPLIED TO EACH COVER PRIOR TO GALVANIZING BY BEAD WELDING THE LETTERS ON THE COVERS. THE LETTERS SHALL BE RAISED AT LEAST 3/32" INCH.
- BONDING JUMPER FOR COVER SHALL BE A MIN. OF 36" LONG. WHEN NON-METALLIC CONDUIT IS USED, THE BONDING JUMPER FOR THE COVER SHALL BE SPLICED TO THE BOND WIRE IN THE CONDUITS. WHEN THE USE OF METALLIC CONDUIT IS SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, THE BONDING JUMPER FOR THE COVER SHALL BE CONNECTED TO THE CONDUIT GROUND BUSHING, AND THE CONDUITS SHALL BE BONDED TOGETHER WITH GROUND BUSHINGS AND A BONDING JUMPER.
- CONDUITS SHALL ENTER AT BOTTOM OF PULL BOX AS SHOWN IN THE DRAWING.

PULL BOX NO.	REINFORCED CONCRETE BOX			
	MIN. THICKNESS	MIN. DEPTH BOX AND EXTENSION	LO	WO
3-1/2	7"	NO EXTENSION	20"	14"
5	7"	22"	28"	18"
5A	7"	22"	25-1/2"	15-3/4"

**REINFORCED CONCRETE BOX**

**CITY OF FOLSOM**  
TRAFFIC RATED PULLBOX  
SCALE: NONE  
DATE: FEBRUARY 2020  
SL-08

2 SL-08 - TRAFFIC RATED PULLBOX  
SCALE: NTS

**NOTES:**

- UPON ACCEPTANCE OF THE WORK, ALL CONDUITS SHALL BE SEALED WITH COMPATIBLE SEALANT MATERIAL.
- ALL GROUND CONNECTIONS SHALL BE COATED WITH OXIDATION INHIBITING COMPOUND.
- THE VAULT SHALL BE GALVANIZED AFTER ALL KNOWN ENTRANCES HAVE BEEN MADE.
- VAULT SHALL HAVE INTEGRAL BASE OR SHALL BE GROUDED PER SPECIAL PROVISIONS OF SPICE VAULTS.
- VAULTS SHALL NOT BE WITHIN THE BOUNDARIES OF NEW OR EXISTING WHEELCHAIR RAMPS OR DRIVEWAYS.
- ALL COVERS AND VAULTS SHALL BE INTERCHANGEABLE WITH CALIFORNIA STANDARD MALE AND FEMALE GAUGES. WHEN INTERCHANGED WITH A STANDARD MALE OR FEMALE GAUGE, THE TOP SURFACES SHALL BE FLUSH WITHIN 1/8" OF AN INCH. TOP OUTSIDE EDGE OF ALL CONCRETE COVERS AND SPICE VAULTS SHALL HAVE 1/4" MINIMUM RADIUS.
- THE BOTTOM OF THE SPICE VAULTS SHALL BE BEDDED IN AT LEAST 6" OF CRUSHED ROCK AND SHALL BE GROUDED. A LAYER OF ROOFING PAPER SHALL BE PLACED BETWEEN THE GROUT AND THE CRUSHED ROCK. A 1" DIA HOLE SHALL BE PROVIDED IN THE CENTER OF THE SPICE VAULT THROUGH THE GROUT AND THE ROOFING PAPER. SEE SPECIAL PROVISIONS FOR ADDITIONAL DETAILS.
- A MINIMUM OF 2 FEET COVER OVER NEW CONDUITS IS REQUIRED. CONDUITS MUST NOT BE INSTALLED DEEPER THAN 5 FEET UNLESS OTHERWISE APPROVED BY THE ENGINEER.

**CITY OF FOLSOM**  
FIBER SPICE VAULT  
SCALE: NONE  
DATE: FEBRUARY 2020  
SL-16

3 SL-16 - FIBER SPICE VAULT  
SCALE: NTS

**CITY OF FOLSOM**  
PIPE INLET AND TRASH RACK  
30" PIPE AND SMALLER  
SCALE: NONE  
DATE: FEBRUARY 2020  
SD-16

4 SD-16 PIPE INLET AND TRASH RACK 33" AND LARGER  
SCALE: NTS

**NOTES:**

- THE TREE PROTECTION ZONE (TPZ) IS DEFINED BY THE RADIUS OF A CIRCLE AROUND EACH PROTECTED TREE THAT IS THE LONGEST HORIZONTAL DRIFLINE BRANCH, PLUS 1 FOOT OR THE AREA WITH A RADIUS OF 1 FOOT FOR EVERY 1 INCH OF DIAMETER AT STANDARD HEIGHT (DSH) WHICHEVER IS GREATER.
- ROOTS MAY EXTEND UP TO 2-3 TIMES BEYOND THE BRANCHED CANOPY.
- THIS WHOLE ROOT VENTILATION SYSTEM SHALL BE PLACED UPON UNDISTURBED SOIL GRADE.
- PATIO/SIDEWALK SHALL BE MINIMALLY 3 1/2" THICK CLASS B CONCRETE.
- CONCRETE / DRIVEWAYS / VEHICLE PARKING:
  - SHALL BE CLASS B WITH A THICKNESS OF 4" (5" FOR POROUS CONCRETE / 3" FOR ASPHALT).
  - SHALL HAVE A MINIMUM THICKENED EDGE OF 6" WITH #4 REBAR @ ALL EDGES. REBAR LAP JOINTS OF 40 BAR DIAMETERS (NO REBAR FOR POROUS CONCRETE).
  - HAVE A 6"x6" WELDED WIRE MESH (WWM) THROUGHOUT (NO WWM FOR POROUS CONCRETE).
  - SLOPED TO DRAIN AWAY FROM TREE.
  - FINAL STRUCTURAL DESIGN BY OWNER'S ENGINEER OR ARCHITECT.
- FILL SOIL MAY VARY IN DEPTH OVER AERATION SYSTEM.

**CITY OF FOLSOM**  
CONCRETE / ASPHALT / ENGINEERED FILL OVER TREE ROOTS  
SCALE: NONE  
DATE: FEBRUARY 2020  
LS-06

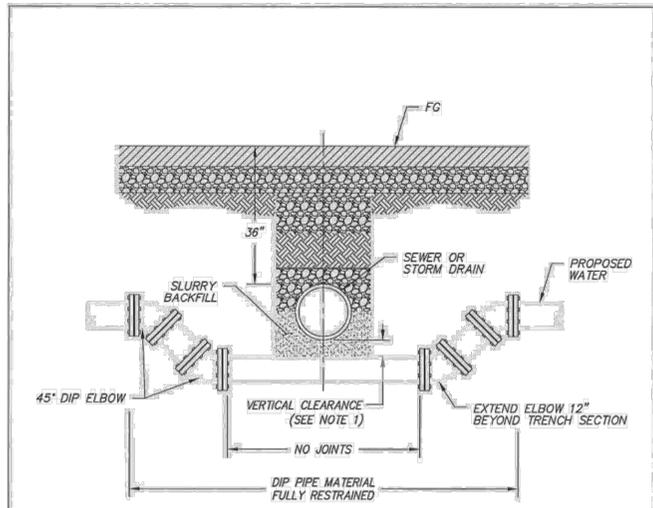
5 LS-06 CONC/AC/ENGINEERED FILL OVER TREE ROOTS  
SCALE: NTS

**CITY OF FOLSOM**  
4" & 6" END OF LINE BLOW-OFF VALVE ASSEMBLY  
SCALE: NONE  
DATE: JANUARY 2023  
WR-05

**NOTES:**

- REQUIRED TO BE PLACED AT THE END OF 8" OR LARGER WATER MAINS.
- BLOW OFF VALVE TO BE PLACED AT THE END OF MAIN LINE.
- TEMPORARY BLOW OFF VALVES MAY BE 4" GALVANIZED.
- PERMANENT BRASS BLOW OFF SHALL BE IDENTIFIED AS "LEAD FREE".
- CUL-DE-SAC BLOW OFFS SHALL BE FIRE HYDRANT ONLY. REDUCE WATER MAIN TO 6" AFTER LAST WATER SERVICE.

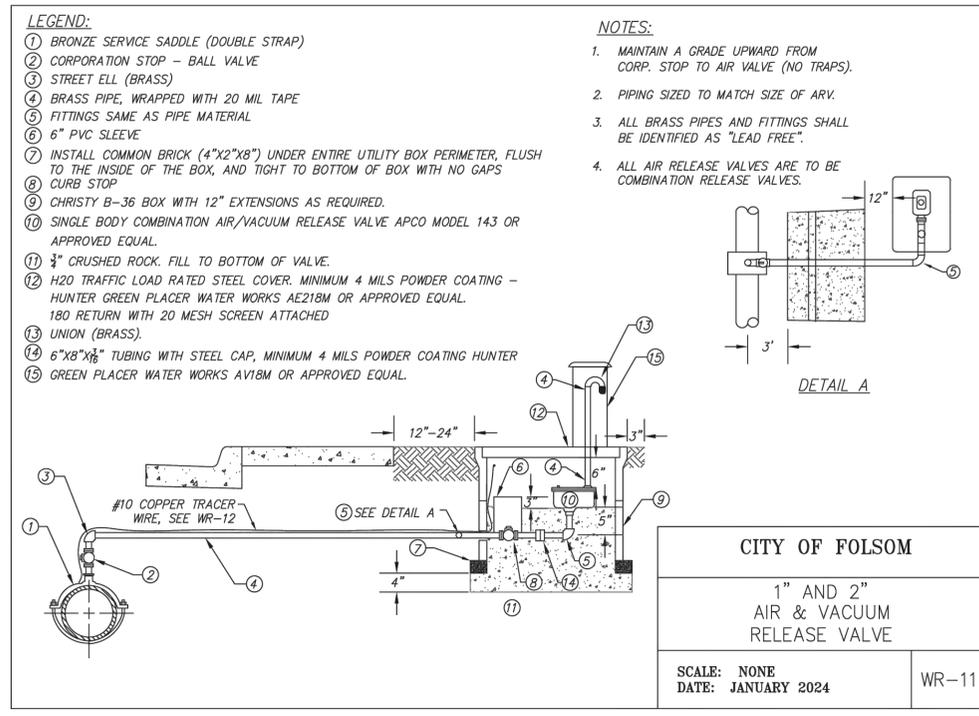
6 WR-05 - 4" - 6" END OF LINE BLOW OFF VALVE ASSEMBLY  
SCALE: NTS



- NOTES:**
- REQUIRED MINIMUM VERTICAL CLEARANCES:  
6" FOR STORM DRAINS 12" FOR SANITARY SEWERS & RECYCLED WATER
  - NO WATER SERVICES ALLOWED ALONG THE LOWERED LENGTH OF WATER MAIN.
  - NO JOINTS IN SEWER OR STORM DRAIN WITHIN 10 FEET OF CENTERLINE OF WATER MAIN.
  - FOR ADDITIONAL INFORMATION ON UTILITIES THAT CROSS POTABLE WATER LINES, REFER TO STATE OF CALIFORNIA, DEPT. OF HEALTH SERVICES.
  - SEWER CROSSING PIPE TO BE DUCTILE IRON PIPE LINED WITH PROTECTO 401 OR APPROVED EQUAL. CASING SHALL BE DOUBLE WRAPPED IN 8-MIL POLYETHYLENE FILM PER CITY SPECIFICATIONS.

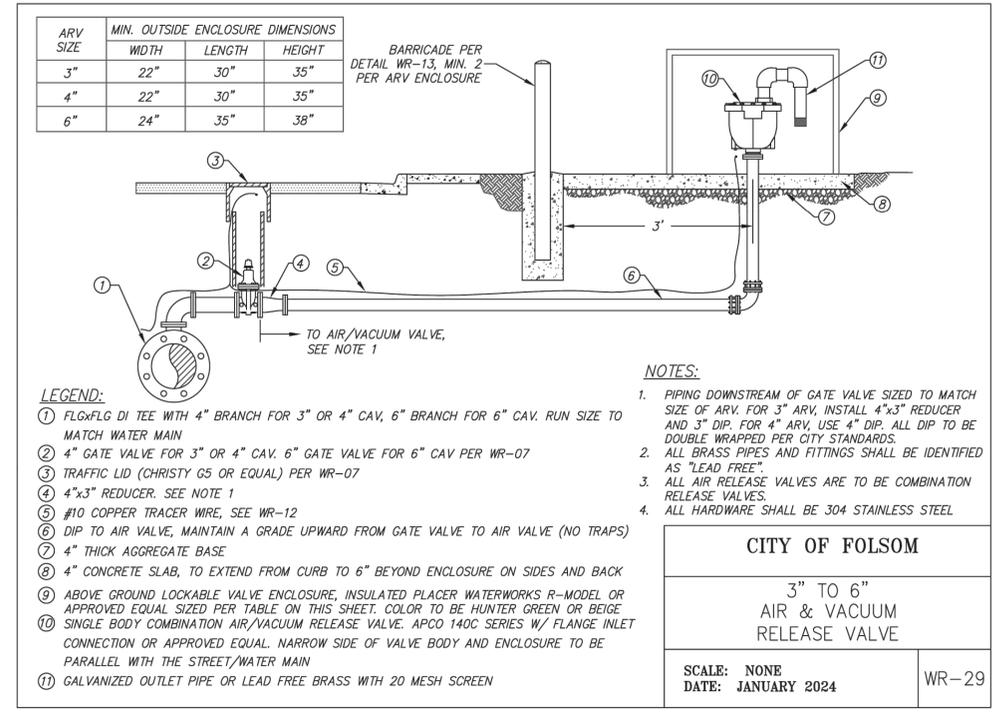
<b>CITY OF FOLSOM</b>	
WATER MAINS CROSSING BELOW SANITARY SEWER OR STORM DRAIN	
SCALE: NONE	WR-22
DATE: FEBRUARY 2020	

**WR-22 WATER MAIN CROSSING DETAIL** 1  
SCALE: NTS



<b>CITY OF FOLSOM</b>	
1" AND 2" AIR & VACUUM RELEASE VALVE	
SCALE: NONE	WR-11
DATE: JANUARY 2024	

**WR-11 2" ARV DETAIL** 2  
SCALE: NTS



<b>CITY OF FOLSOM</b>	
3" TO 6" AIR & VACUUM RELEASE VALVE	
SCALE: NONE	WR-29
DATE: JANUARY 2024	

**WR-29 3" ARV DETAIL** 3  
SCALE: NTS

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BERKELEY, CA 94710  
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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

CITY STANDARD DETAILS - 4

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C013** SHEET 14 OF 86  
DRAWING NUMBER

**GENERAL**

1. ALL BURIED FERROUS METALLIC PIPE, VALVES, FITTINGS ETC. SHALL BE CATHODICLY PROTECTED.

**WELDS:**

1. WIRE CONNECTIONS TO PIPES, VALVES, FITTINGS ETC. SHALL BE MADE USING EXOTHERMIC WELD KITS.
2. EPOXY COATING SHALL BE REMOVED FROM THE SURFACE OF THE PIPE, VALVE, FITTING ETC. OVER AN AREA JUST SUFFICIENT TO MAKE THE WELD.
3. EXOTHERMIC WELDS SHALL BE COVERED WITH A MOLDED PLASTIC DOME FILLED WITH CORROSION RESISTANT COMPOUND (HANDY CAP OR EQUAL) AND SECURED WITH 10 MIL TAPE.
4. ALL AREAS WHERE THE EPOXY COATING HAS BEEN REMOVED SHALL BE REPAIRED WITH LIQUID EPOXY.
5. EXOTHERMIC WELDS SHALL NOT TOUCH EACH OTHER.

**WIRE:**

1. WIRE FOR TEST STATIONS SHALL BE SOLID SINGLE CONDUCTOR COPPER WIRE NO. 10 AWG AS SHOWN.
2. WIRE FOR CONTINUITY BONDS SHALL BE STRANDED SINGLE CONDUCTOR COPPER WIRE NO. 10 AWG.
3. ALL WIRES SHALL HAVE A MINIMUM OF 24" COVER, BE FREE OF JOINTS AND SPLICES AND HAVE AT LEAST 18" SLACK LEFT IN THE TEST STATION.
4. CONTINUITY BOND SHALL BE A MAXIMUM LENGTH OF 10 FEET.
5. ALL WIRE FOR CATHODIC PROTECTION SHALL BE HIGH-MOLECULAR-WEIGHT-POLYETHYLENE (HMWPE) INSULATION.

**TEST STATION:**

1. TEST STATION SHALL BE INSTALLED PER STANDARD DRAWING "CATHODIC PROTECTION - TEST STATION"
2. TEST STATIONS SHALL HAVE THE LEGEND "ANODE" CAST ON THE LID.

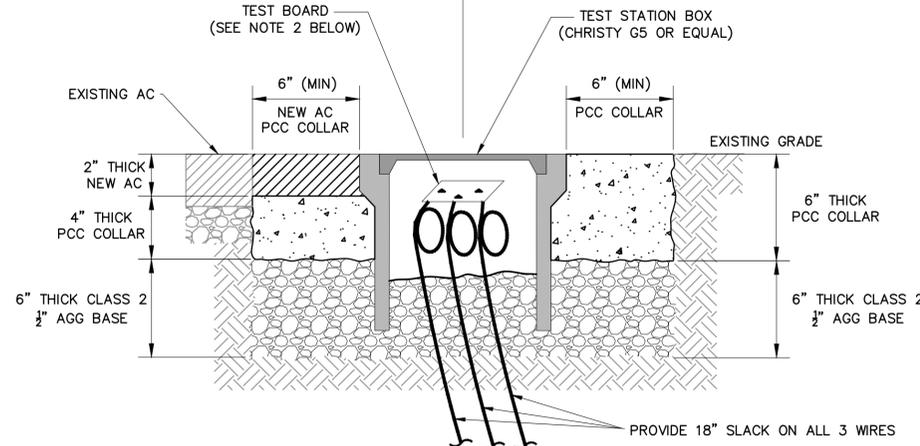
**SACRIFICIAL ANODES:**

1. SACRIFICIAL ANODES SHALL BE ZINC OR MAGNESIUM ANODES.
2. BARE ANODE WEIGHT PER INSTALLATION SHALL BE 30LBS MINIMUM.
3. SEE "CATHODIC PROTECTION - ANODE SIZE" (SHEET C014) FOR ANODE WEIGHT.
4. ANODE SHALL BE PLACED AT MINIMUM OF 3 FEET FROM THE CLOSEST METAL OBJECT.
5. ANODE SHALL BE DRENCHED WITH WATER PRIOR TO BACKFILLING TRENCH.

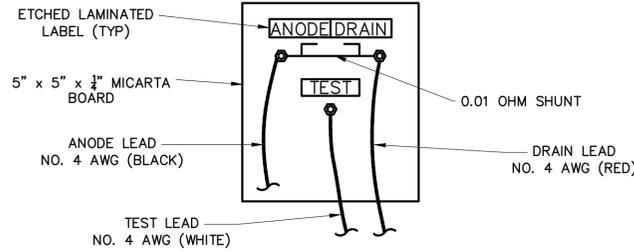
**TEST & INSPECTION PROCEDURES:**

1. CITY SHALL TEST CATHODIC PROTECTION ASSEMBLY FOR CONTINUITY PRIOR TO BACKFILLING OF TRENCH.
2. CONTRACTOR SHALL PROVIDE THE CITY WITH TEST DATA INDICATING THAT CATHODIC PROTECTION ASSEMBLY IS OPERATING AT AN ACCEPTABLE POTENTIAL.

TEST STATION IN PAVED AREA TEST STATION IN UNPAVED AREA



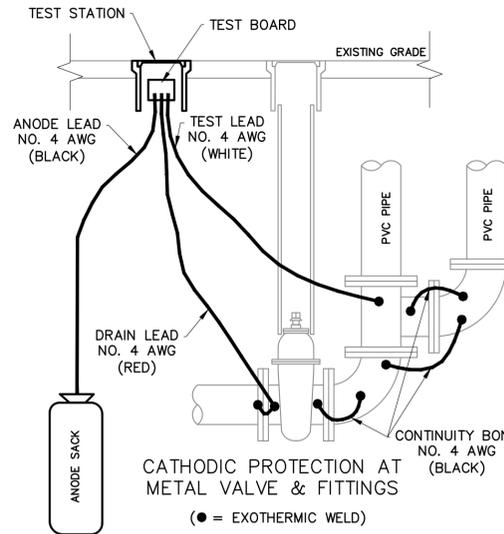
TEST STATION HOUSING DETAIL



TEST BOARD DETAIL

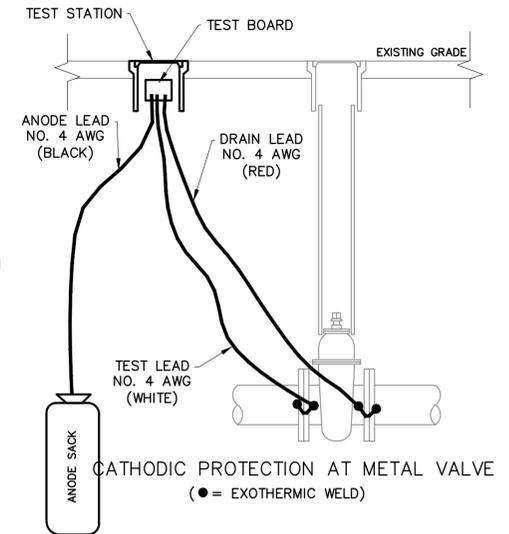
**NOTES**

1. FOR GENERAL NOTES SEE CATHODIC PROTECTION DETAIL 1/C013
2. TEST BOARD MAY BE:
  - a. MICARTA TYPE AS SHOWN ABOVE.
  - b. "BIG FINK" TYPE STATION OR ENGINEER APPROVED EQUAL.



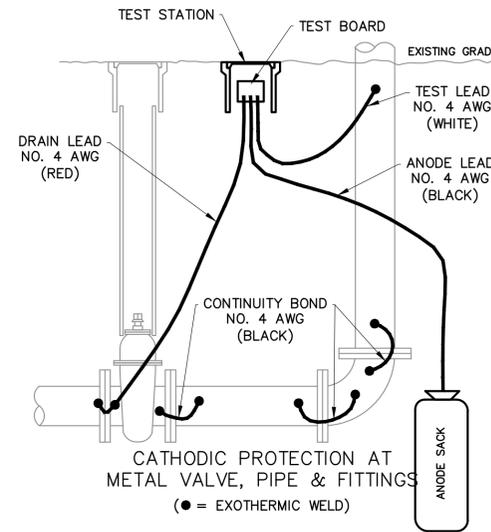
CATHODIC PROTECTION AT METAL VALVE & FITTINGS

(● = EXOTHERMIC WELD)



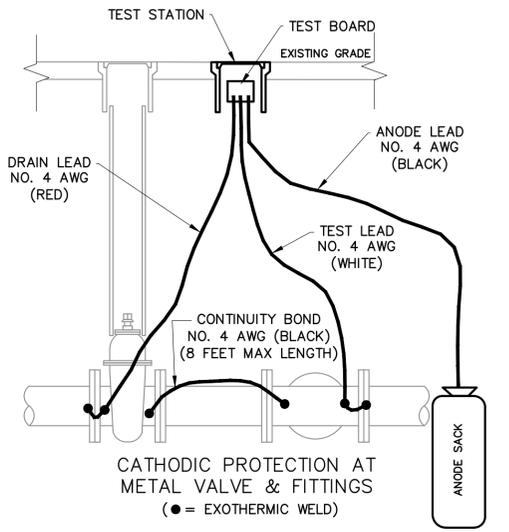
CATHODIC PROTECTION AT METAL VALVE

(● = EXOTHERMIC WELD)



CATHODIC PROTECTION AT METAL VALVE, PIPE & FITTINGS

(● = EXOTHERMIC WELD)



CATHODIC PROTECTION AT METAL VALVE & FITTINGS

(● = EXOTHERMIC WELD)

FOR NOTES, SEE CATHODIC PROTECTION - NOTES 1/-

**1 CATHODIC PROTECTION - NOTES**  
SCALE: NTS

**2 CATHODIC PROTECTION - TEST STATION**  
SCALE: NTS

**3 CATHODIC PROTECTION - LAYOUT AT VALVES & FITTINGS**  
SCALE: NTS



REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

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**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

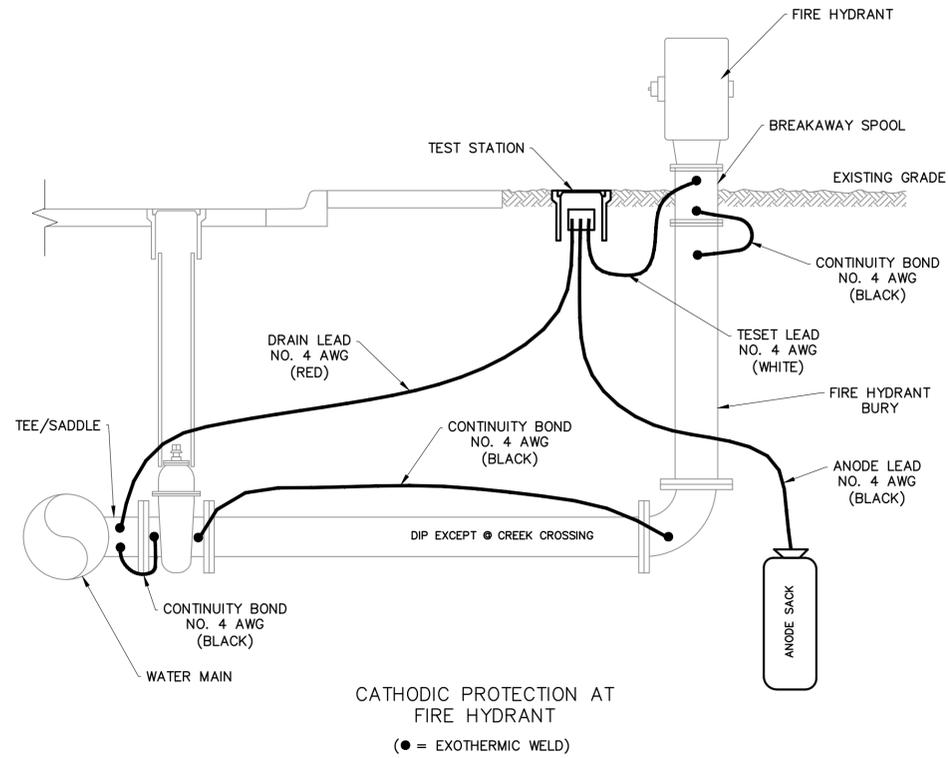
CATHODIC PROTECTION  
DETAILS - 1



PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C014**  
DRAWING NUMBER

SHEET  
15 OF 86



FOR NOTES, SEE CATHODIC PROTECTION - NOTES 1/C013

**4** CATHODIC PROTECTION - LAYOUT AT FIRE HYDRANTS  
SCALE: NTS

TABLE 1 (ANODE WEIGHT IN LBS FOR PIPE AND FITTINGS)

PIPE SIZE	VALVE	*CROSS	*TEE	ELBOW	RT, X FLG ADAPTER	FIRE HYDRANT AND BURY	EACH 36" OF SPOOL LENGTH
4"	1.2	1.5	1.2	1	0.5	-	1
6"	1.8	2.3	1.8	1.5	0.5	3	1.5
8"	1.4	3	2.4	2	0.5	-	2
10"	3	3.8	3	2.5	0.5	-	2.5
12"	3.6	4.5	3.6	3	0.5	-	3
14"	4.2	5.3	4.2	3.5	0.5	-	3.5
16"	4.8	6.0	4.8	4.0	0.5	-	4.0
24"	7.2	9.0	7.2	6.0	0.5	-	6.0
30"	9.0	11.3	9.0	7.5	0.5	-	7.5

\* BASE WEIGHT REQUIRED ON LARGEST OUTLET

NOTES:

1. BARE ANODE WEIGHT PER INSTALLATION SHALL BE 32 LBS MINIMUM
2. TABLE 1 INDICATES THE ANODE WEIGHT (LBS) FOR PIPE AND FITTINGS.
3. WEIGHT OF ANODE SHALL BE ROUNDED UP IN 5LB INCREMENTS

ANODE WEIGHT EXAMPLE 'A':

4 - 12" VALVES	= 14.4LBS (4 x 3.6LBS)
3 - 12" TEE'S	= 10.8LBS (3 x 3.6LBS)
1 - 12" CROSS	= 4.5LBS (1 x 4.5LBS)
2 - 12" ELBOWS	= 6.0LBS (2 x 3LBS)
<b>TOTAL</b>	<b>= 35.7LBS</b>

EXAMPLE 'A' INDICATES THAT THE MINIMUM WEIGHT OF THE ANODE SHALL BE 40LBS

ANODE WEIGHT EXAMPLE 'B':

2 - 6" VALVES	= 3.6LBS (2 x 1.8LBS)
1 - 6" TEE'S	= 1.8LBS (1 x 1.8LBS)
2 - 6" ELBOWS	= 3.0LBS (2 x 1.5LBS)
<b>TOTAL</b>	<b>= 8.4LBS</b>

EXAMPLE 'B' INDICATES THAT THE MINIMUM WEIGHT OF THE ANODE SHALL BE 32 LBS

FOR NOTES, SEE CATHODIC PROTECTION - NOTES 1/C013

**5** CATHODIC PROTECTION - ANODE SIZE  
SCALE: NTS

REV	DESCRIPTION	DATE

DRAWN BY: AGP  
DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

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PCE: C59049 DATE: 6/3/24

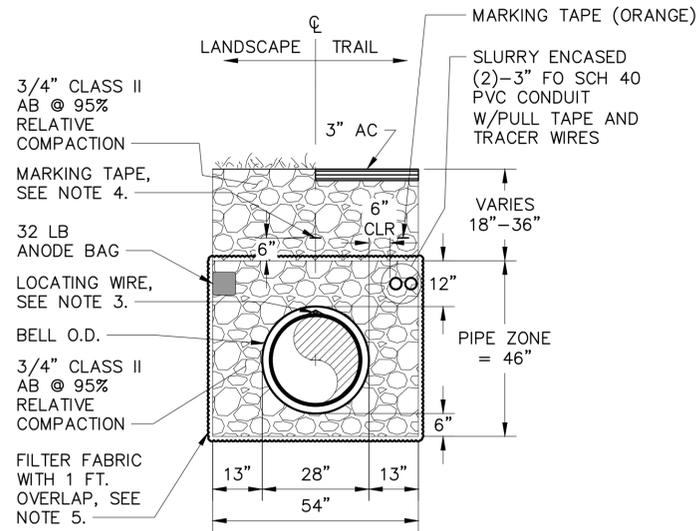


CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

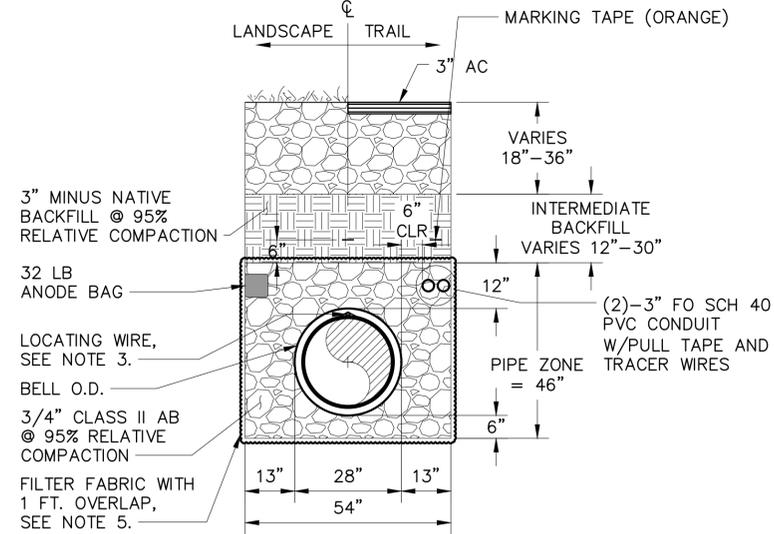
CATHODIC PROTECTION  
DETAILS - 2





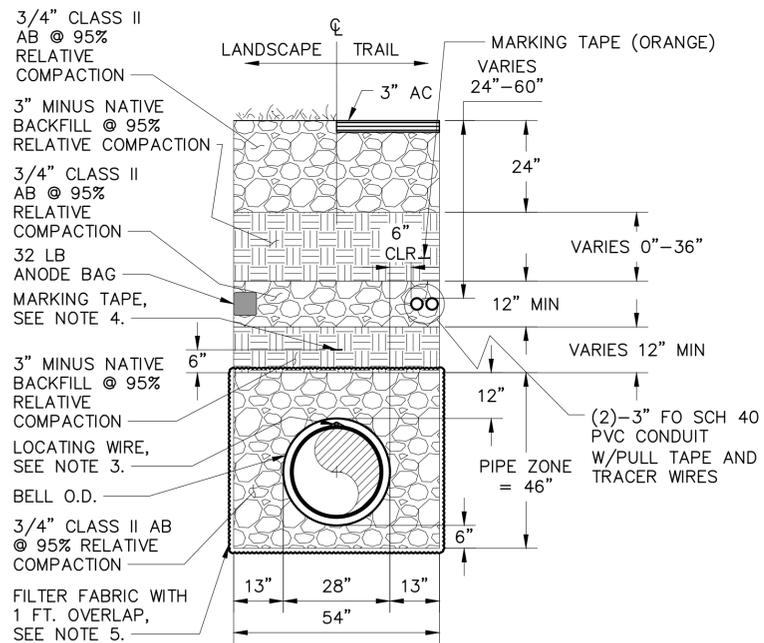
(A) 30"-48" COVER W/ (2)-3" FO

**1 SHALLOW TRENCH - LANDSCAPE / TRAIL AREA**  
SCALE: NTS



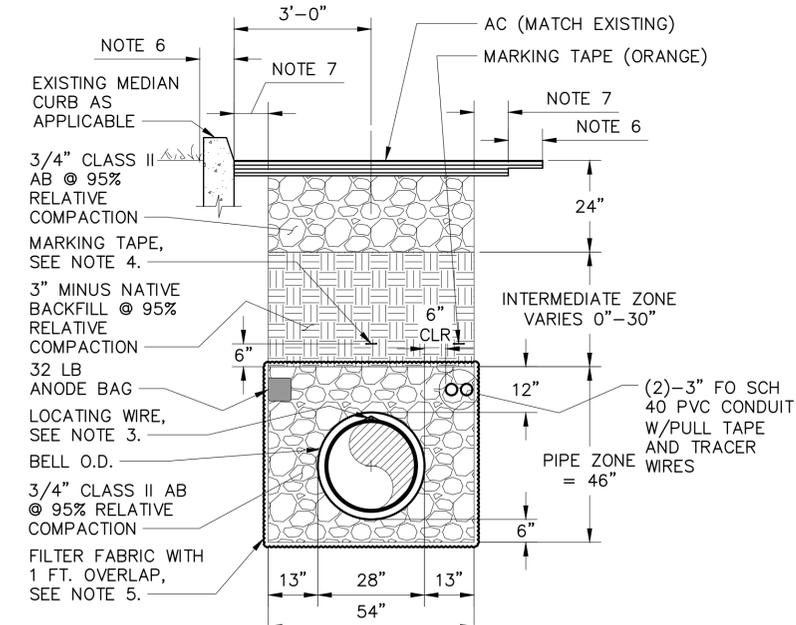
(A) 48"-66" COVER W/ (2)-3" FO  
\*SHORING REQUIRED

**2 DEEP TRENCH - LANDSCAPE / TRAIL AREA**  
SCALE: NTS



(A) 66" OR MORE COVER W/ (2)-3" FO  
\*SHORING REQUIRED

**3 DEEP TRENCH - LANDSCAPE / TRAIL AREA**  
SCALE: NTS

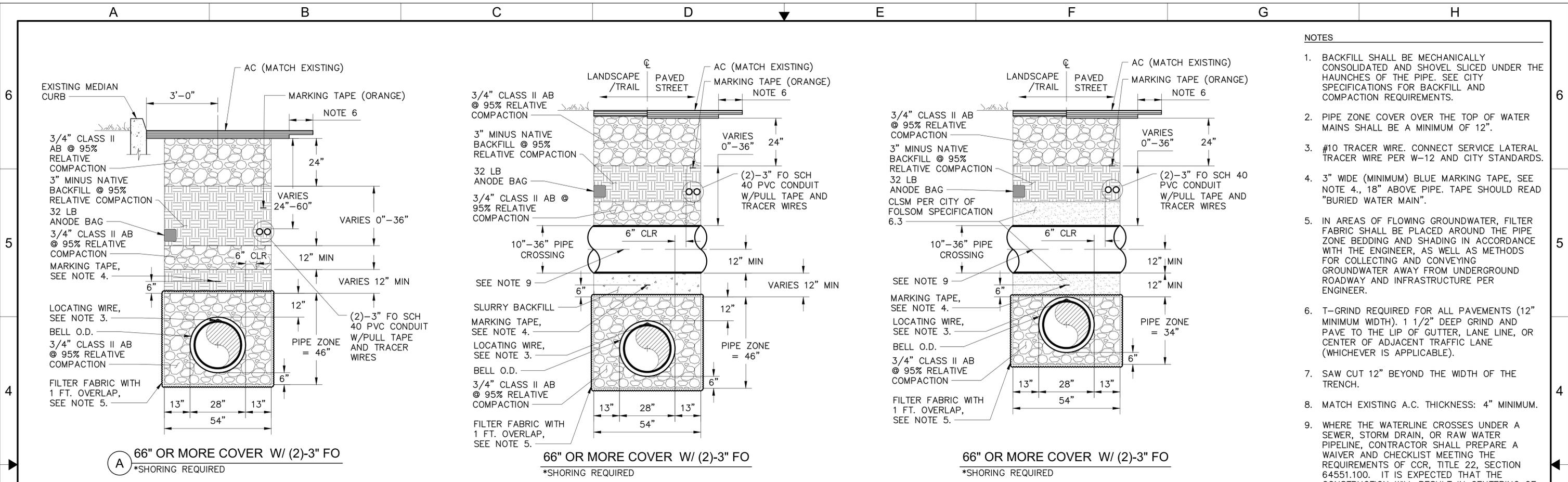


(A) DEEP TRENCH 48"-66" OR MORE COVER W/ (2)-3" FO  
\*SHORING REQUIRED

**4 TRENCH - PAVED STREET**  
SCALE: NTS

- NOTES**
- BACKFILL SHALL BE MECHANICALLY CONSOLIDATED AND SHOVEL SLICED UNDER THE HAUNCHES OF THE PIPE. SEE CITY SPECIFICATIONS FOR BACKFILL AND COMPACTION REQUIREMENTS.
  - PIPE ZONE COVER OVER THE TOP OF WATER MAINS SHALL BE A MINIMUM OF 12".
  - #10 TRACER WIRE. CONNECT SERVICE LATERAL TRACER WIRE PER W-12 AND CITY STANDARDS.
  - 3" WIDE (MINIMUM) BLUE MARKING TAPE, SEE NOTE 4., 18" ABOVE PIPE. TAPE SHOULD READ "BURIED WATER MAIN".
  - IN AREAS OF FLOWING GROUNDWATER, FILTER FABRIC SHALL BE PLACED AROUND THE PIPE ZONE BEDDING AND SHADING IN ACCORDANCE WITH THE ENGINEER, AS WELL AS METHODS FOR COLLECTING AND CONVEYING GROUNDWATER AWAY FROM UNDERGROUND ROADWAY AND INFRASTRUCTURE PER ENGINEER.
  - T-GRIND REQUIRED FOR ALL PAVEMENTS (12" MINIMUM WIDTH). 1 1/2" DEEP GRIND AND PAVE TO THE LIP OF GUTTER, LANE LINE, OR CENTER OF ADJACENT TRAFFIC LANE (WHICHEVER IS APPLICABLE).
  - SAW CUT 12" BEYOND THE WIDTH OF THE TRENCH.
  - MATCH EXISTING A.C. THICKNESS: 4" MINIMUM.

REV	DESCRIPTION	DATE	DRAWN BY: AGP DATE: 6/3/24	DESIGN BY: CML PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C59049 DATE: 6/3/24

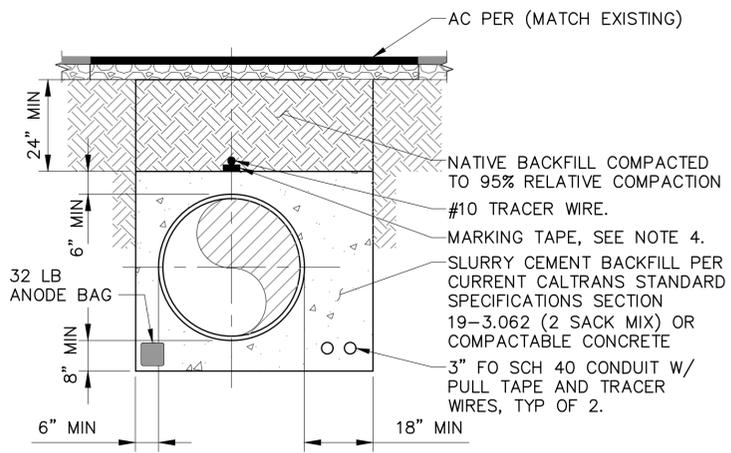


- NOTES**
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  - SAW CUT 12" BEYOND THE WIDTH OF THE TRENCH.
  - MATCH EXISTING A.C. THICKNESS: 4" MINIMUM.
  - WHERE THE WATERLINE CROSSES UNDER A SEWER, STORM DRAIN, OR RAW WATER PIPELINE, CONTRACTOR SHALL PREPARE A WAIVER AND CHECKLIST MEETING THE REQUIREMENTS OF CCR, TITLE 22, SECTION 64551.100. IT IS EXPECTED THAT THE CONSTRUCTION WILL RESULT IN CENTERING OF THE NEW WATER PIPELINE UNDER EXISTING UTILITY AND MAXIMUM SEPARATION OF JOINTS IN THE NEW POTABLE WATER LINE FROM THE CROSSING UTILITY.

**1 DEEP TRENCH - PAVED STREET**  
SCALE: NTS

**2 BACKFILL @ WATER CROSSING**  
SCALE: NTS

**3 BACKFILL @ STORM DRAIN OR SEWER CROSSING**  
SCALE: NTS



**4 CONCRETE ENCASEMENT W/ (2)-3" FO**  
SCALE: NTS

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

DESIGNED BY: CML  
PCE: C59049 DATE: 6/3/24

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

**CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT**

**TRENCH DETAILS - 2**

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
6/3/2024

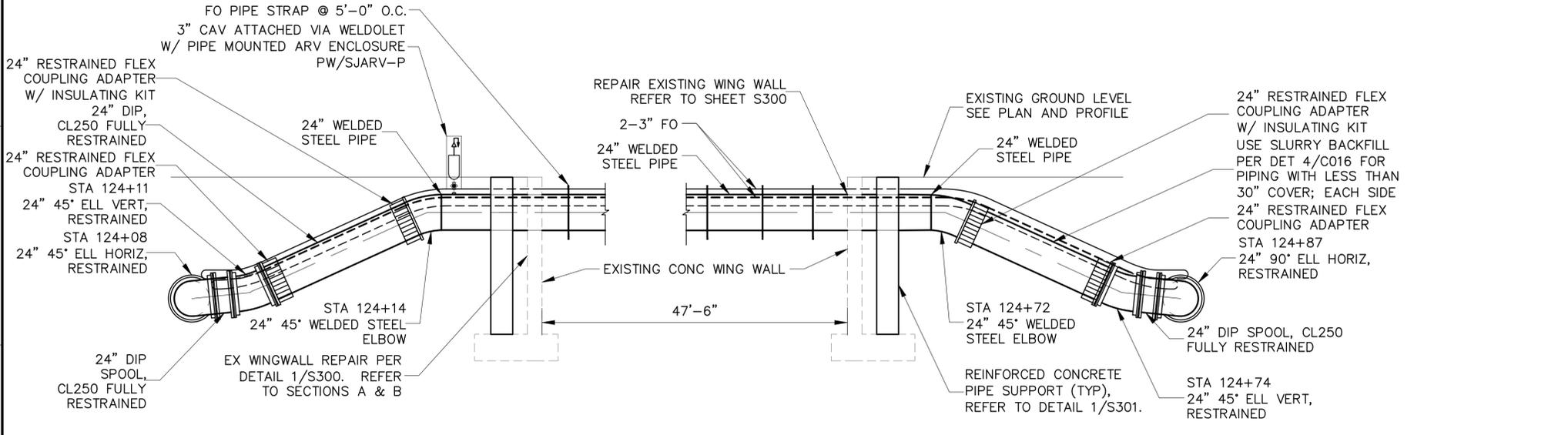
PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C017** SHEET 18 OF 86  
DRAWING NUMBER

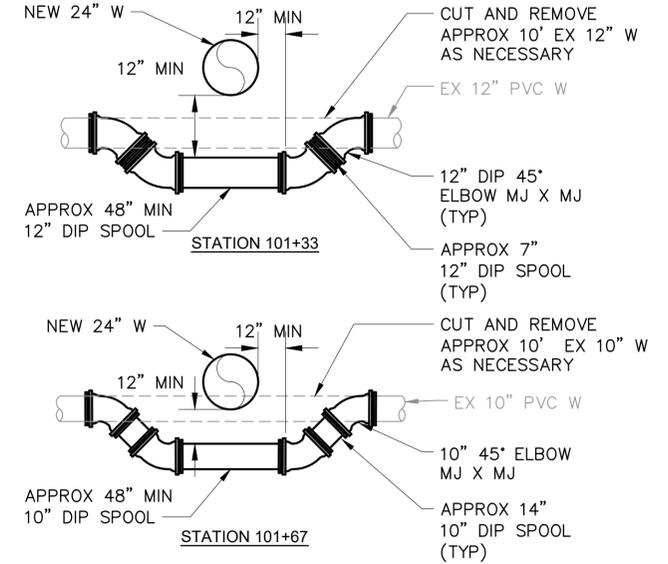
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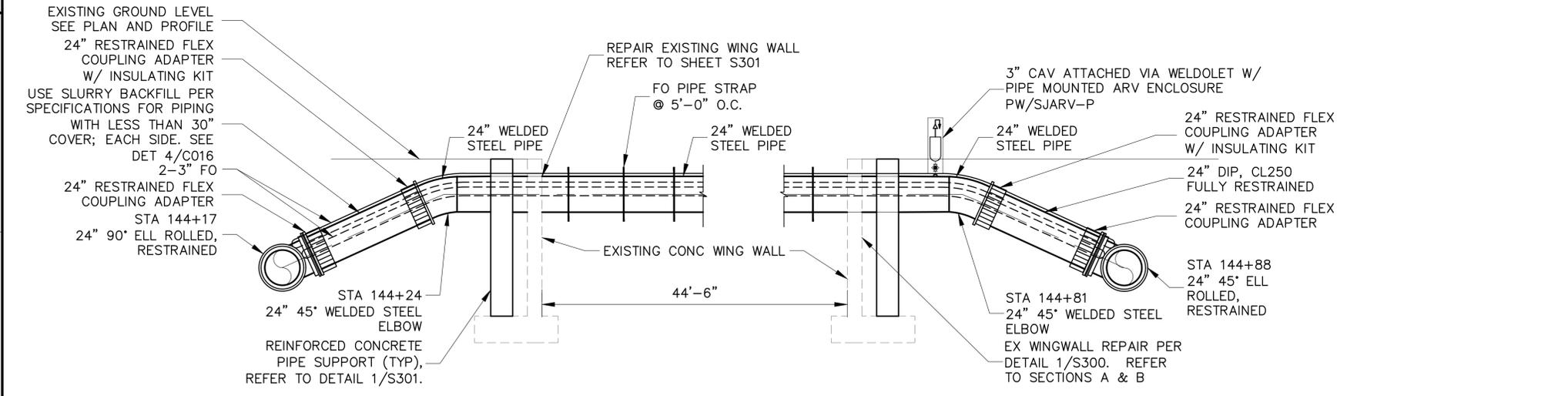
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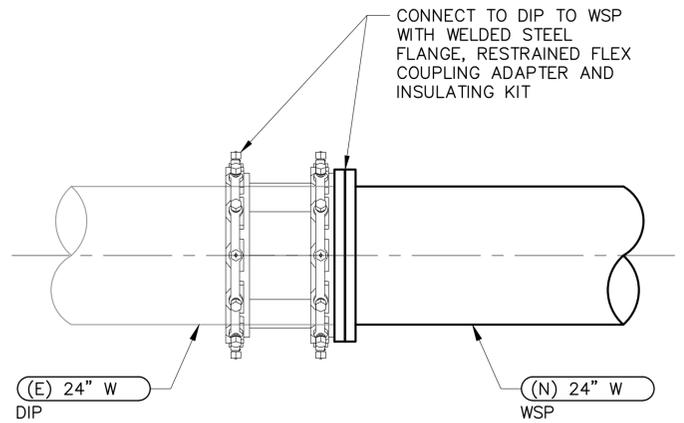
**1 HUMBUG CREEK CROSSING DETAIL**  
C106 SCALE: NTS



**3 WATER LOWERING DETAILS**  
SCALE: NTS



**2 WILLOW CREEK CROSSING DETAIL**  
C108 SCALE: NTS



**4 DIP-WSP CONNECTION DETAIL**  
SCALE: NTS

NOTE: THESE DETAILS ASSUME THAT DIP IS THE PIPE MATERIAL USED FOR THE 24" W. IF WSP IS USED IN LIEU OF DIP, THE CONNECTIONS ON EITHER SIDE OF THE CREEK WILL BE SUBMITTED BY THE CONTRACTOR AS A SUBMITTAL, AND WILL NOT REQUIRE A SEPARATE SPOOL OR FCA TO TRANSITION FROM ONE PIPE MATERIAL TO THE OTHER. REGARDLESS OF THE PIPE MATERIAL CHOSEN FOR THE 24"W FOR THE PIPELINE IN OAK AVENUE PARKWAY, THE PIPELINE CROSSING HUMBUG CREEK AND WILLOW CREEK SHALL BE WSP.

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

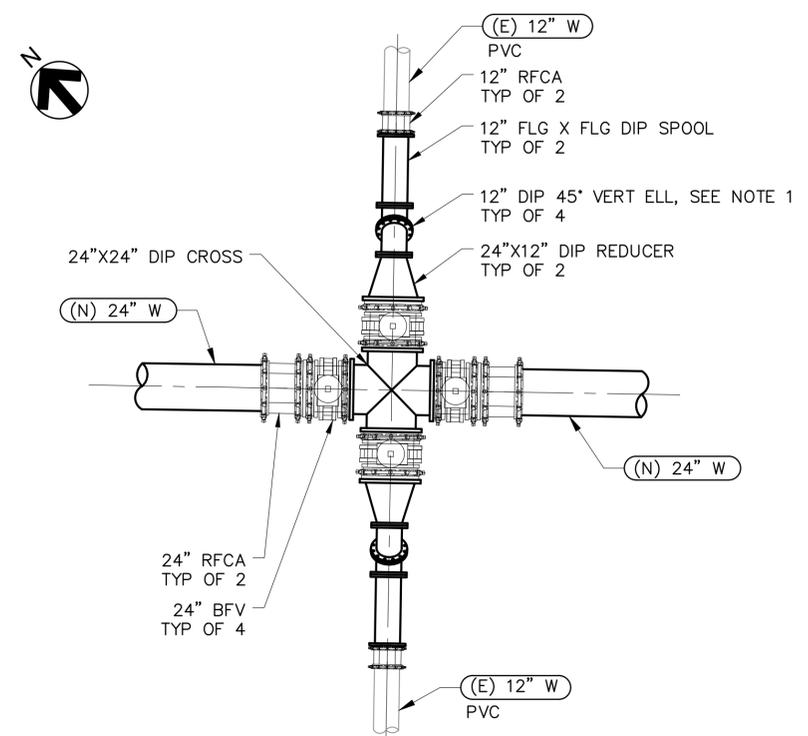
**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

**CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT**

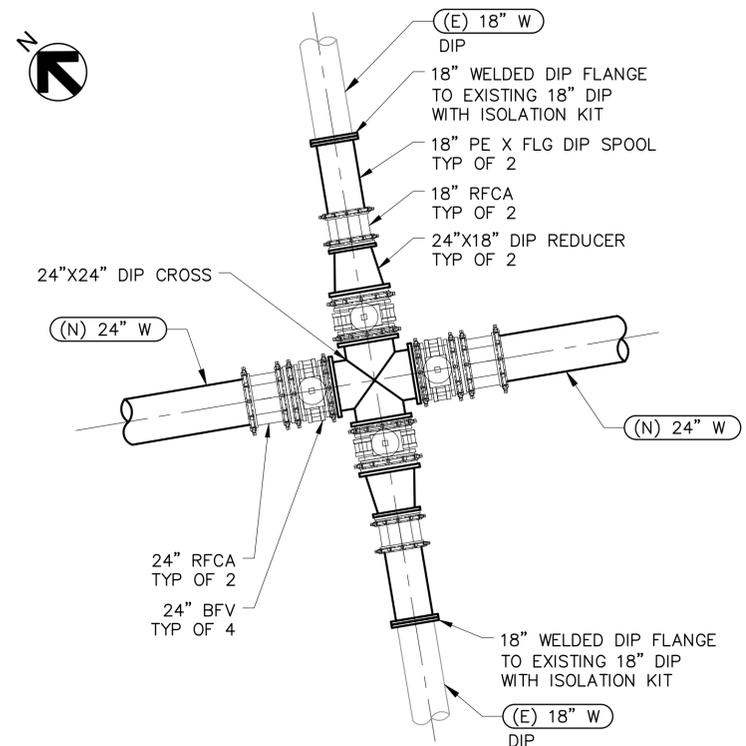
**CIVIL DETAILS - 1**

REGISTERED PROFESSIONAL ENGINEER  
COURTIS L. LAM  
C59049  
CIVIL  
STATE OF CALIFORNIA  
6/3/2024

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE  
**C018**  
SHEET 19 OF 86  
DRAWING NUMBER

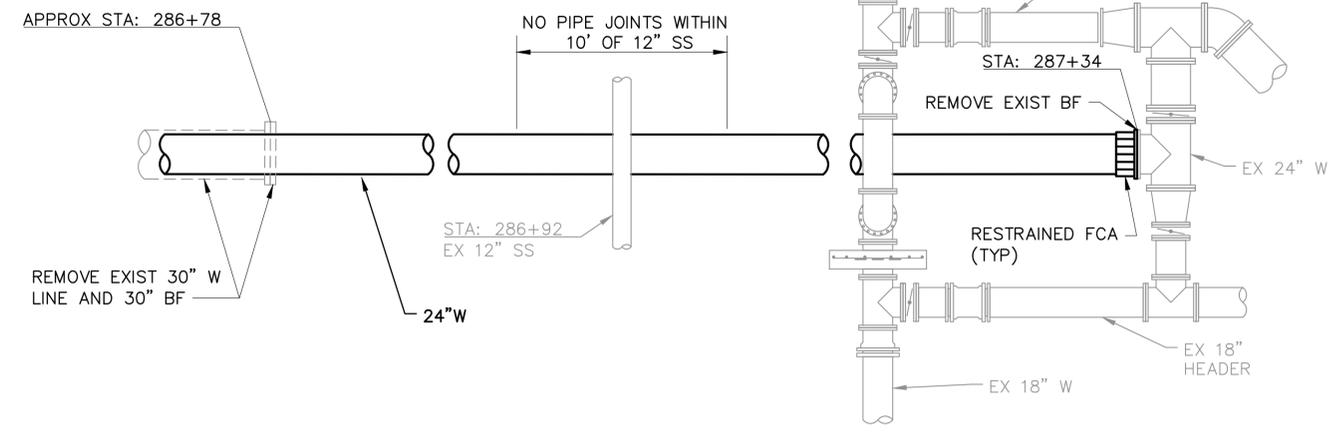


**CONNECTION DETAIL - SCHOLAR WAY** 1  
SCALE: 1/4" = 1'-0"  
C114



**CONNECTION DETAIL - BROADSTONE PARKWAY** 2  
SCALE: 1/4" = 1'-0"  
C117

- NOTES**
- CONTRACTOR SHALL LOCATE THE EXISTING 12-INCH PIPELINE AND CONFIRM IN THE FIELD ELEVATION DIFFERENCE BETWEEN THE NEW 24" WATER AND EXISTING 12" PVC WATER AND PROVIDE ADDITIONAL 12" DIP SPOOL AS NEEDED.
  - CONTRACTOR SHALL PROVIDE AN INSULATING FLANGE KIT WHERE CONNECTION OF DISSIMILAR METALS OCCUR AND AS NOTED ON THE PLANS.
  - CONTRACTOR SHALL PROVIDE CATHODIC PROTECTION TO THE NEW DIP PIPE AND APPURTENANCES.



**CONNECTION DETAIL - IRON POINT ROAD** 3  
SCALE: NTS  
C121

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

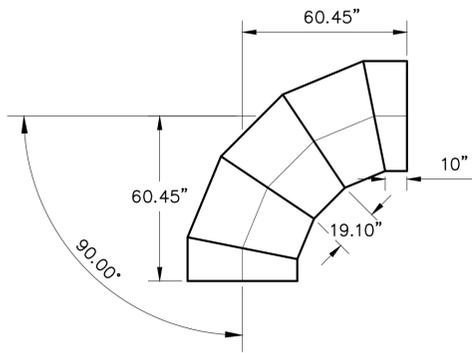
**CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT**

**CONNECTION DETAILS - 1**

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
CURTIS A. LAM  
C59049  
STATE OF CALIFORNIA  
6/3/2024

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

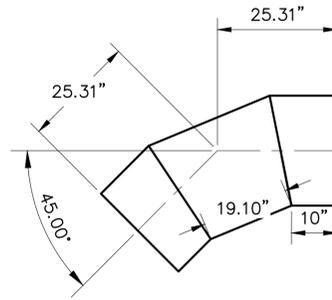
**C019** SHEET 20 OF 86  
DRAWING NUMBER



WELDED STEEL - 90° BEND (R = 2.5D)

SCALE: NTS

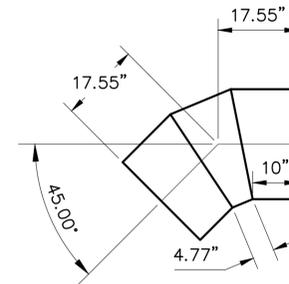
1  
-



WELDED STEEL - 45° BEND (R = 2.5D)

SCALE: NTS

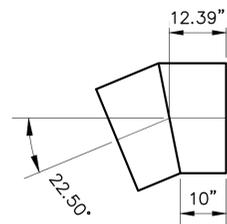
2  
-



WELDED STEEL - 45° BEND (R = D)

SCALE: NTS

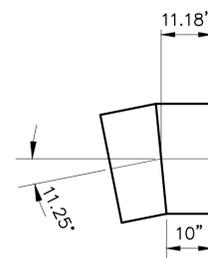
3  
-



WELDED STEEL - 22.5° BEND (R = 2.5D)

SCALE: NTS

4  
-



WELDED STEEL - 11.25° BEND (R = 2.5D)

SCALE: NTS

5  
-



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DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24



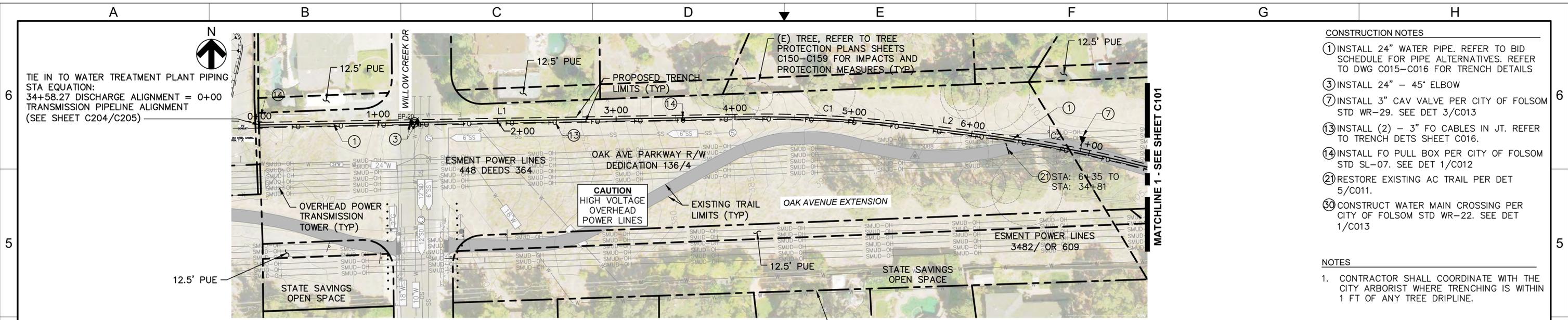
CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

WELDED STEEL DETAILS



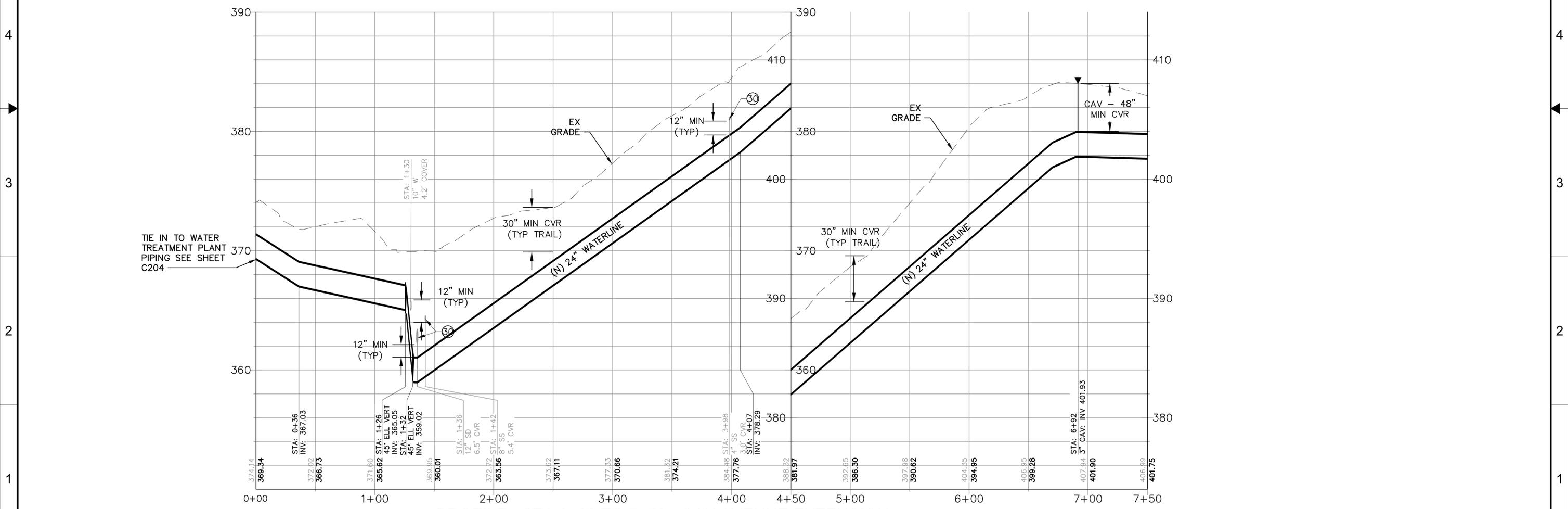
PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE  
C020 SHEET 21 OF 86  
DRAWING NUMBER



PLAN - STA 0+00 TO 7+50  
SCALE: 1" = 40'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ③ INSTALL 24" - 45° ELBOW
  - ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑰ RESTORE EXISTING AC TRAIL PER DET 5/C011.
  - ⑳ CONSTRUCT WATER MAIN CROSSING PER CITY OF FOLSOM STD WR-22. SEE DET 1/C013

- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.



PROFILE - STA 0+00 TO 7+50 - OAK AVENUE EXTENSION  
HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

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**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

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DATE: 6/3/24

DESIGN BY: CML/KFF/MAF  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

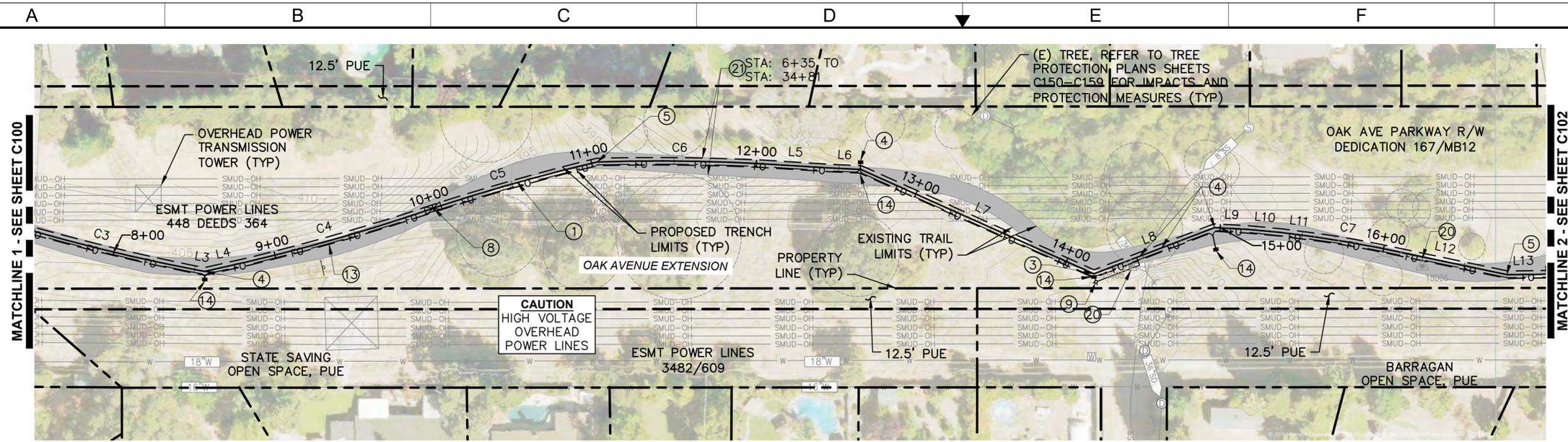
CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

PLAN & PROFILE  
STA 0+00 TO 7+50  
OAK AVENUE EXTENSION

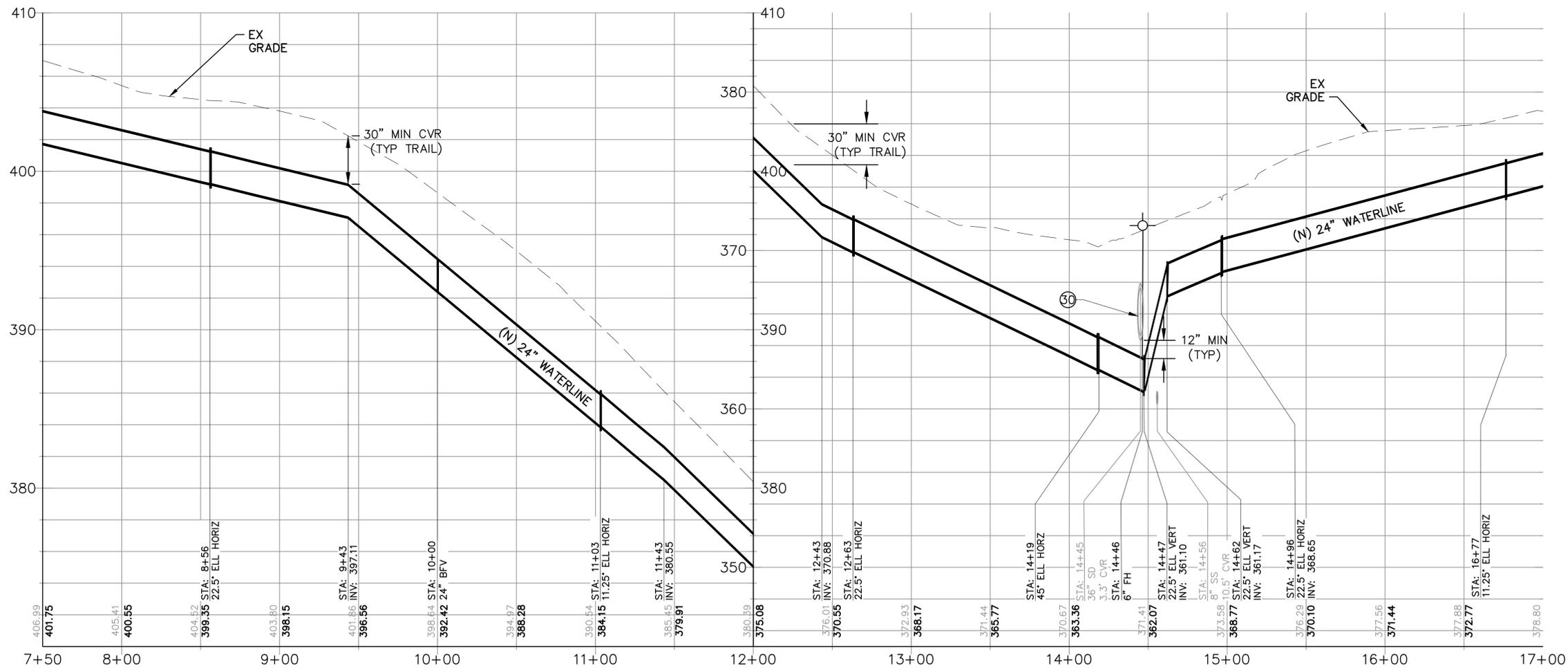
PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C100** SHEET 22 OF 86

DRAWING NUMBER



**PLAN - STA 7+50 TO 17+00**  
SCALE: 1" = 40'-0"



**PROFILE - STA 7+50 TO 17+00 - OAK AVENUE EXTENSION**  
HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ③ INSTALL 24" - 45° ELBOW
  - ④ INSTALL 24" - 22.5° ELBOW
  - ⑤ INSTALL 24" - 11.25° ELBOW
  - ⑧ INSTALL 24" BFV
  - ⑨ INSTALL FH PER CITY OF FOLSOM STD WR-08. SEE DET 1/C010
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑯ RESTORE MONUMENT PER CITY OF FOLSOM STD RD-23. SEE DET 3/C011
  - ⑰ RESTORE EXISTING AC TRAIL PER DET 5/C011.
  - ⑳ CONSTRUCT WATER MAIN CROSSING PER CITY OF FOLSOM STD WR-22. SEE DET 1/C013

- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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FOLSOM, CA 95630

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DATE: 6/3/24

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PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

**CITY OF FOLSOM**  
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FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

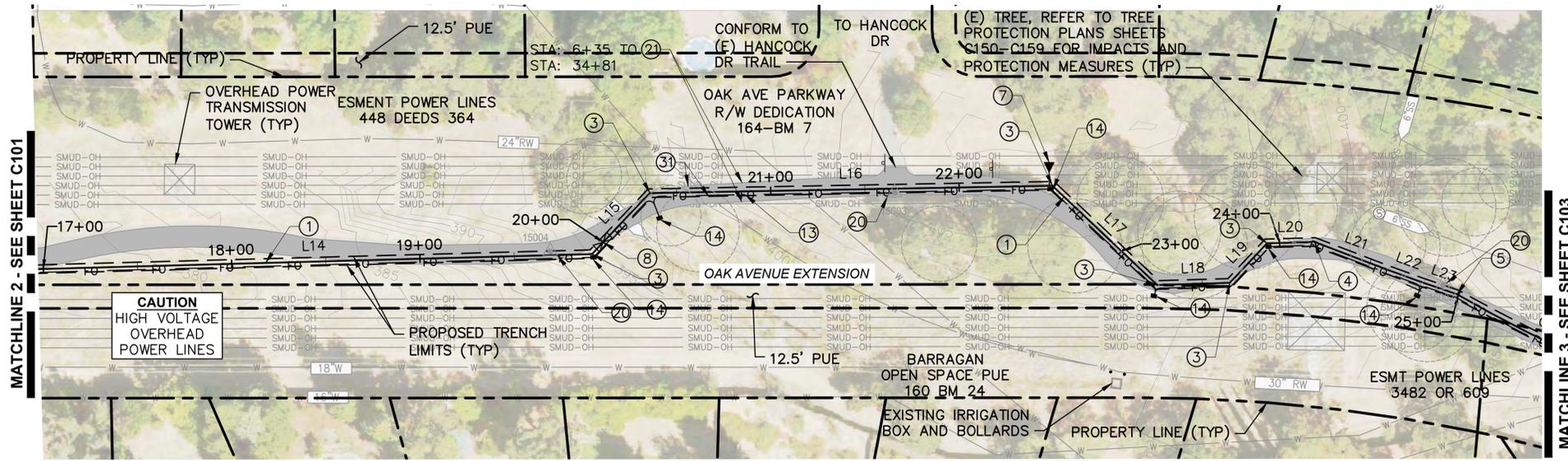
PLAN & PROFILE  
STA 7+50 TO 17+00  
OAK AVENUE EXTENSION

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C101**

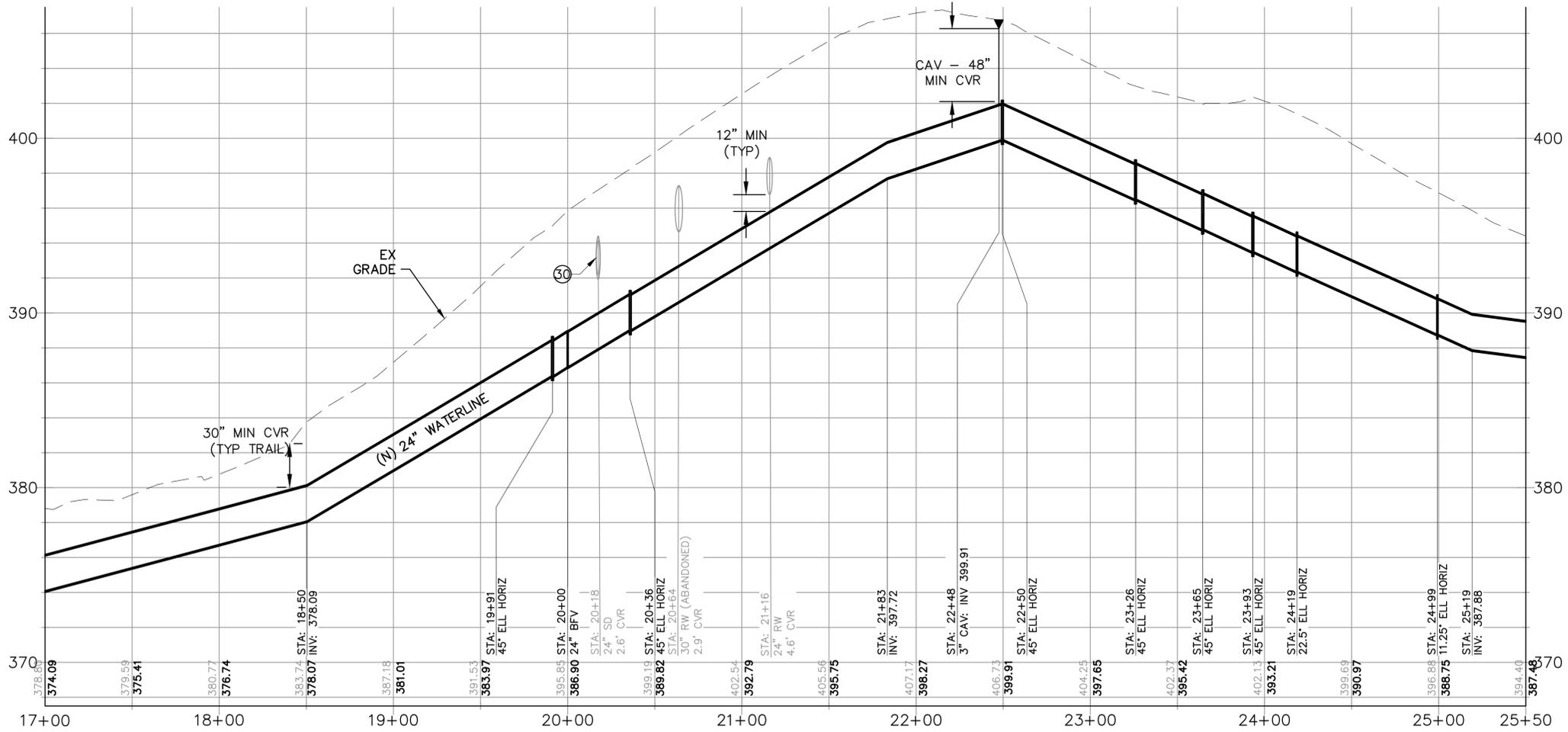
SHEET  
23 OF 86

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
6/3/2024



PLAN - STA 17+00 TO 25+50

SCALE: 1" = 40'-0"



PROFILE - STA 17+00 TO 25+50 - OAK AVENUE EXTENSION

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

CONSTRUCTION NOTES

- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
- ③ INSTALL 24" - 45° ELBOW
- ④ INSTALL 24" - 22.5° ELBOW
- ⑤ INSTALL 24" - 11.25° ELBOW
- ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
- ⑧ INSTALL 24" BFV
- ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
- ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
- ⑯ RESTORE MONUMENT PER CITY OF FOLSOM STD RD-23. SEE DET 3/C011
- ⑰ RESTORE EXISTING AC TRAIL PER DET 5/C011.
- ⑳ INSTALL 24"x24" CROSS. RELOCATE EXISTING 12" WATER PER DET 1/C019

NOTES

1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.



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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

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DATE: 6/3/24

DESIGN BY: CML/KFF/MAF  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

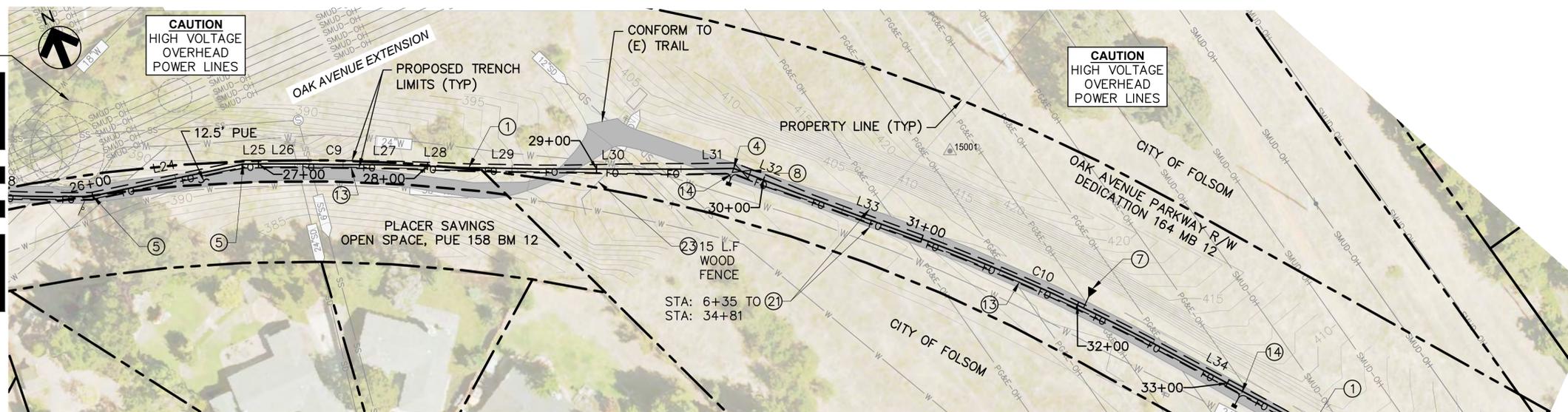
PLAN & PROFILE  
STA 17+00 TO 25+50  
OAK AVENUE EXTENSION



PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C102** SHEET 24 OF 86  
DRAWING NUMBER

(E) TREE, REFER TO TREE PROTECTION PLANS SHEETS C150-C159 FOR IMPACTS AND PROTECTION MEASURES (TYP)



PLAN - STA 25+50 TO 34+81

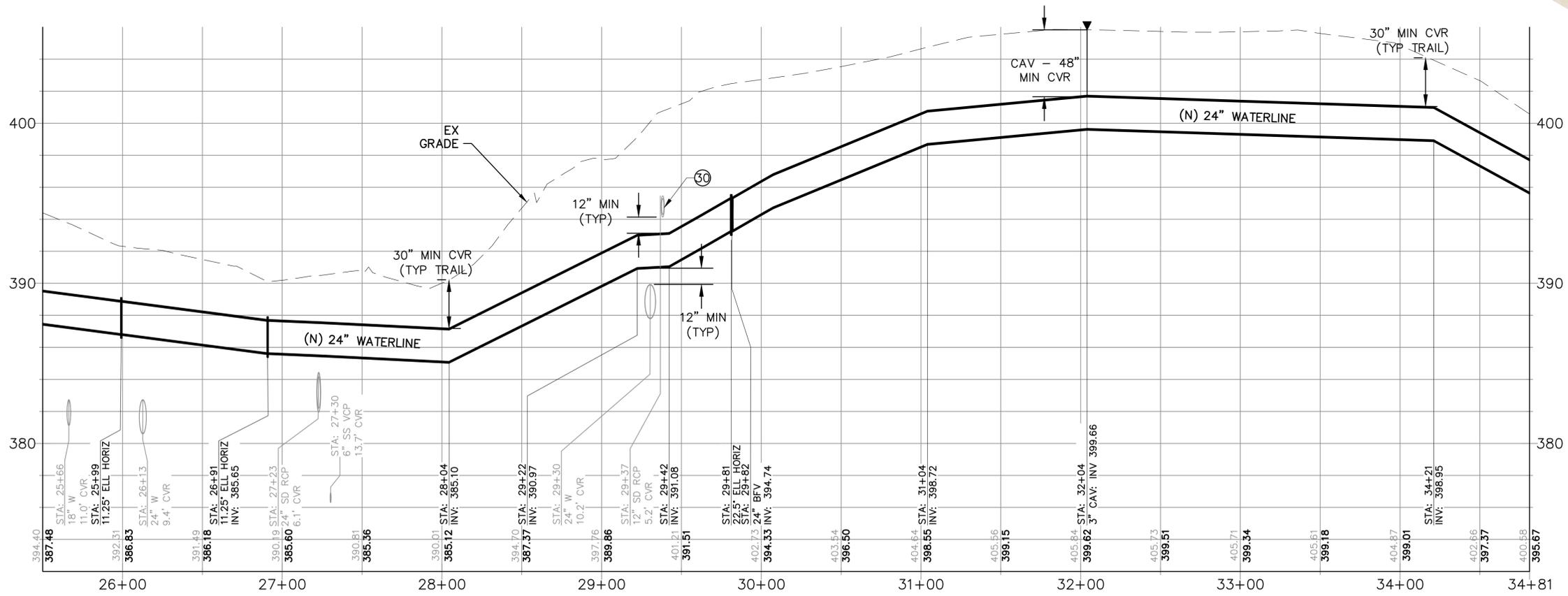
SCALE: 1" = 40'-0"

CONSTRUCTION NOTES

- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
- ④ INSTALL 24" - 22.5' ELBOW
- ⑤ INSTALL 24" - 11.25' ELBOW
- ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
- ⑧ INSTALL 24" BFFV
- ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
- ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
- ⑰ RESTORE EXISTING AC TRAIL PER DET 5/C011.
- ⑳ REPLACE EXISTING FENCE IN KIND.
- ㉑ CONSTRUCT WATER MAIN CROSSING PER CITY OF FOLSOM STD WR-22. SEE DET 1/C013

NOTES

- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.



PROFILE - STA 25+50 TO 34+81 - OAK AVENUE EXTENSION

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"



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CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

PLAN & PROFILE  
STA 25+50 TO 34+81  
OAK AVENUE EXTENSION



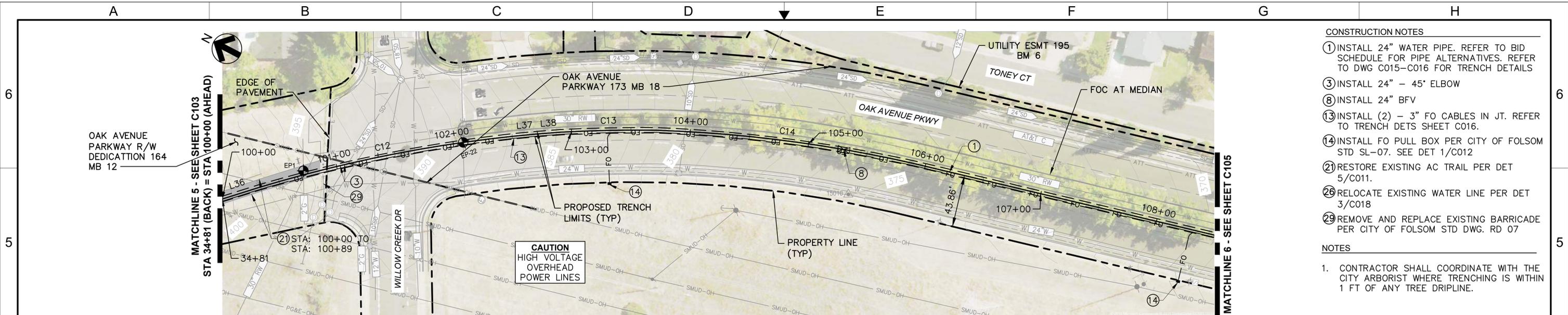
PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE  
C103  
SHEET 25 OF 86  
DRAWING NUMBER

REV	DESCRIPTION	DATE

DRAWN BY: KFF/AVW/MAF  
DATE: 6/3/24

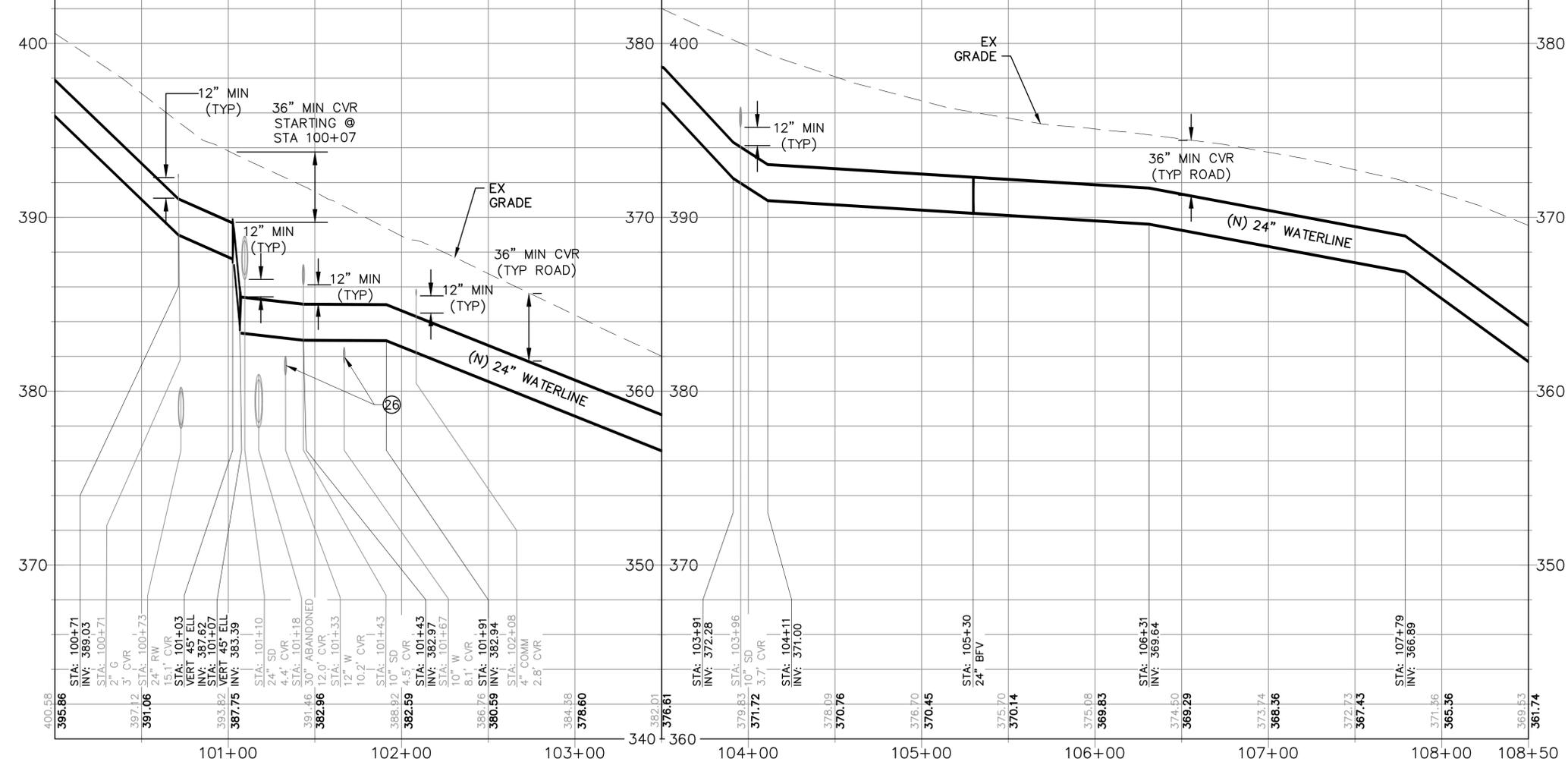
DESIGN BY: CML/KFF/MAF  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24



PLAN - STA 100+00 TO 108+50

SCALE: 1" = 40'-0"



PROFILE - STA 100+00 TO 108+50 - OAK AVENUE PKWY

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

CONSTRUCTION NOTES

- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
- ③ INSTALL 24" - 45' ELBOW
- ⑧ INSTALL 24" BFV
- ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
- ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
- ⑰ RESTORE EXISTING AC TRAIL PER DET 5/C011.
- ⑳ RELOCATE EXISTING WATER LINE PER DET 3/C018
- ㉑ REMOVE AND REPLACE EXISTING BARRICADE PER CITY OF FOLSOM STD DWG. RD 07

NOTES

- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
 50 NATOMAS STREET  
 FOLSOM, CA 95630

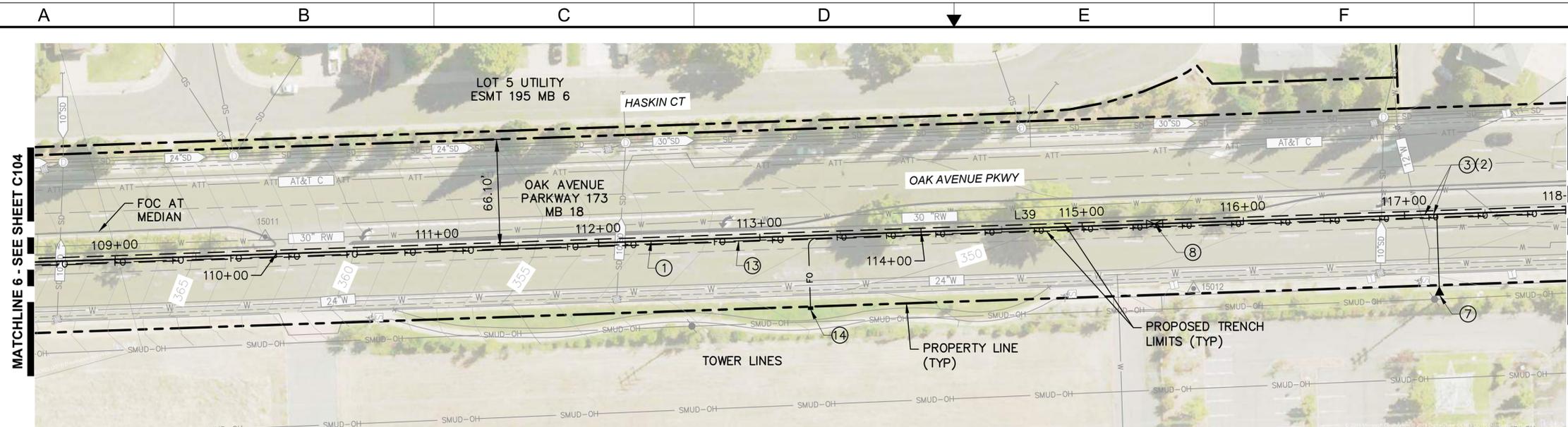
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 100+00 TO 108+50  
 OAK AVENUE PKWY

REGISTERED PROFESSIONAL ENGINEER  
 CIVIL  
 STATE OF CALIFORNIA  
 C59049  
 5/3/2024

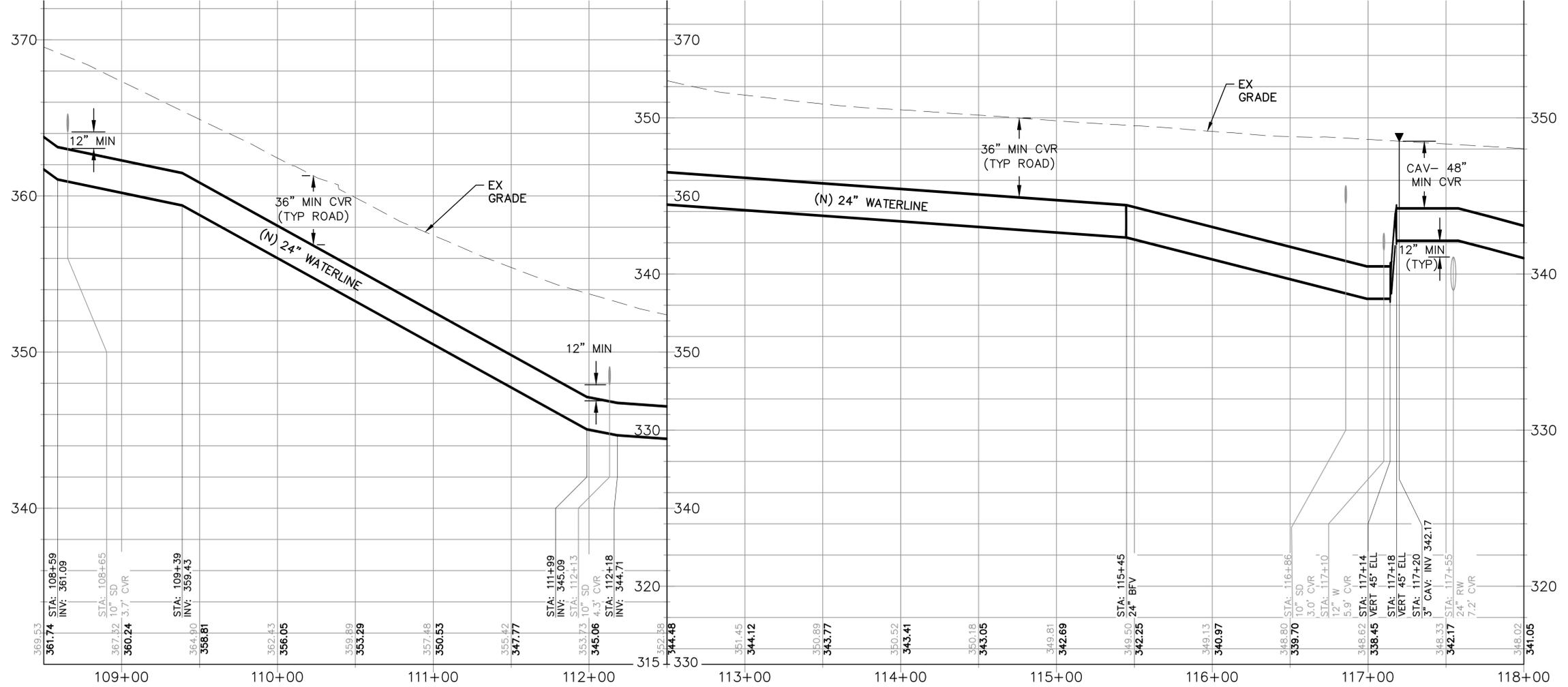
PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE  
**C104**  
 SHEET 26 OF 86

DRAWN BY: KFF/KFF/AVW DATE: 6/3/24	DESIGN BY: CML/KFF PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C66059 DATE: 6/3/24
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PLAN - STA 108+50 TO 118+00

SCALE: 1" = 40'-0"



PROFILE - STA 108+50 TO 118+00 - OAK AVENUE PKWY

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ③ INSTALL 24" - 45° ELBOW
  - ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
  - ⑧ INSTALL 24" BFV
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012

- NOTES
- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
 DISTINCTIVE BY NATURE

DRAWN BY: KFF/AVW  
 DATE: 6/3/24

CITY OF FOLSOM  
 50 NATOMAS STREET  
 FOLSOM, CA 95630

DESIGN BY: CML/KFF  
 PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
 PCE: C66059 DATE: 6/3/24

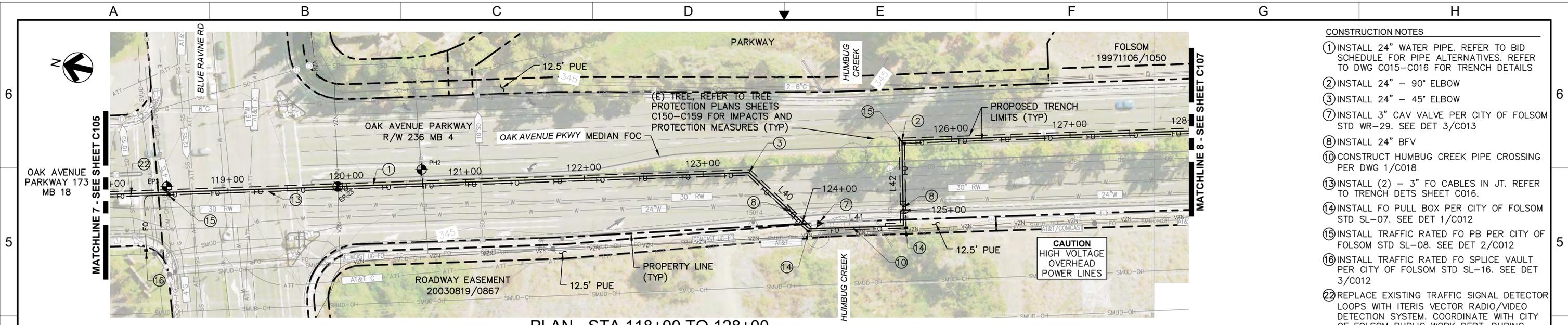
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA108+50 TO 118+00  
 OAK AVENUE PKWY

PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE

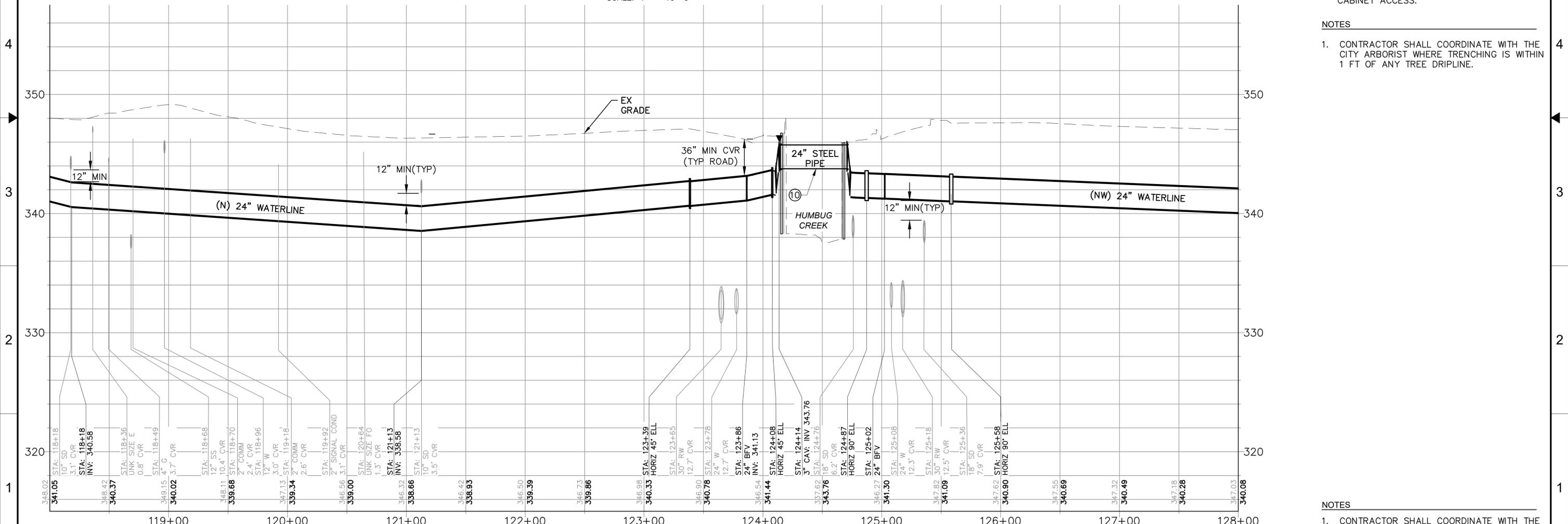
**C105** SHEET 27 OF 86

REGISTERED PROFESSIONAL ENGINEER  
 CIVIL  
 STATE OF CALIFORNIA  
 C59049  
 5/3/2024



**PLAN - STA 118+00 TO 128+00**

SCALE: 1" = 40'-0"



**PROFILE - STA 118+00 TO 128+00 - OAK AVENUE PKWY**

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

**CONSTRUCTION NOTES**

- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
- ② INSTALL 24" - 90° ELBOW
- ③ INSTALL 24" - 45° ELBOW
- ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
- ⑧ INSTALL 24" BFV
- ⑩ CONSTRUCT HUMBUG CREEK PIPE CROSSING PER DWG 1/C018
- ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
- ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
- ⑮ INSTALL TRAFFIC RATED FO PB PER CITY OF FOLSOM STD SL-08. SEE DET 2/C012
- ⑯ INSTALL TRAFFIC RATED FO SPLICE VAULT PER CITY OF FOLSOM STD SL-16. SEE DET 3/C012
- ⑳ REPLACE EXISTING TRAFFIC SIGNAL DETECTOR LOOPS WITH ITERIS VECTOR RADIO/VIDEO DETECTION SYSTEM. COORDINATE WITH CITY OF FOLSOM PUBLIC WORK DEPT. DURING CONSTRUCTION FOR SIGNAL OPERATION AND CABINET ACCESS.

**NOTES**

1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
 50 NATOMAS STREET  
 FOLSOM, CA 95630

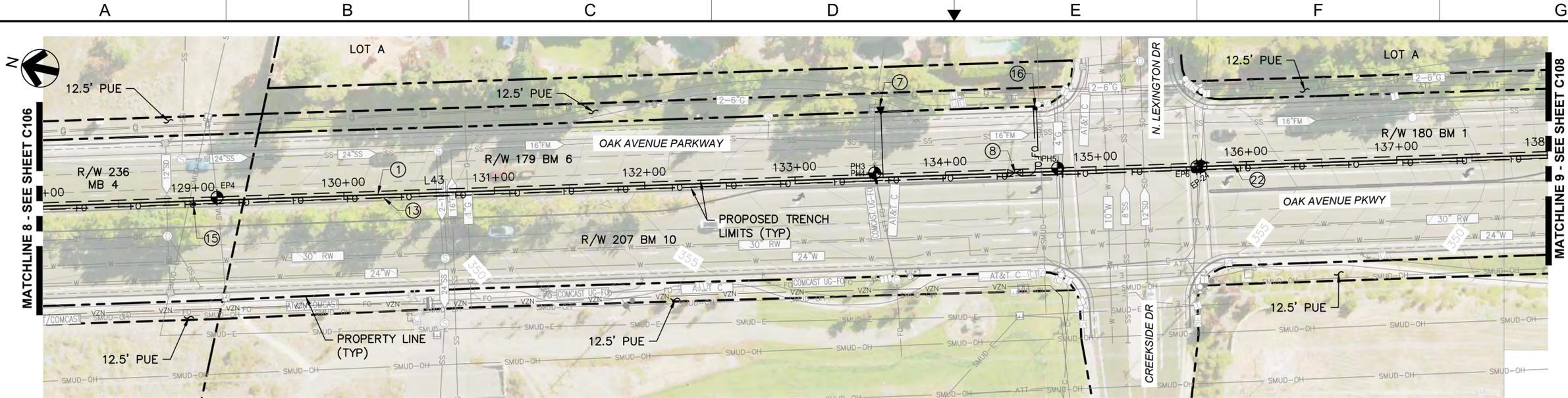
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 118+00 TO 128+00  
 OAK AVENUE PKWY

DRAWN BY: KFF/AVW DATE: 6/3/24	DESIGN BY: CML/KFF PCE: C59049 DATE: 6/3/24	CHECKED BY: CML PCE: C66059 DATE: 6/3/24
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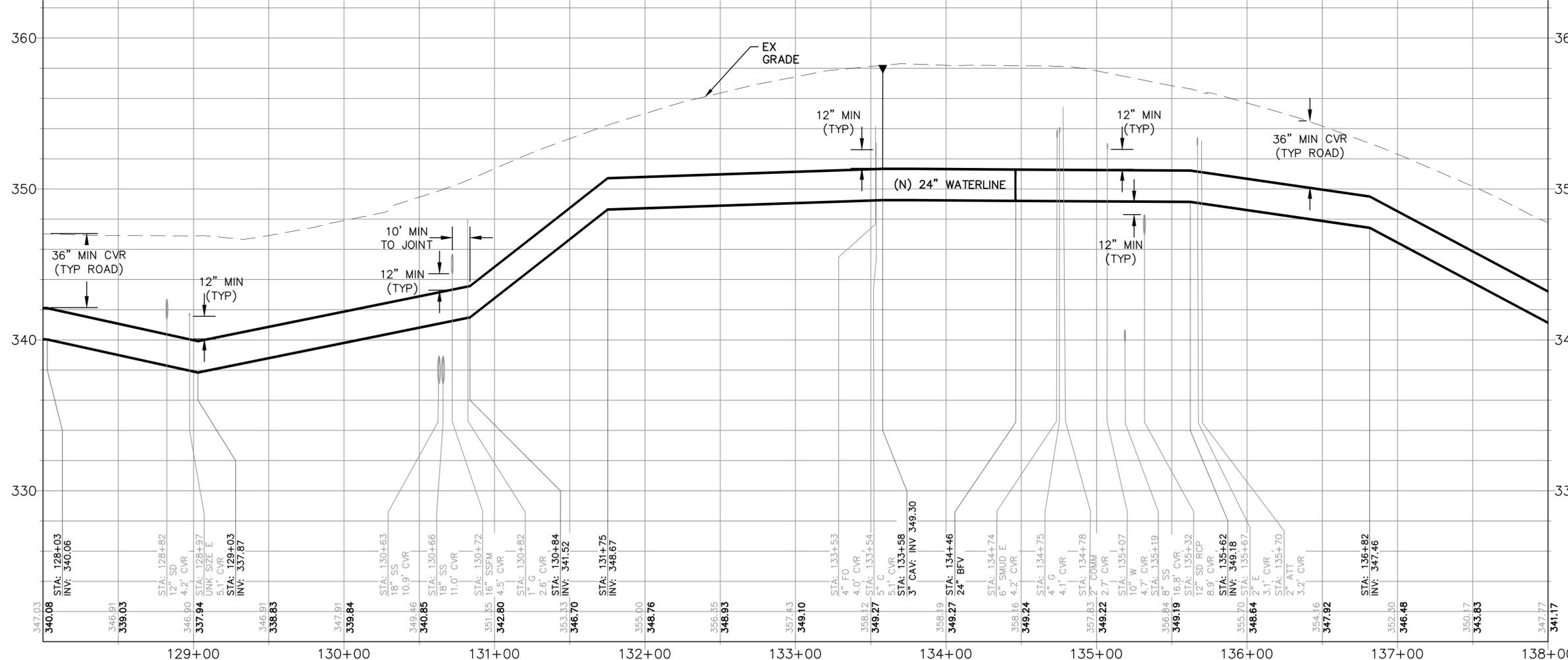
**REGISTERED PROFESSIONAL ENGINEER**  
 CIVIL  
 STATE OF CALIFORNIA  
 C59049  
 5/3/2024

PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE  
**C106**  
 SHEET 28 OF 86



PLAN - STA 128+00 TO 138+00

SCALE: 1" = 40'-0"



PROFILE - STA 128+00 TO 138+00 - OAK AVENUE PKWY

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

CONSTRUCTION NOTES

- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
- ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
- ⑧ INSTALL 24" BFV
- ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
- ⑮ INSTALL TRAFFIC RATED FO PB PER CITY OF FOLSOM STD SL-08. SEE DET 2/C012
- INSTALL TRAFFIC RATED FO SPLICE VAULT PER CITY OF FOLSOM STD SL-16. SEE DET 3/C012
- ⑳ REPLACE EXISTING TRAFFIC SIGNAL DETECTOR LOOPS WITH ITERIS VECTOR RADIO/VIDEO DETECTION SYSTEM. COORDINATE WITH CITY OF FOLSOM PUBLIC WORK DEPT. DURING CONSTRUCTION FOR SIGNAL OPERATION AND CABINET ACCESS.

NOTES

- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 BERKELEY, CA 94710  
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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
 50 NATOMAS STREET  
 FOLSOM, CA 95630

DESIGN BY: CML/KFF  
 PCE: C59049 DATE: 6/3/24

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 PCE: C66059 DATE: 6/3/24

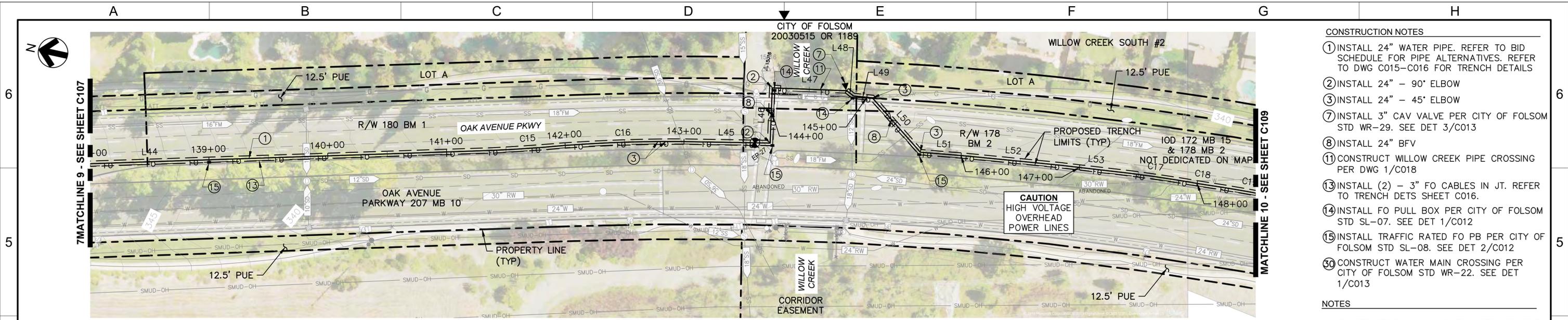
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 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 128+00 TO 138+00  
 OAK AVENUE PKWY

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 STATE OF CALIFORNIA  
 C59049

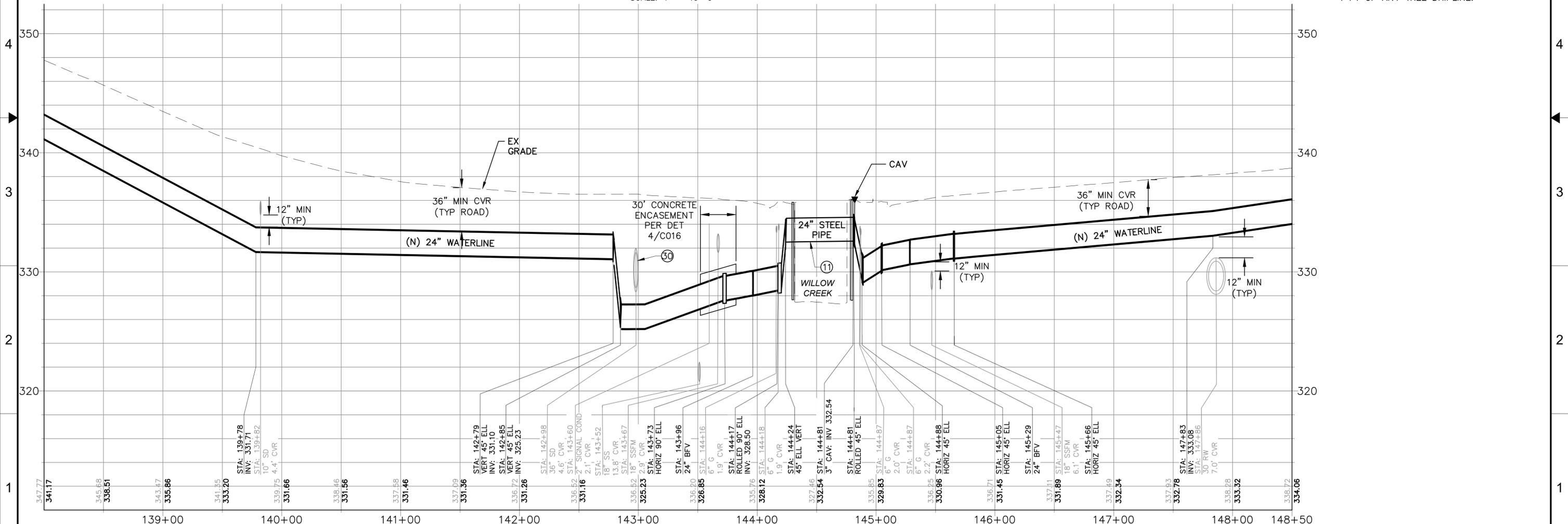
PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE

C107  
 SHEET 29 OF 86



**PLAN - STA 138+00 TO 148+50**  
SCALE: 1" = 40'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ② INSTALL 24" - 90° ELBOW
  - ③ INSTALL 24" - 45° ELBOW
  - ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
  - ⑧ INSTALL 24" BFV
  - ⑪ CONSTRUCT WILLOW CREEK PIPE CROSSING PER DWG 1/C018
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑮ INSTALL TRAFFIC RATED FO PB PER CITY OF FOLSOM STD SL-08. SEE DET 2/C012
  - ⑳ CONSTRUCT WATER MAIN CROSSING PER CITY OF FOLSOM STD WR-22. SEE DET 1/C013
- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.



**PROFILE - STA 138+00 TO 148+50 - OAK AVENUE PKWY**  
HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

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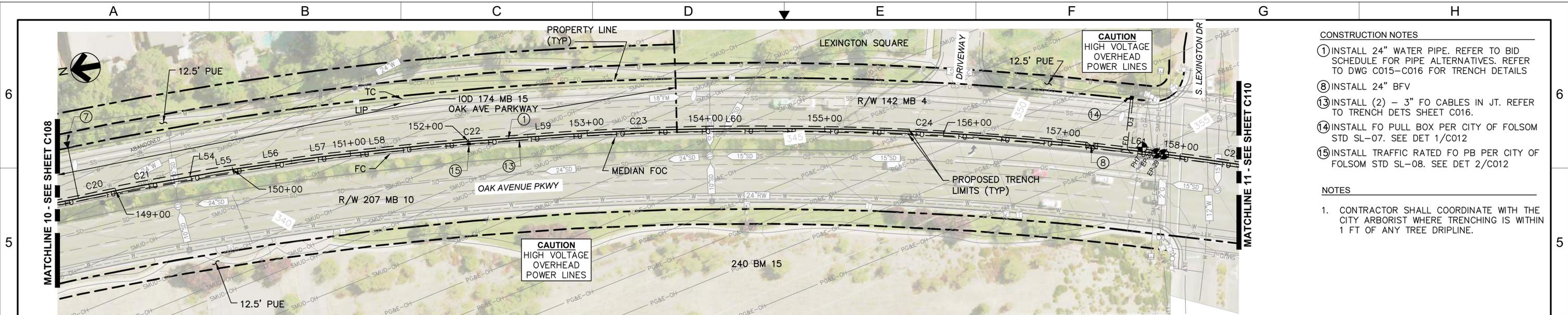
**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

PLAN & PROFILE  
STA 138+00 TO 148+50  
OAK AVENUE PKWY

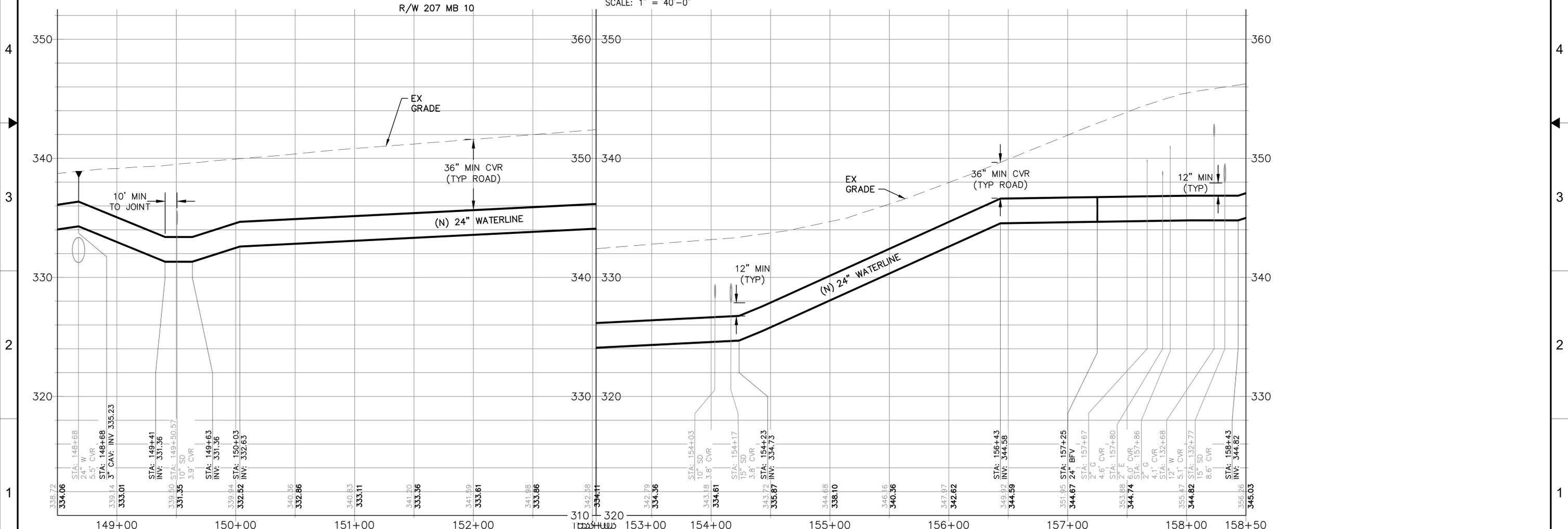
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STATE OF CALIFORNIA  
C59049  
5/3/2024

PAPER SIZE: 22x34 (ANSI D)  
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**C108**  
SHEET 30 OF 86



PLAN - STA 148+50 TO 158+50

SCALE: 1" = 40'-0"



PROFILE - STA 148+50 TO 158+50 - OAK AVENUE PKWY

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ⑧ INSTALL 24" BFV
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑮ INSTALL TRAFFIC RATED FO PB PER CITY OF FOLSOM STD SL-08. SEE DET 2/C012

- NOTES**
- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 FOLSOM, CA 95630

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 TRANSMISSION PIPELINE  
 PROJECT

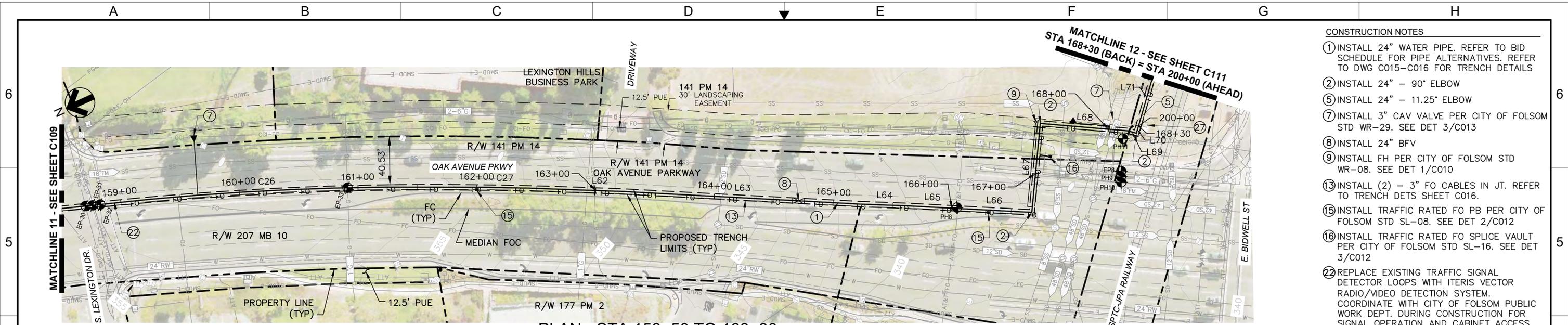
PLAN & PROFILE  
 STA 148+50 TO 158+50  
 OAK AVENUE PKWY

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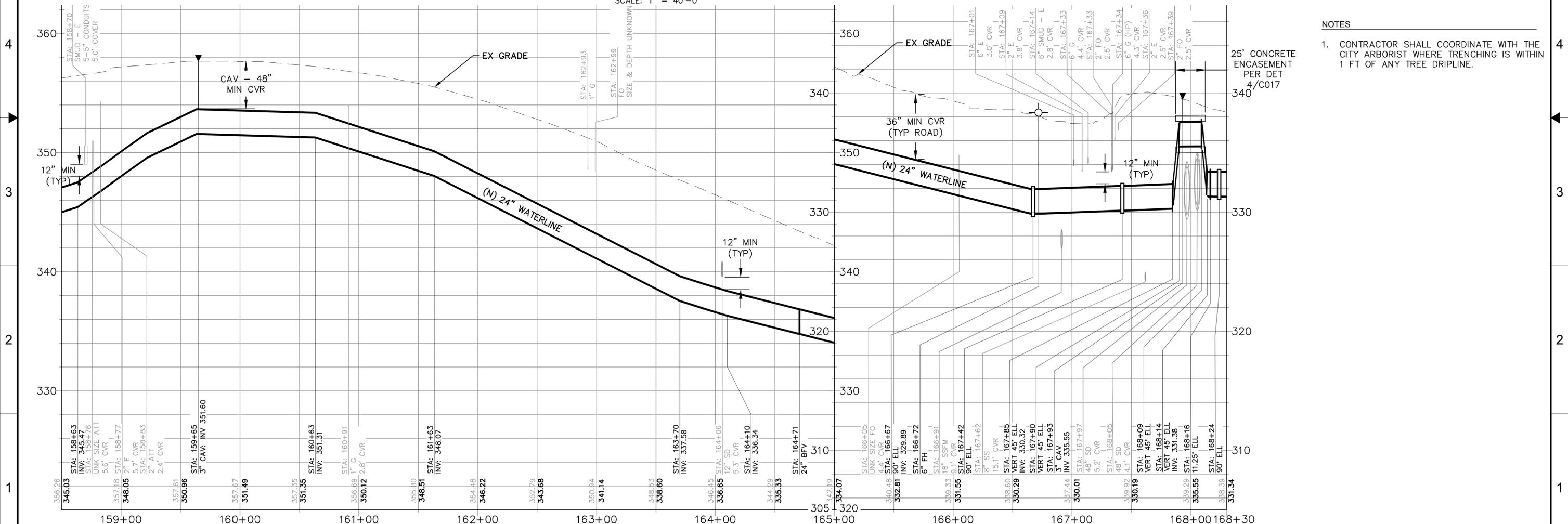
**C109** SHEET 31 OF 86

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 CIVIL  
 STATE OF CALIFORNIA  
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PLAN - STA 158+50 TO 168+30

SCALE: 1" = 40'-0"



PROFILE - STA 158+50 TO 168+30 - OAK AVENUE PKWY

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ② INSTALL 24" - 90° ELBOW
  - ⑤ INSTALL 24" - 11.25° ELBOW
  - ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
  - ⑧ INSTALL 24" BFV
  - ⑨ INSTALL FH PER CITY OF FOLSOM STD WR-08. SEE DET 1/C010
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑮ INSTALL TRAFFIC RATED FO PB PER CITY OF FOLSOM STD SL-08. SEE DET 2/C012
  - ⑯ INSTALL TRAFFIC RATED FO SPlice VAULT PER CITY OF FOLSOM STD SL-16. SEE DET 3/C012
  - ⑰ REPLACE EXISTING TRAFFIC SIGNAL DETECTOR LOOPS WITH ITERIS VECTOR RADIO/VIDEO DETECTION SYSTEM. COORDINATE WITH CITY OF FOLSOM PUBLIC WORK DEPT. DURING CONSTRUCTION FOR SIGNAL OPERATION AND CABINET ACCESS.
  - ⑳ REMOVE EXISTING CONCRETE STRUCTURE

- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 FOLSOM, CA 95630

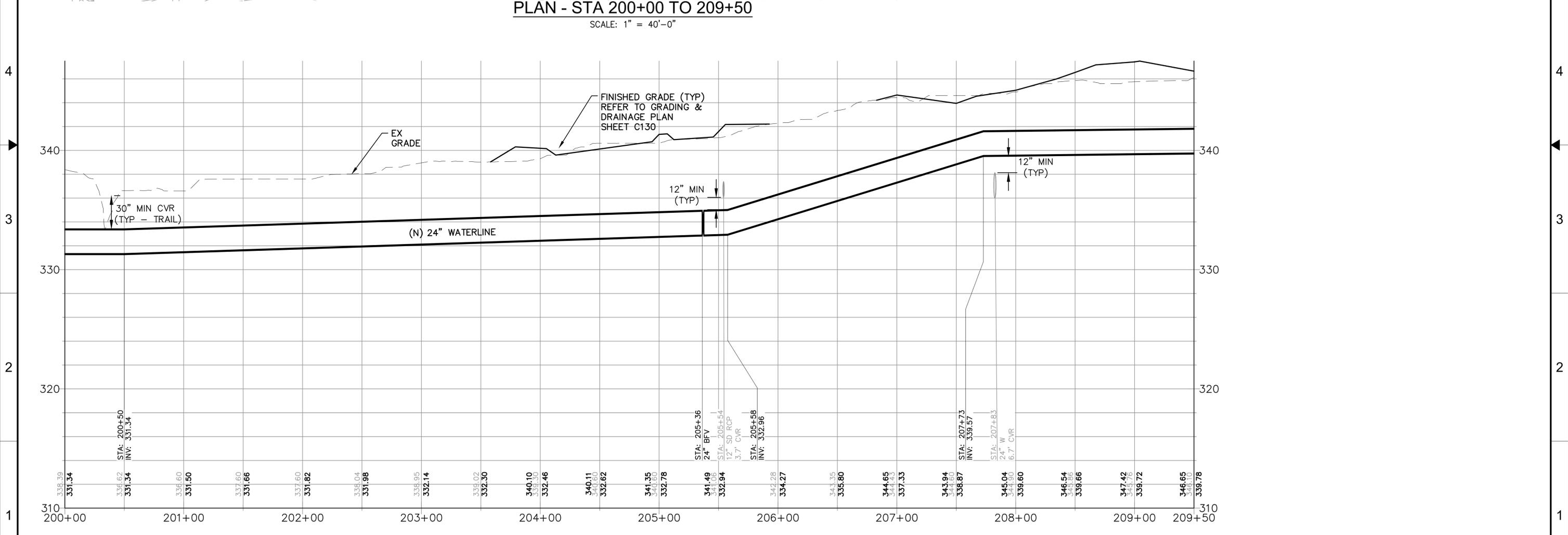
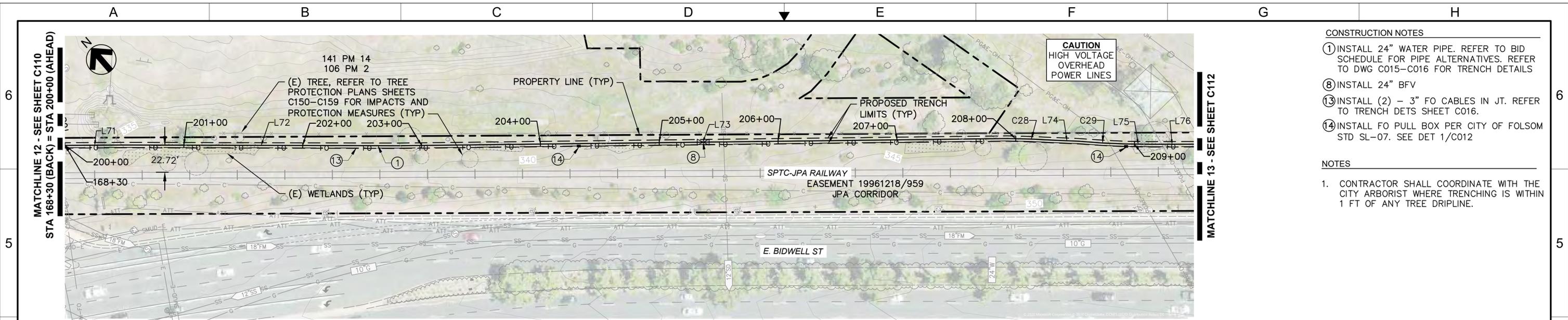
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 158+50 TO 168+30  
 OAK AVENUE PKWY

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**C110**  
 SHEET 32 OF 86

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- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ⑧ INSTALL 24" BFV
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
- NOTES**
- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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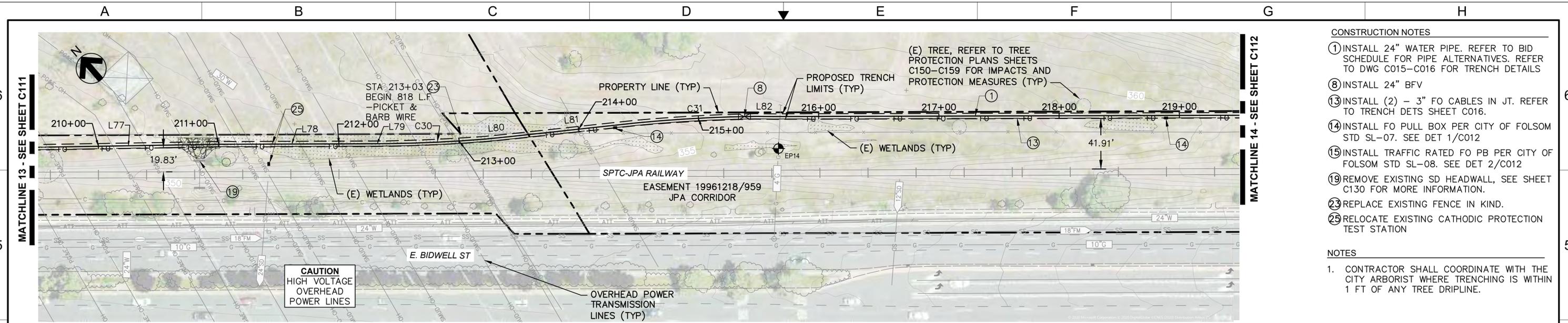
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CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

PLAN & PROFILE  
STA 200+00 TO 209+50  
E. BIDWELL ST

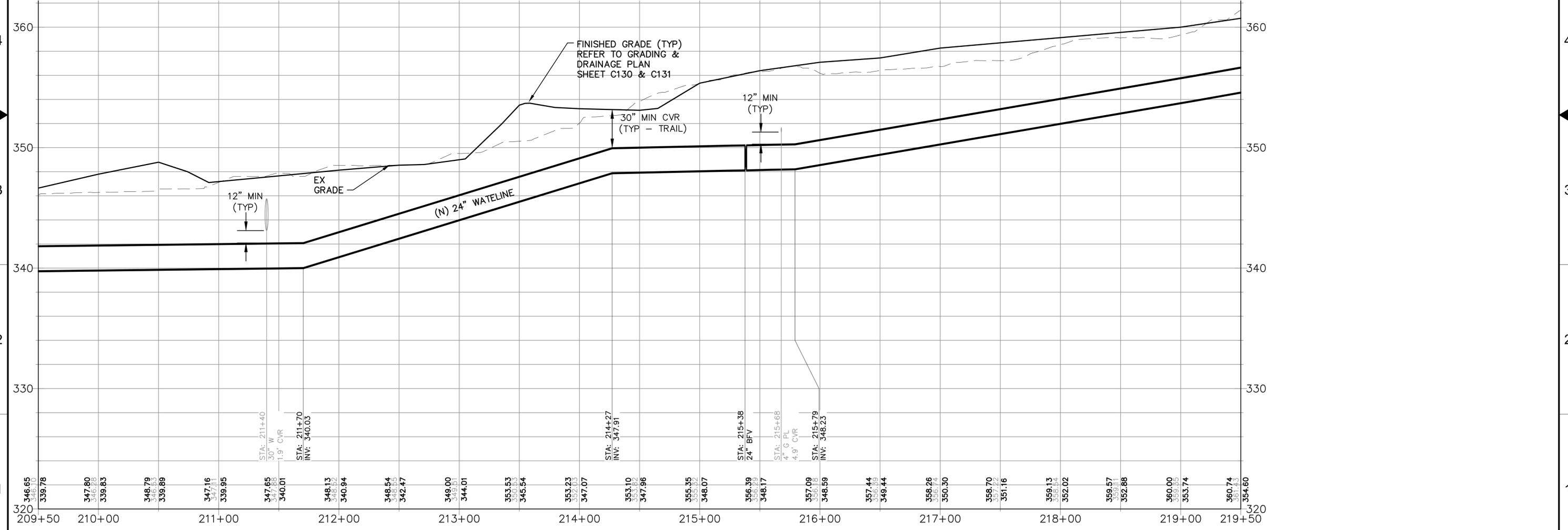
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THIS BAR IS 1 INCH AT FULL SCALE

**C111** SHEET 33 OF 86  
DRAWING NUMBER



PLAN - STA 209+50 TO 219+50

SCALE: 1" = 40'-0"



PROFILE - STA 209+50 TO 219+50 - E. BIDWELL ST

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ⑧ INSTALL 24" BFV
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑮ INSTALL TRAFFIC RATED FO PB PER CITY OF FOLSOM STD SL-08. SEE DET 2/C012
  - ⑲ REMOVE EXISTING SD HEADWALL, SEE SHEET C130 FOR MORE INFORMATION.
  - ⑳ REPLACE EXISTING FENCE IN KIND.
  - ㉑ RELOCATE EXISTING CATHODIC PROTECTION TEST STATION

- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 FOLSOM, CA 95630

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 TRANSMISSION PIPELINE  
 PROJECT

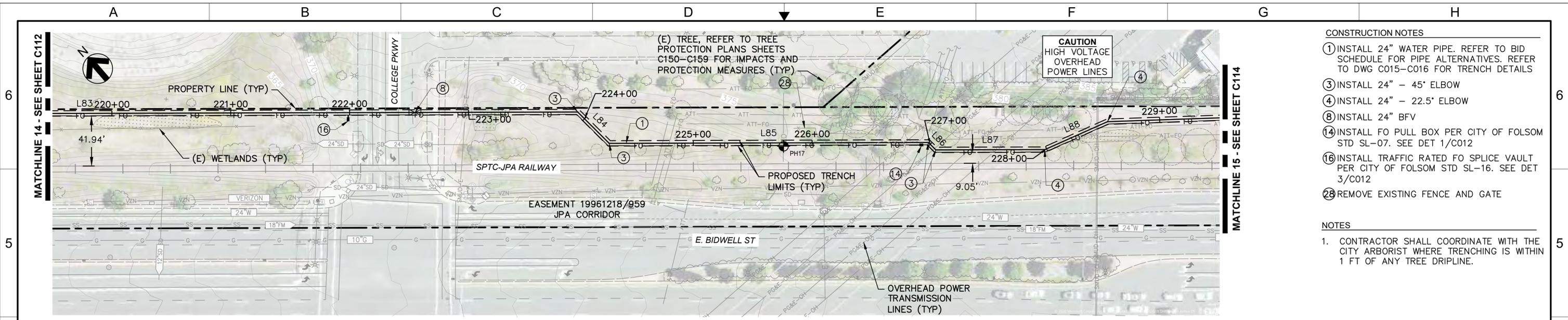
PLAN & PROFILE  
 STA 209+50 TO 219+50  
 E. BIDWELL ST

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 CIVIL  
 STATE OF CALIFORNIA  
 C59049  
 6/3/2024

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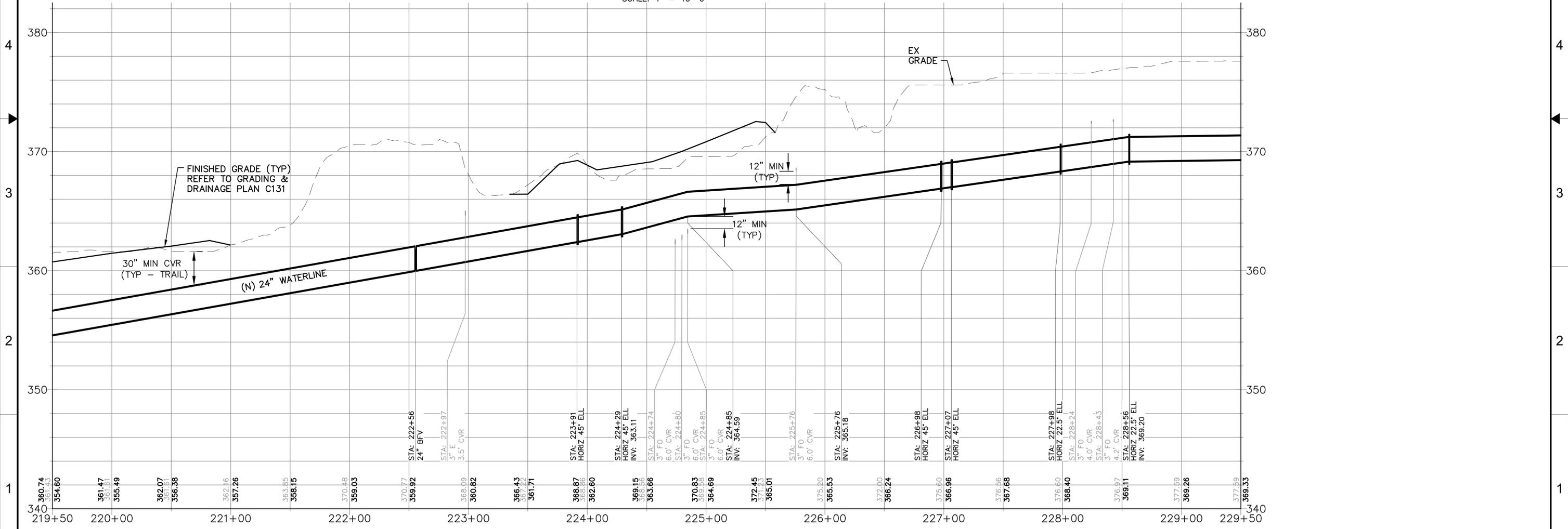
**C112**

SHEET  
 34 OF 86



PLAN - STA 219+50 TO 229+50

SCALE: 1" = 40'-0"



PROFILE - STA 219+50 TO 229+50 - E. BIDWELL ST

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ③ INSTALL 24" - 45° ELBOW
  - ④ INSTALL 24" - 22.5° ELBOW
  - ⑧ INSTALL 24" BFV
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑯ INSTALL TRAFFIC RATED FO SPLICE VAULT PER CITY OF FOLSOM STD SL-16. SEE DET 3/C012
  - ⑳ REMOVE EXISTING FENCE AND GATE

- NOTES**
- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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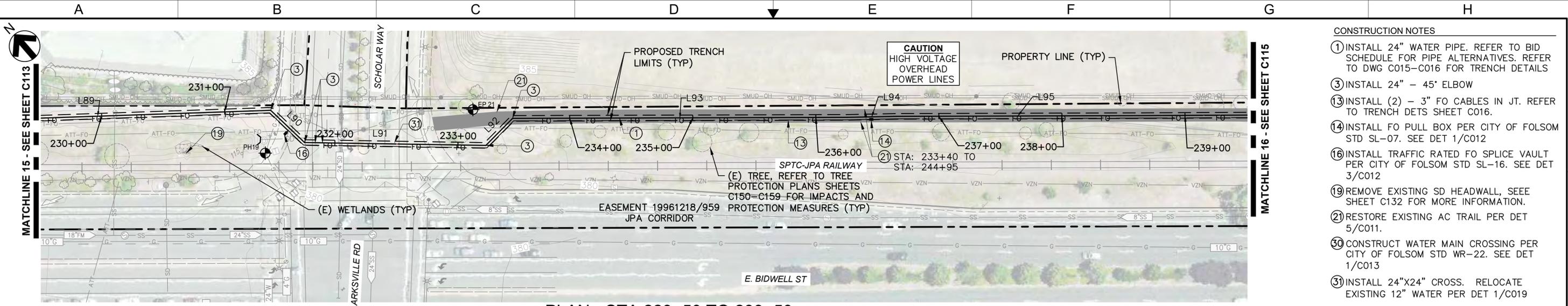
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 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 219+50 TO 229+50  
 E. BIDWELL ST

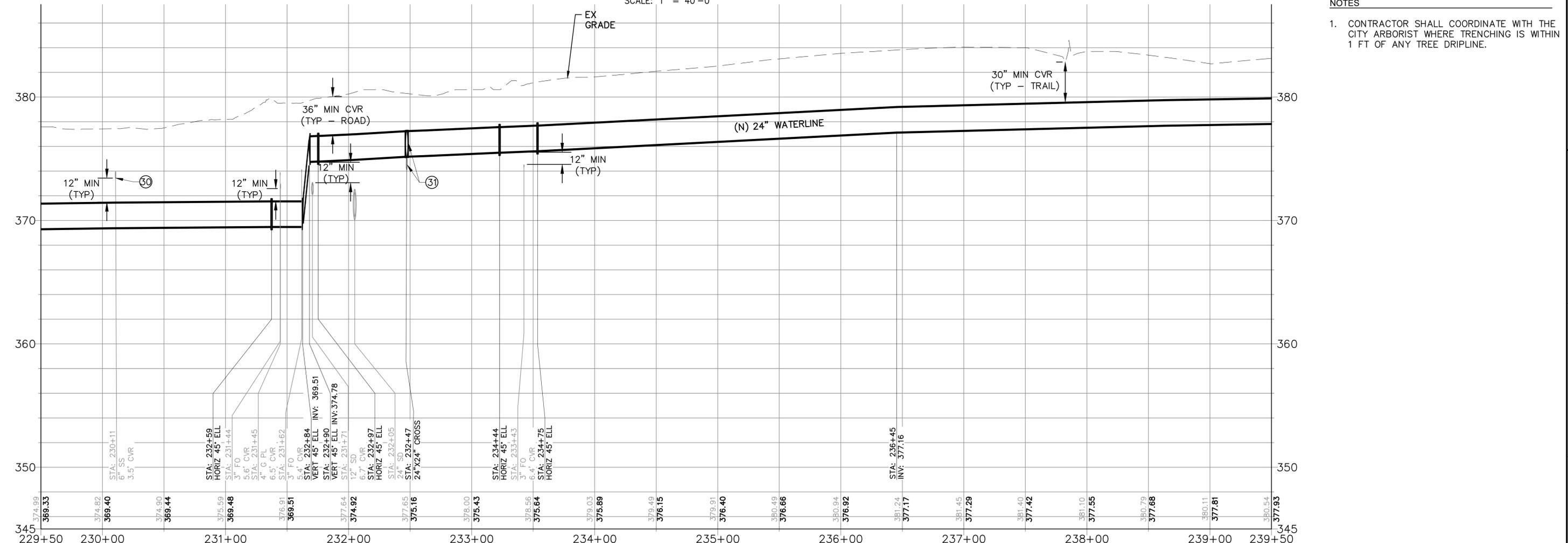
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 THIS BAR IS 1 INCH AT FULL SCALE

**C113** SHEET 35 OF 86  
 DRAWING NUMBER



**PLAN - STA 229+50 TO 239+50**

SCALE: 1" = 40'-0"



**PROFILE - STA 229+50 TO 239+50 - E. BIDWELL ST**

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ③ INSTALL 24" - 45° ELBOW
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑯ INSTALL TRAFFIC RATED FO SPLICE VAULT PER CITY OF FOLSOM STD SL-16. SEE DET 3/C012
  - ⑰ REMOVE EXISTING SD HEADWALL, SEEE SHEET C132 FOR MORE INFORMATION.
  - ⑱ RESTORE EXISTING AC TRAIL PER DET 5/C011.
  - ⑳ CONSTRUCT WATER MAIN CROSSING PER CITY OF FOLSOM STD WR-22. SEE DET 1/C013
  - ㉑ INSTALL 24"x24" CROSS. RELOCATE EXISTING 12" WATER PER DET 1/C019

- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 50 NATOMAS STREET  
 FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLANNING & DESIGN DIVISION

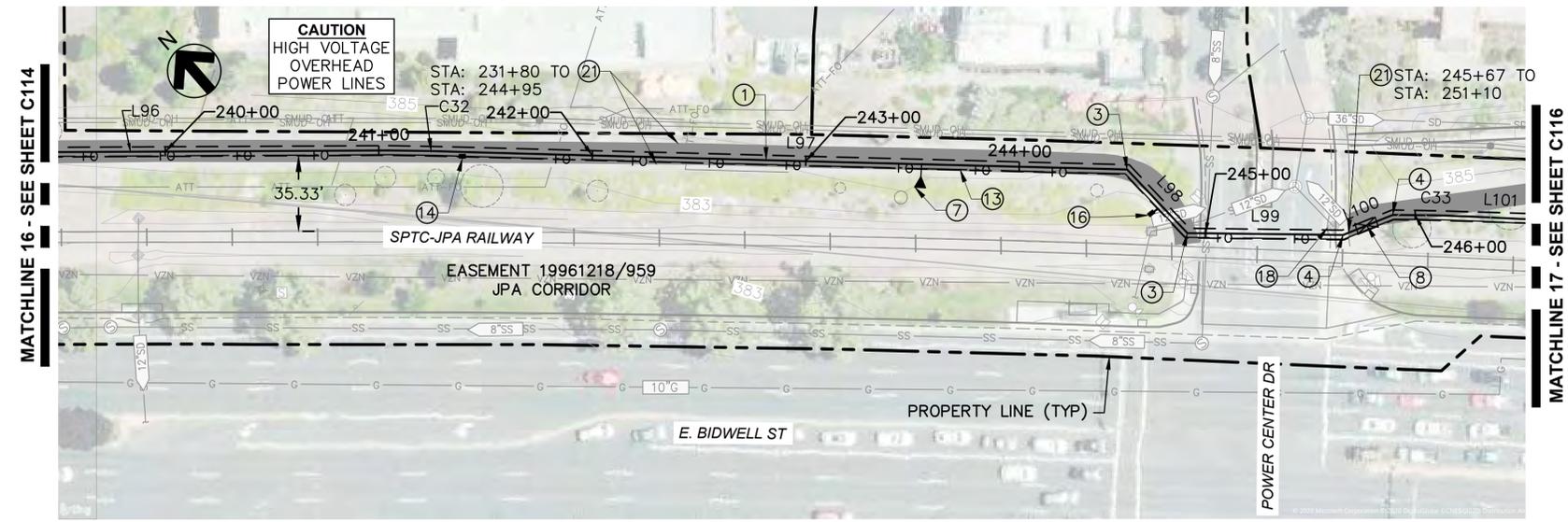
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 229+50 TO 239+50  
 E. BIDWELL ST

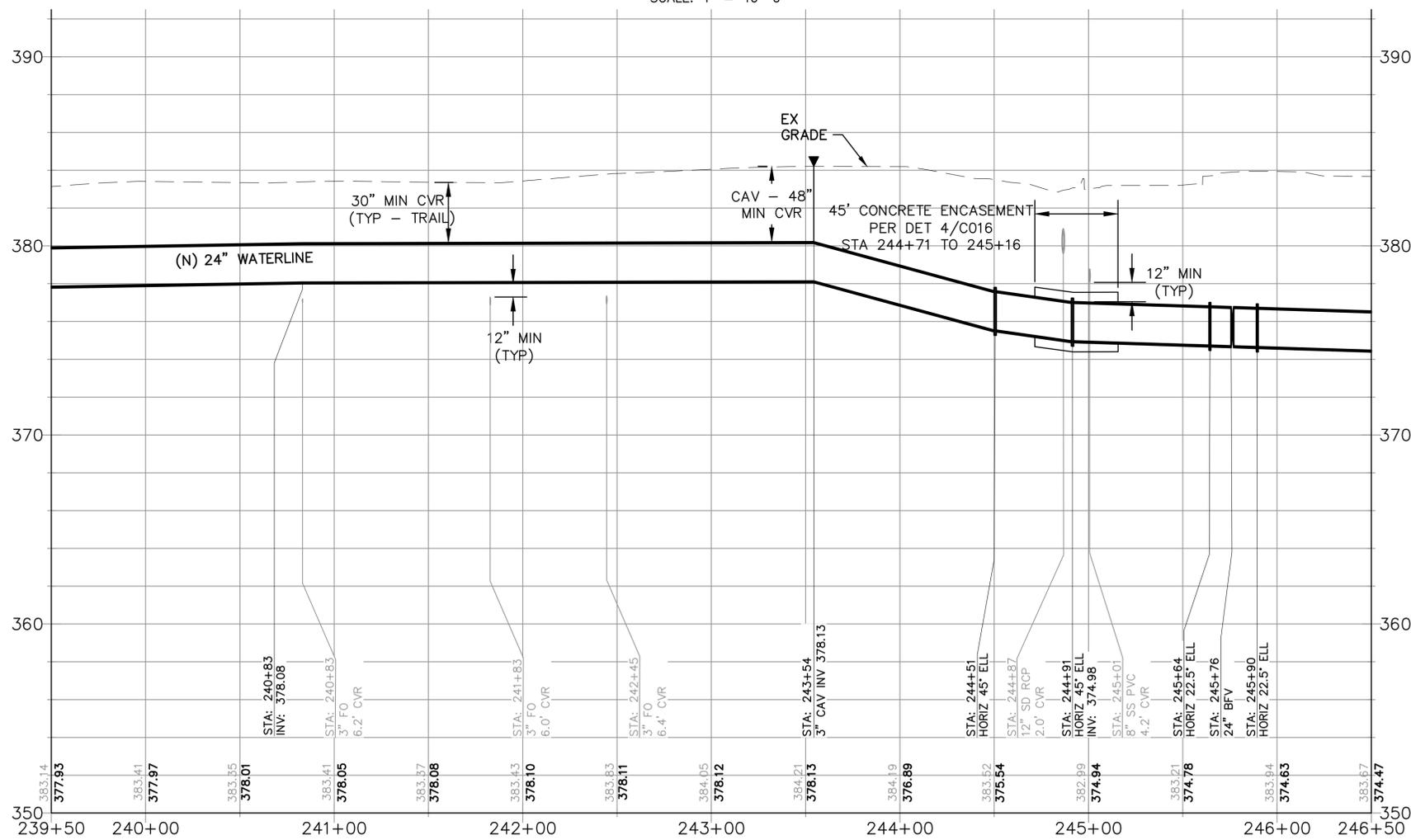
PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE

**C114** SHEET 36 OF 86

DRAWING NUMBER



**PLAN - STA 239+50 TO 246+50**  
SCALE: 1" = 40'-0"



**PROFILE - STA 239+50 TO 246+50 - E. BIDWELL ST**  
HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ③ INSTALL 24" - 45° ELBOW
  - ④ INSTALL 24" - 22.5° ELBOW
  - ⑦ INSTALL 3" CAV VALVE PER CITY OF FOLSOM STD WR-29. SEE DET 3/C013
  - ⑧ INSTALL 24" BFF
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑯ INSTALL TRAFFIC RATED FO SPLICE VAULT PER CITY OF FOLSOM STD SL-16. SEE DET 3/C012
  - ⑰ PROTECT IN PLACE EXISTING SD INLET
  - ⑱ RESTORE EXISTING AC TRAIL PER DET 5/C011.
- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

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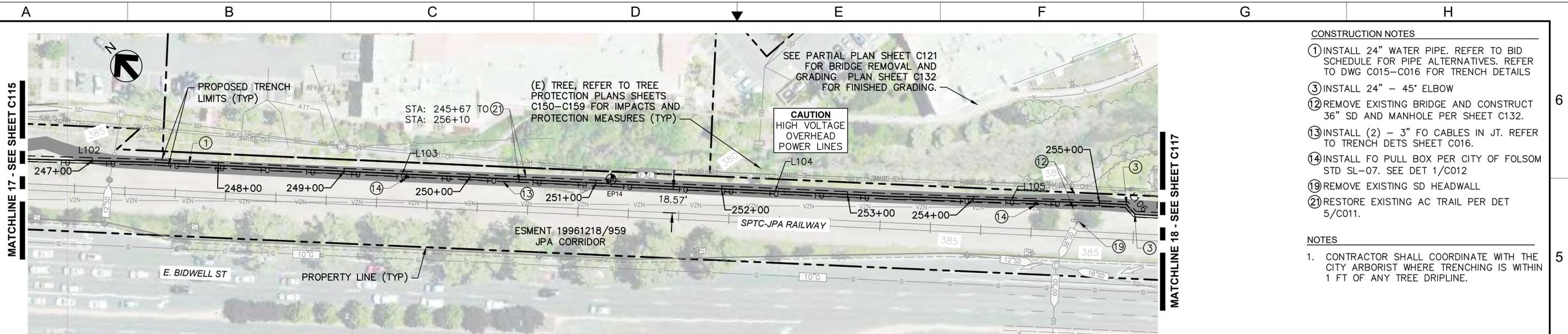
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**CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT**

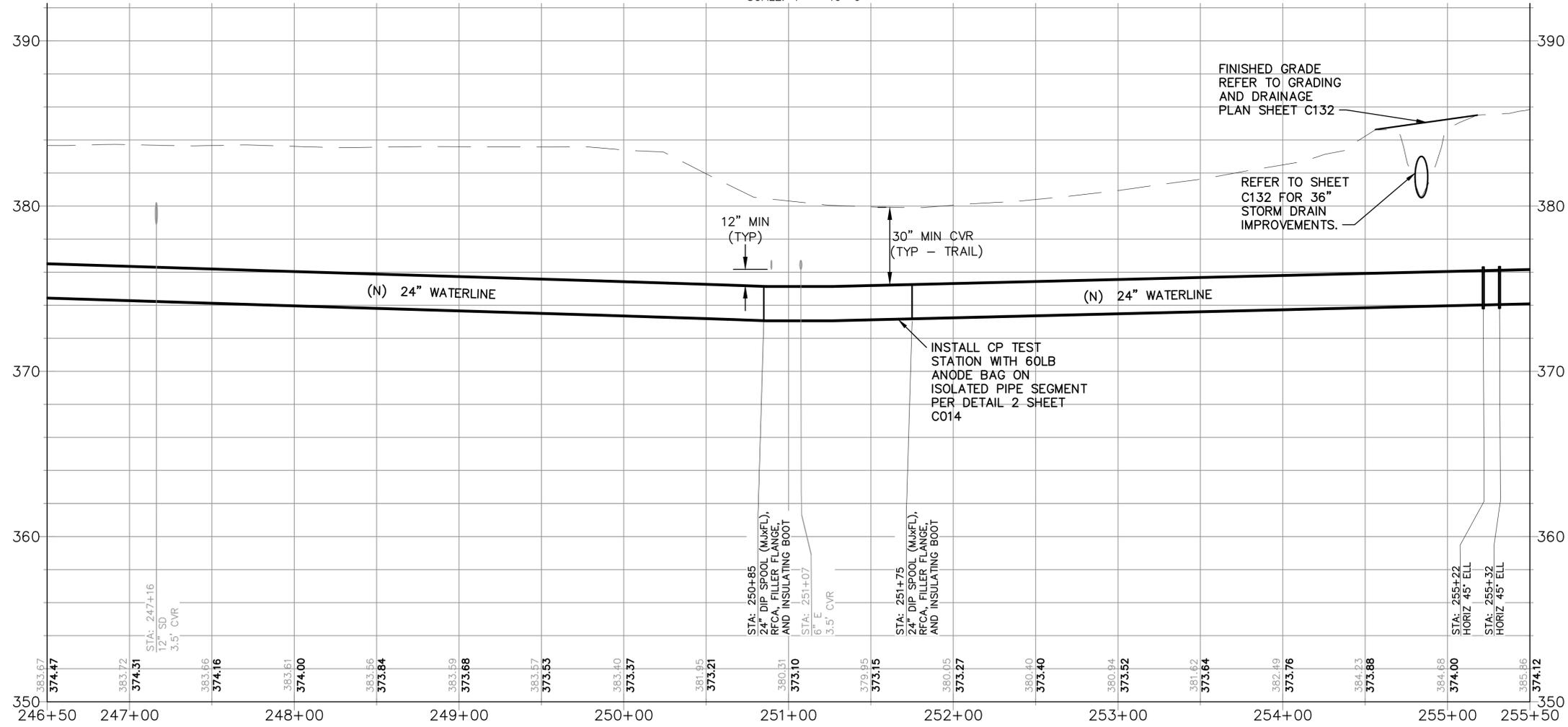
**PLAN & PROFILE  
STA 239+50 TO 246+50  
E. BIDWELL ST**

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C115** SHEET 37 OF 86  
DRAWING NUMBER



**PLAN - STA 246+50 TO 255+50**  
SCALE: 1" = 40'-0"



**PROFILE - STA 246+50 TO 255+50 - E. BIDWELL ST**  
HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ② REMOVE EXISTING BRIDGE AND CONSTRUCT 36" SD AND MANHOLE PER SHEET C132.
  - ③ INSTALL 24" - 45' ELBOW
  - ④ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑤ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑥ REMOVE EXISTING SD HEADWALL
  - ⑦ RESTORE EXISTING AC TRAIL PER DET 5/C011.

- NOTES**
1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

PLAN & PROFILE  
STA 246+50 TO 255+50  
E. BIDWELL ST

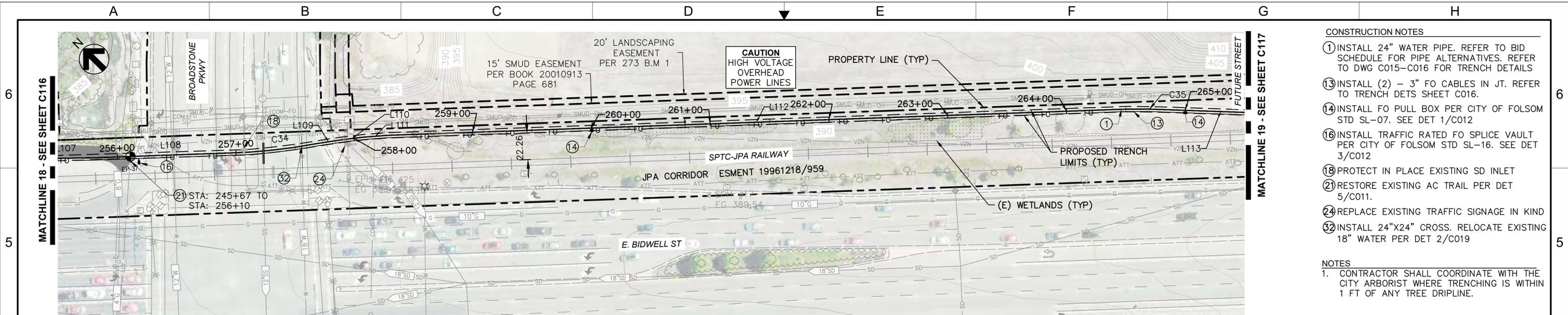
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C59049

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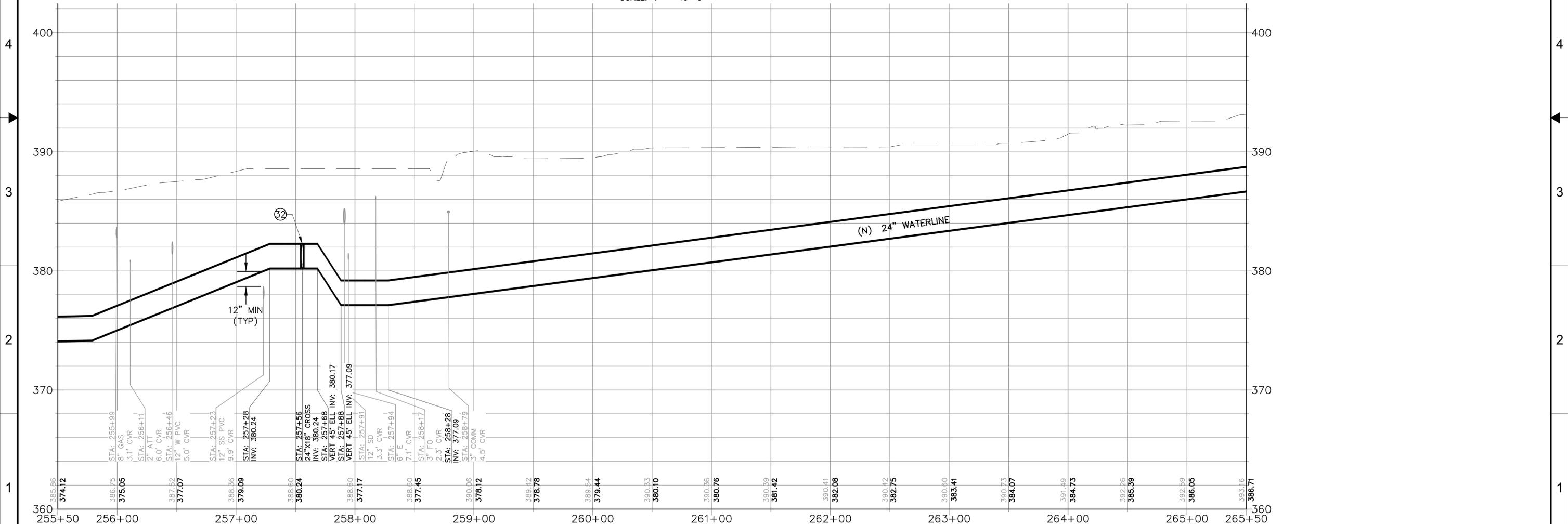
**C116**

SHEET  
38 OF 86



PLAN - STA 255+50 TO 265+50

SCALE: 1" = 40'-0"



PROFILE - STA 255+50 TO 265+50 - E. BIDWELL ST

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

CONSTRUCTION NOTES

- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
- ③ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
- ④ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
- ⑥ INSTALL TRAFFIC RATED FO SPLICE VAULT PER CITY OF FOLSOM STD SL-16. SEE DET 3/C012
- ⑧ PROTECT IN PLACE EXISTING SD INLET
- ⑩ RESTORE EXISTING AC TRAIL PER DET 5/C011.
- ⑫ REPLACE EXISTING TRAFFIC SIGNAGE IN KIND
- ⑭ INSTALL 24"x24" CROSS. RELOCATE EXISTING 18" WATER PER DET 2/C019

NOTES

- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
 50 NATOMAS STREET  
 FOLSOM, CA 95630

DRAWN BY: KFF/AVW  
 DATE: 6/3/24

DESIGN BY: CML/KFF  
 PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
 PCE: C59049 DATE: 6/3/24

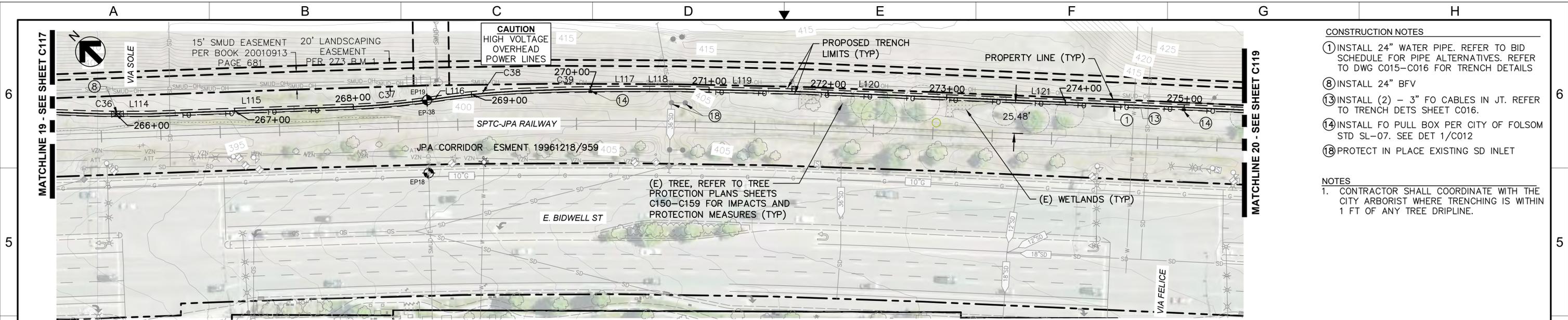
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 255+50 TO 265+50  
 E. BIDWELL ST



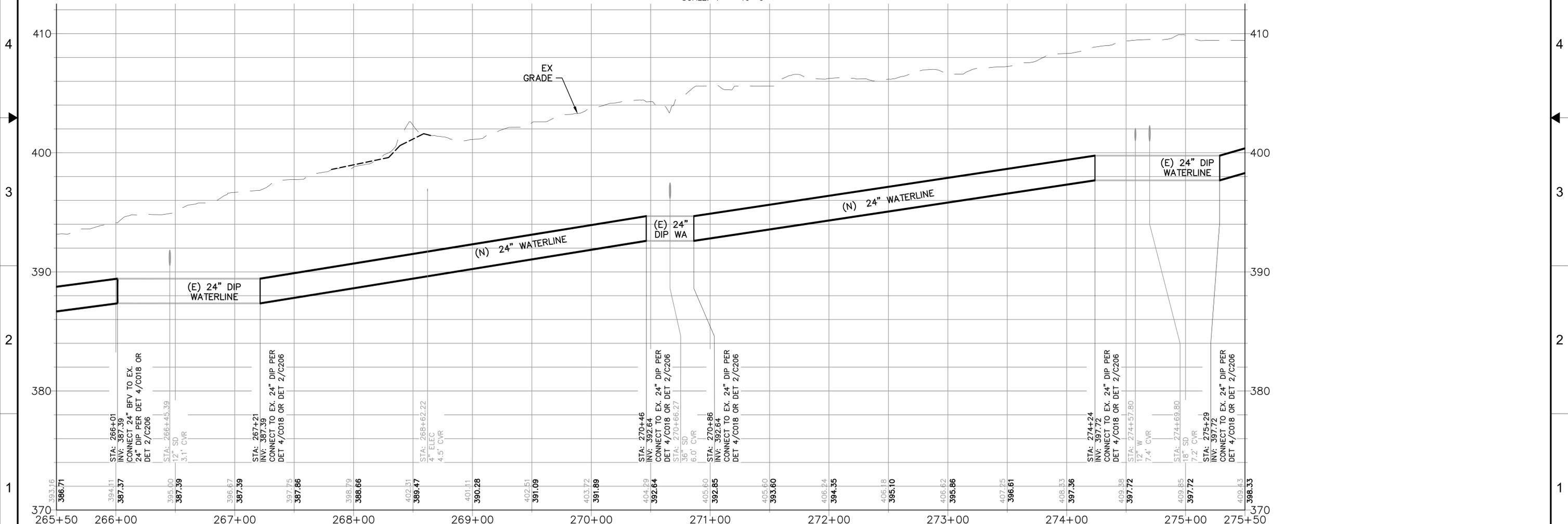
PAPER SIZE: 22x34 (ANSI D)  
 THIS BAR IS 1 INCH AT FULL SCALE

C117 SHEET 39 OF 86



PLAN - STA 265+50 TO 275+50

SCALE: 1" = 40'-0"



PROFILE - STA 265+50 TO 275+50 - E. BIDWELL ST

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ⑧ INSTALL 24" BFV
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑰ PROTECT IN PLACE EXISTING SD INLET
- NOTES**
- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 FOLSOM, CA 95630

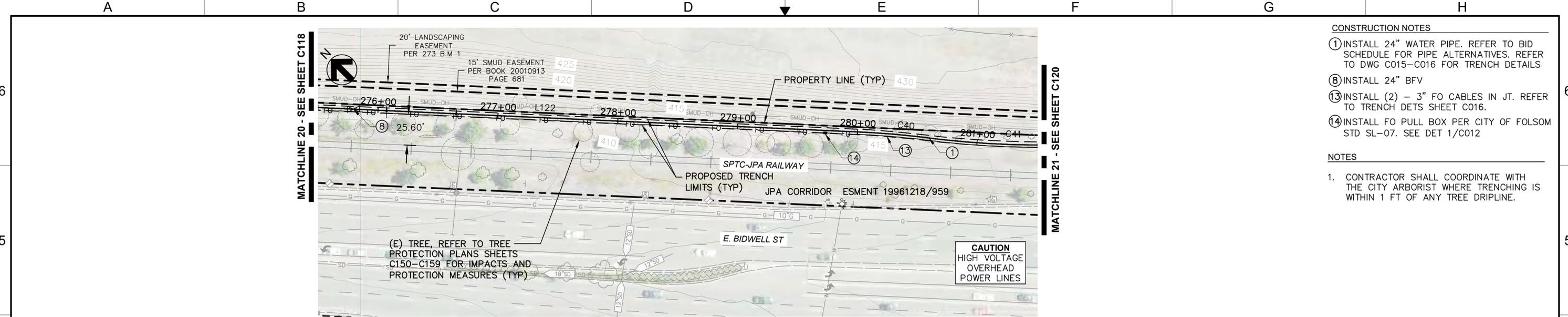
CFD NO. 18 - PHASE 2  
 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 265+50 TO 275+50  
 E. BIDWELL ST

REGISTERED PROFESSIONAL ENGINEER  
 CIVIL  
 STATE OF CALIFORNIA  
 C59049  
 5/3/2024

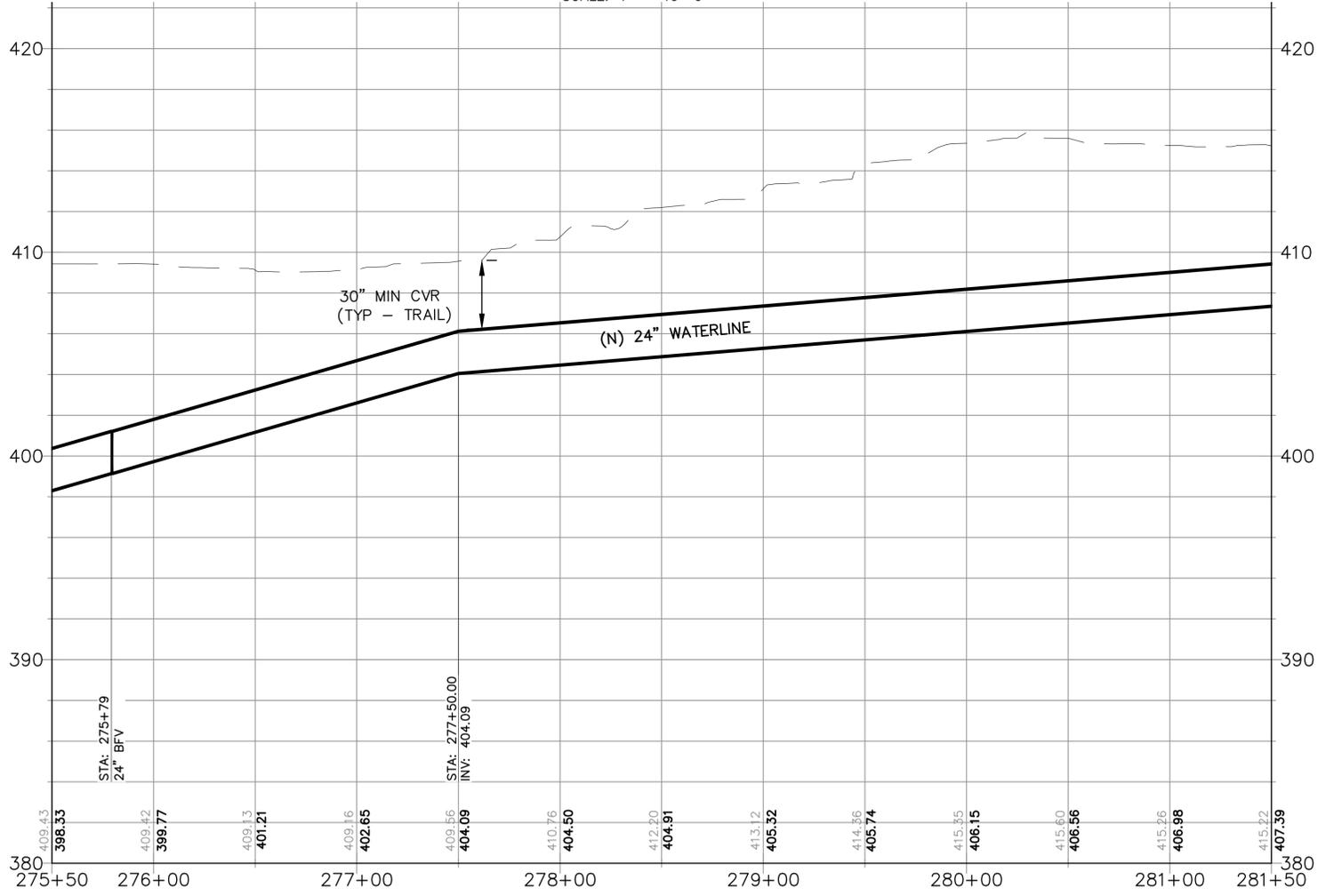
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 THIS BAR IS 1 INCH AT FULL SCALE  
**C118**  
 SHEET 40 OF 86

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PLAN - STA 275+50 TO 281+50

SCALE: 1" = 40'-0"



PROFILE - STA STA 275+50 TO 281+50 - E. BIDWELL ST

HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ② INSTALL 24" BFV
  - ③ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ④ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012

- NOTES**
- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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 CHECKED BY: CML DATE: 6/3/24  
 PCE: C59049

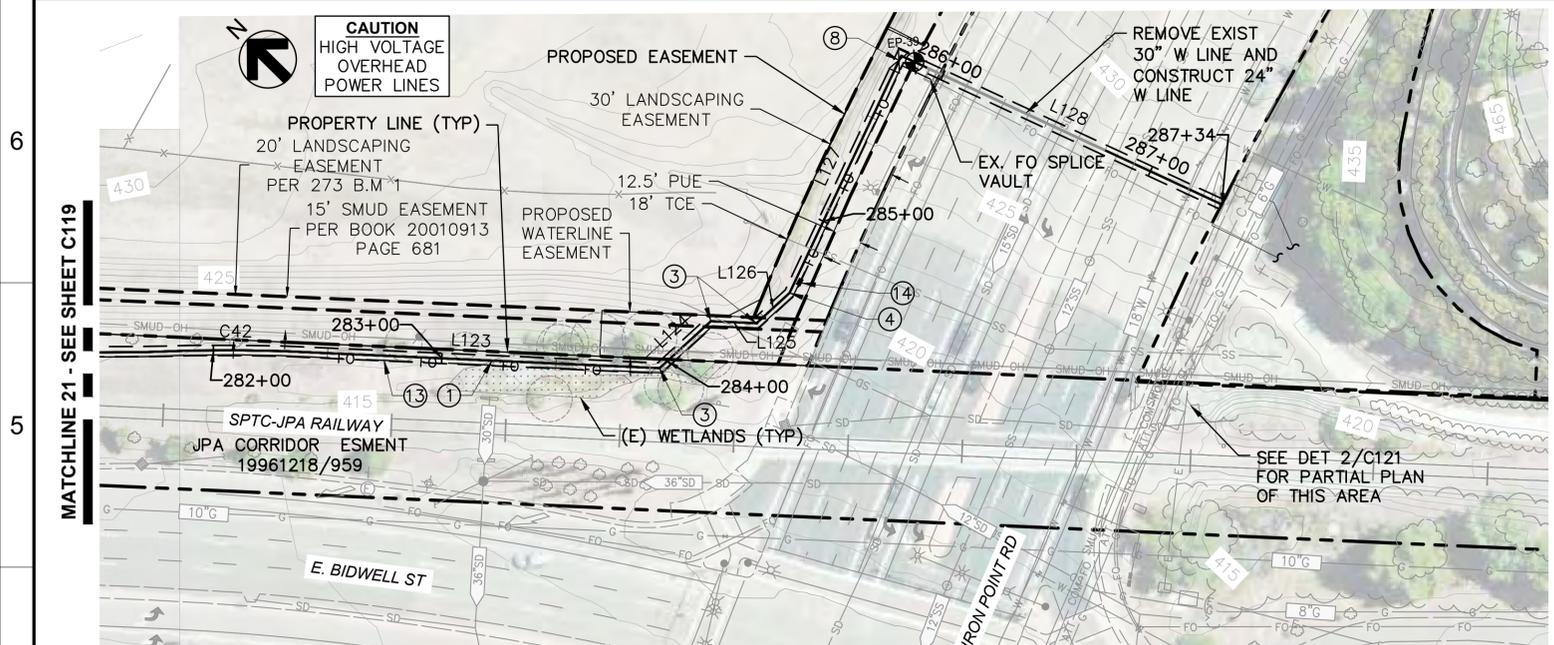
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 TRANSMISSION PIPELINE  
 PROJECT

PLAN & PROFILE  
 STA 275+50 TO 281+50  
 E. BIDWELL ST

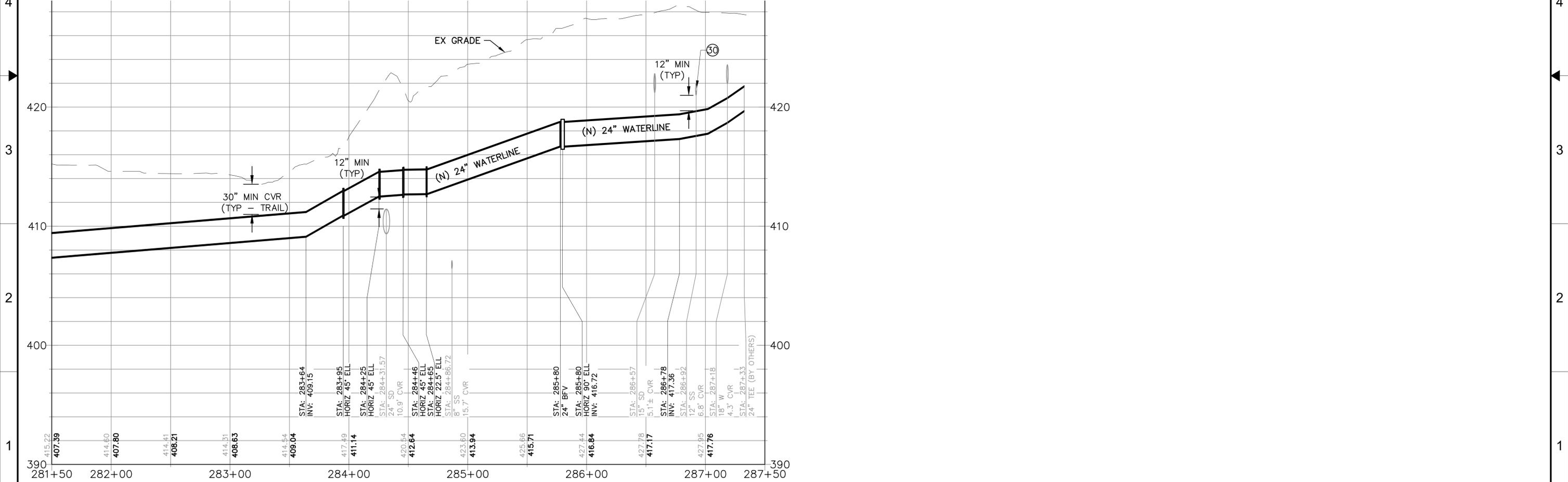
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**C119** SHEET 41 OF 86

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 C59049  
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**PLAN - STA 281+50 TO 287+34**  
SCALE: 1" = 40'-0"



**PROFILE - STA 281+50 TO 287+34 - E. BIDWELL ST**  
HORIZONTAL SCALE: 1" = 40'-0" VERTICAL SCALE: 1" = 4'-0"

- CONSTRUCTION NOTES**
- ① INSTALL 24" WATER PIPE. REFER TO BID SCHEDULE FOR PIPE ALTERNATIVES. REFER TO DWG C015-C016 FOR TRENCH DETAILS
  - ③ INSTALL 24" - 45° ELBOW
  - ④ INSTALL 24" - 22.5° ELBOW
  - ⑧ INSTALL 24" BFV
  - ⑬ INSTALL (2) - 3" FO CABLES IN JT. REFER TO TRENCH DETS SHEET C016.
  - ⑭ INSTALL FO PULL BOX PER CITY OF FOLSOM STD SL-07. SEE DET 1/C012
  - ⑳ CONSTRUCT WATER MAIN CROSSING PER CITY OF FOLSOM STD WR-22. SEE DET 1/C013
- NOTES**
- 1. CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.



REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGNED BY: CML/KFF  
PCE: C59049 DATE: 6/3/24

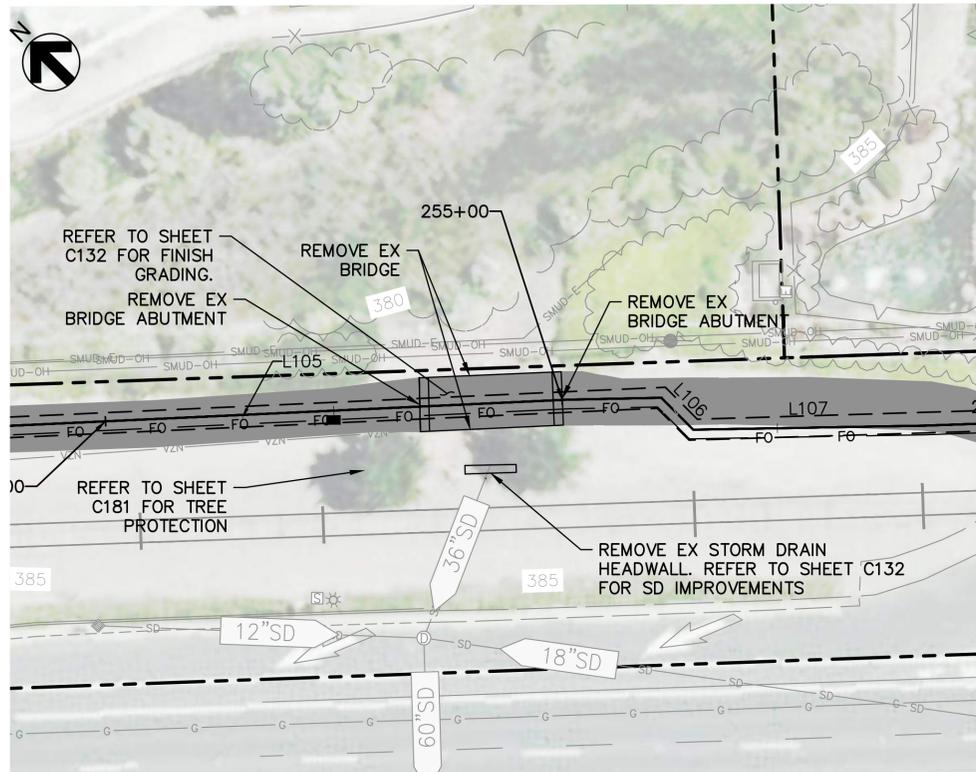
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PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

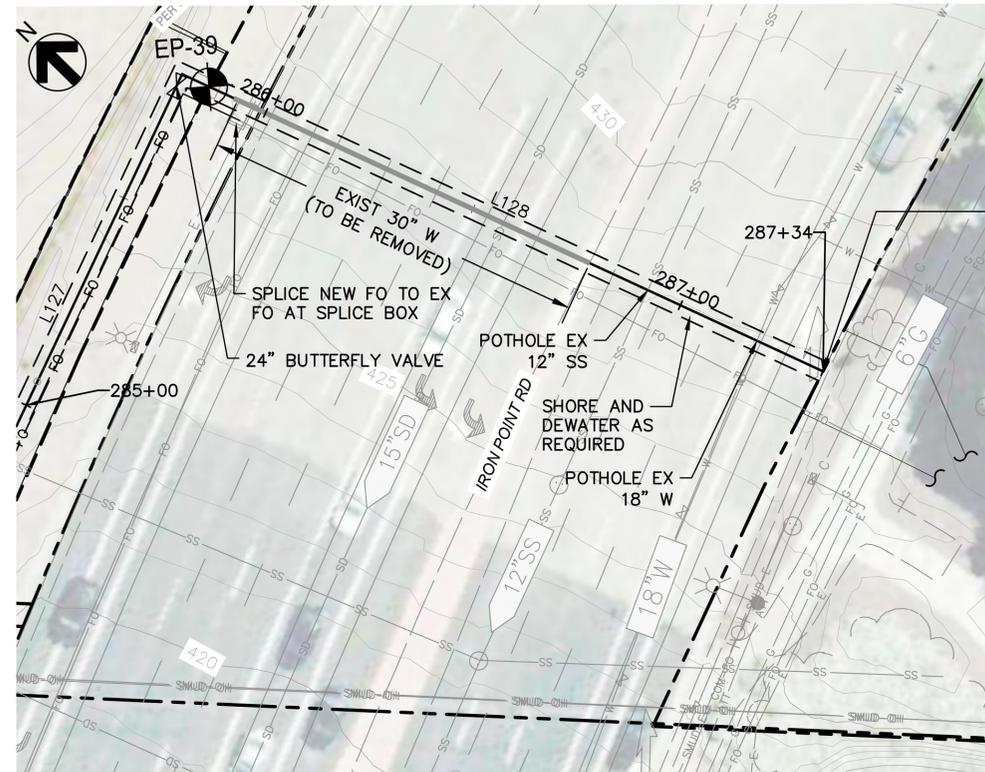
PLAN & PROFILE  
STA 281+50 TO 287+34  
E. BIDWELL ST

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C120** SHEET 42 OF 86



**PARTIAL PLAN - BRIDGE REMOVAL** (1)  
SCALE: 1"=20'-0"



CONNECT TO EXISTING PIPING PER CONNECTION DETAIL 3/C019. POTHOLE TO CONFIRM DEPTH AND LOCATION OF EX 30" W AT MEDIAN AND 24" TEE.

**PARTIAL PLAN - IRON POINT RD** (2)  
SCALE: 1"=20'-0"

- \* WORK RESTRICTIONS:**
- HOURS TO BE RESTRICTED BETWEEN THE HOURS OF 8 PM TO 5 AM.
  - ROADWAY SHALL BE OPEN TO TRAFFIC FOR ALL TRAVEL LANES BY 6 AM DAILY.
  - CONTRACTOR SHALL PROVIDE A TRENCH PLATE FOR ANY OPEN TRENCHES. CONTRACTOR TO PROVIDE A TEMPORARY CUTBACK RAMP IN THE TRAVEL DIRECTION FOR A MINIMUM DISTANCE OF 5' FROM BOTH SIDES OF THE PLATE.



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CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
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PARTIAL PLANS

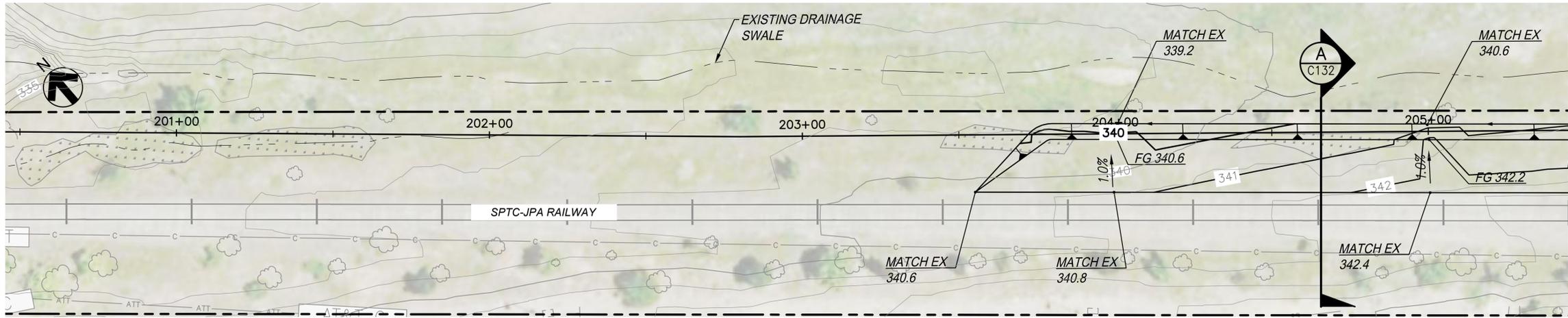


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C121 SHEET 43 OF 86  
DRAWING NUMBER

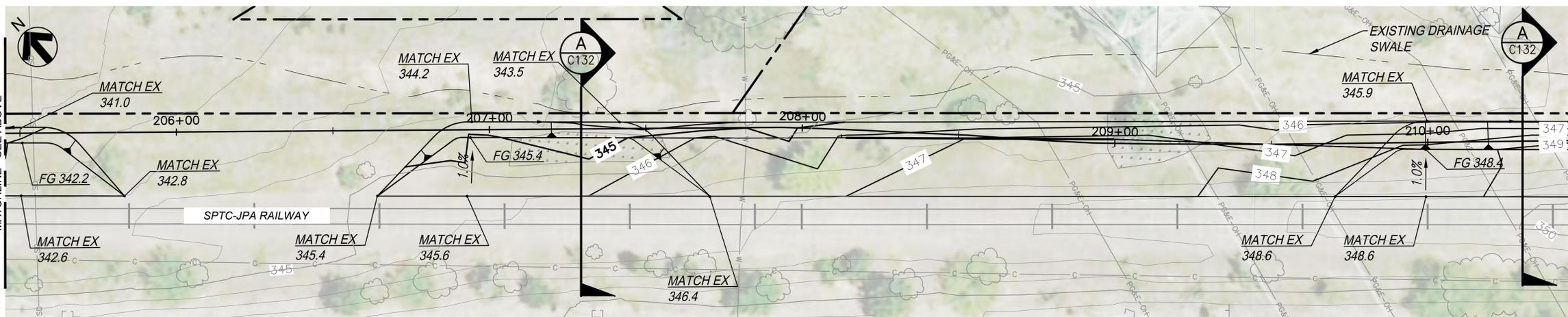
REV	DESCRIPTION	DATE

DRAWN BY: KFF/AVW DATE: 6/3/24  
DESIGN BY: CML/KFF PCE: C59049 DATE: 6/3/24  
CHECKED BY: CML PCE: C59049 DATE: 6/3/24

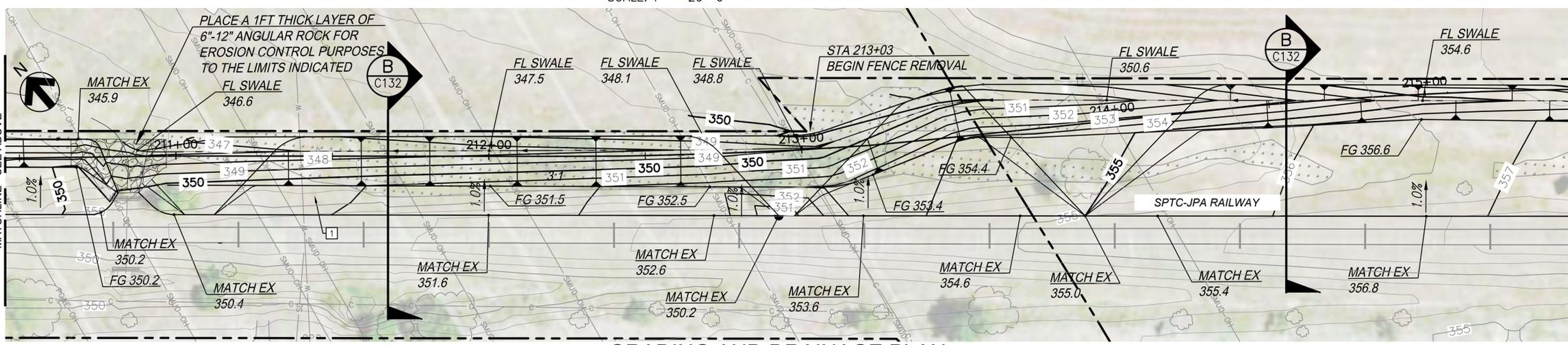


**GRADING AND DRAINAGE PLAN**  
SCALE: 1" = 20'-0"

**PLAN KEYNOTES**  
 1 RELOCATE C.P. TEST STATION TO BENCH AREA. SPLICE WIRES TOGETHER PER SL-05. FG C.P. TEST STATION = 348.4



**GRADING AND DRAINAGE PLAN**  
SCALE: 1" = 20'-0"



**GRADING AND DRAINAGE PLAN**  
SCALE: 1" = 20'-0"

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**CITY OF FOLSOM**  
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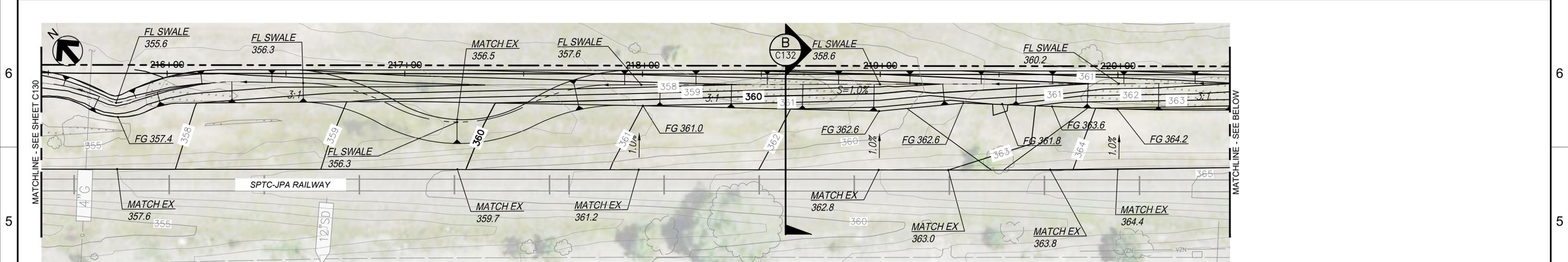
CFD NO. 18 - PHASE 2  
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 PROJECT

GRADING AND DRAINAGE PLAN

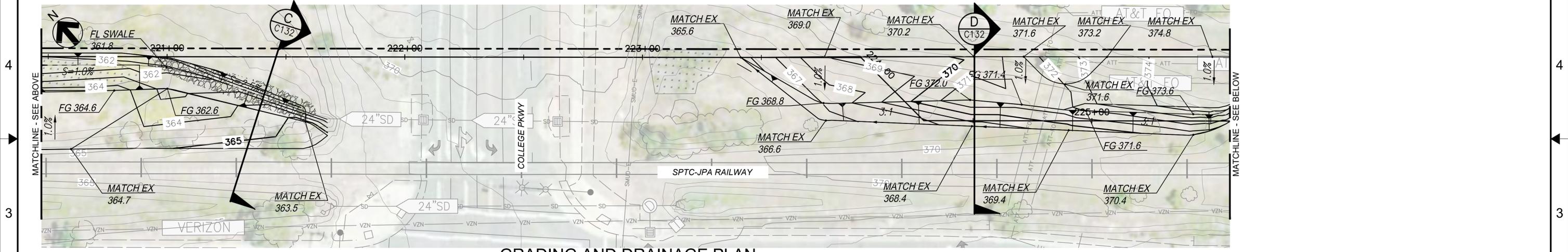


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 THIS BAR IS 1 INCH AT FULL SCALE  
**C130** SHEET 44 OF 86

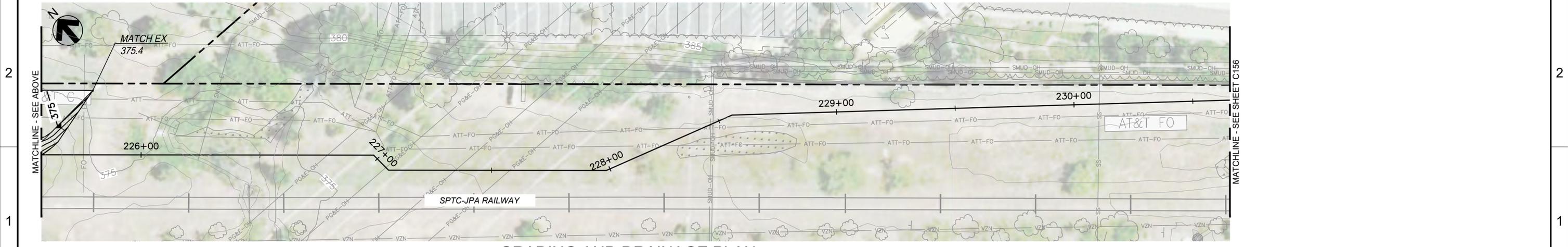
A B C D E F G H



**GRADING AND DRAINAGE PLAN**  
SCALE: 1" = 20'-0"



**GRADING AND DRAINAGE PLAN**  
SCALE: 1" = 20'-0"



**GRADING AND DRAINAGE PLAN**  
SCALE: 1" = 20'-0"

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**CITY OF FOLSOM**  
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50 NATOMAS STREET  
FOLSOM, CA 95630

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DATE: 6/3/24

DESIGN BY: CML  
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PCE: C59049 DATE: 6/3/24

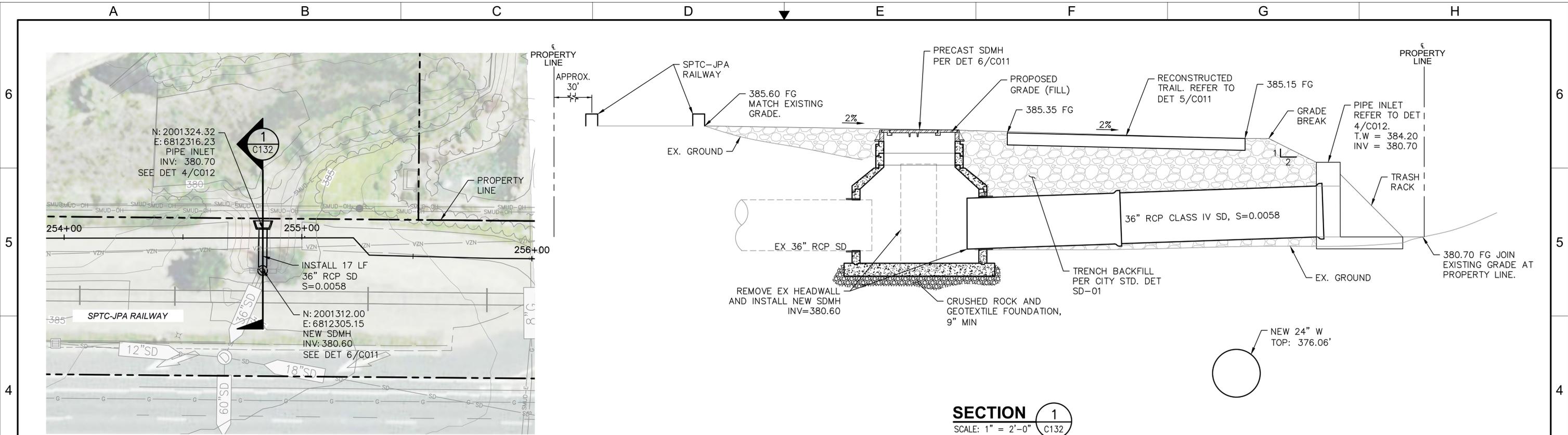
CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

GRADING AND DRAINAGE PLANS

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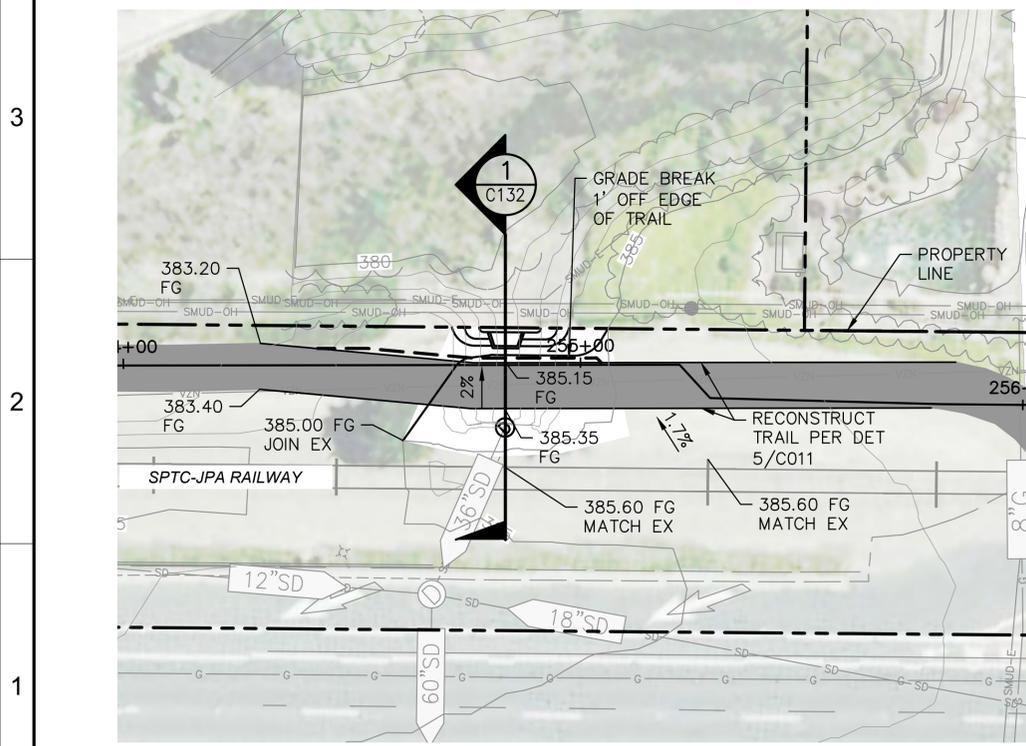
**C131** SHEET 45 OF 127

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C59049  
5/5/2024

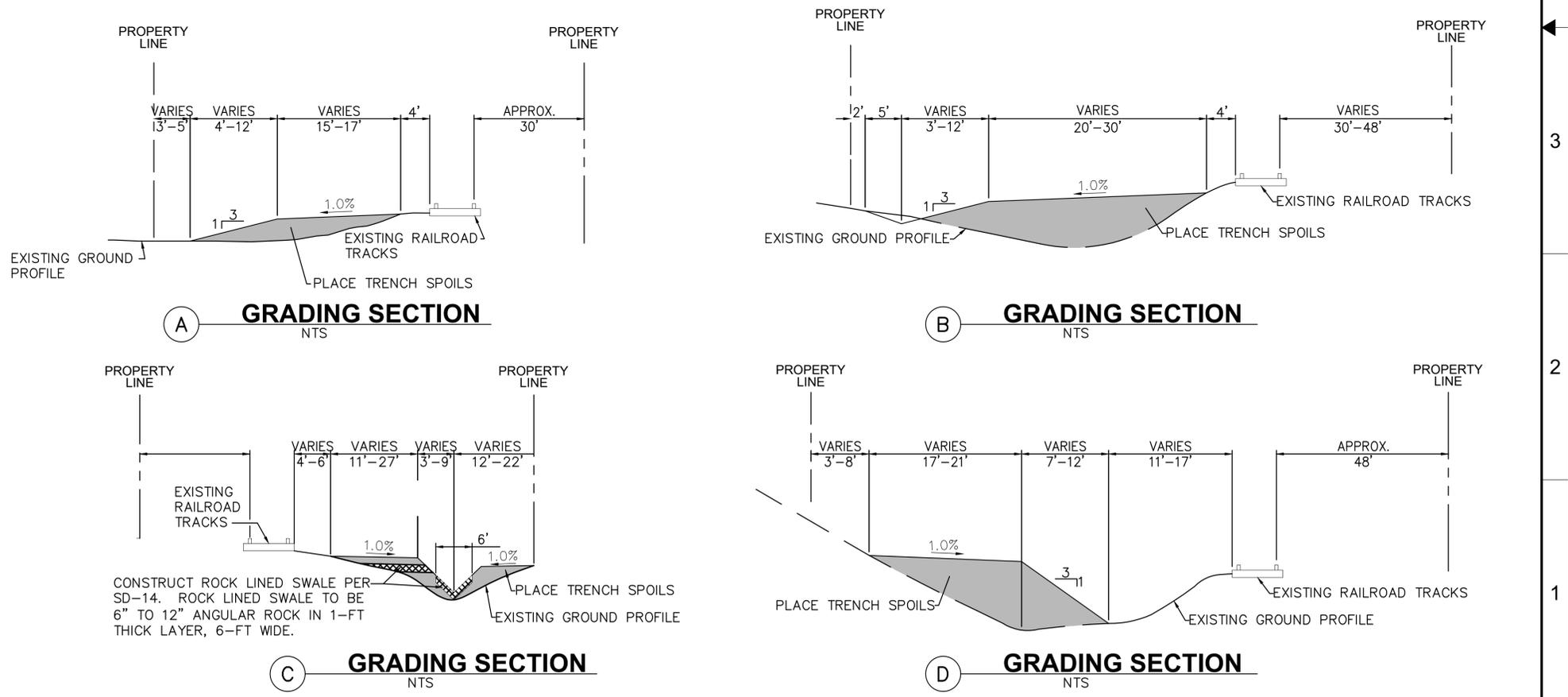


**STORM DRAIN IMPROVEMENT PLAN**  
SCALE: 1" = 20'-0"

**SECTION 1**  
SCALE: 1" = 2'-0" C132



**FINISH GRADING PARTIAL PLAN**  
SCALE: 1" = 20'-0"



**A GRADING SECTION**  
NTS

**B GRADING SECTION**  
NTS

**C GRADING SECTION**  
NTS

**D GRADING SECTION**  
NTS

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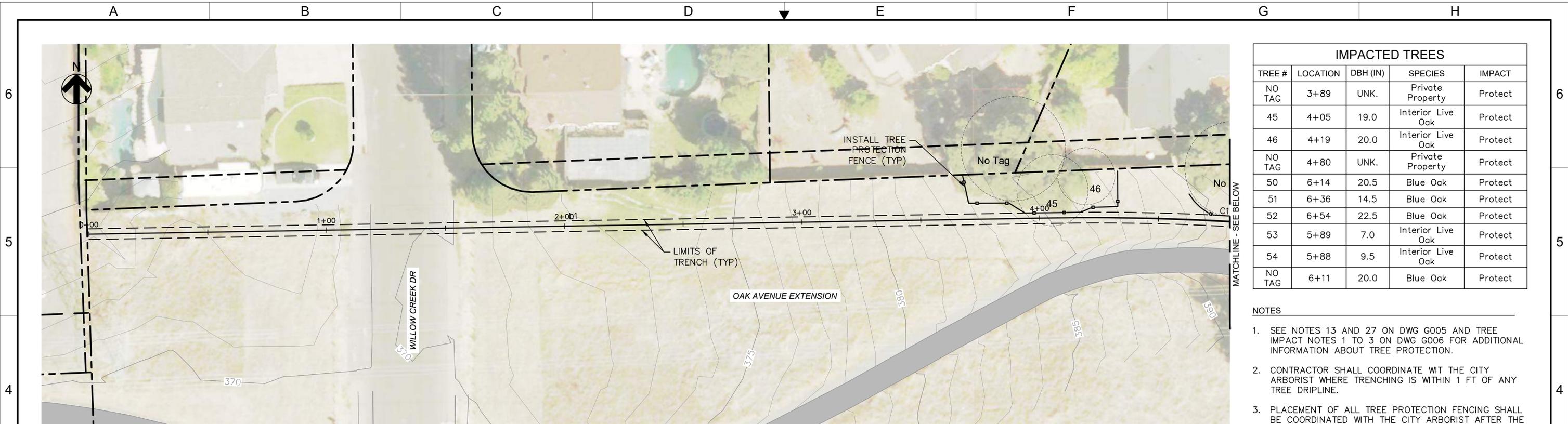
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PROJECT

GRADING AND DRAINAGE PLAN

PAPER SIZE: 22x34 (ANSI D)  
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**C132** SHEET 46 OF 86

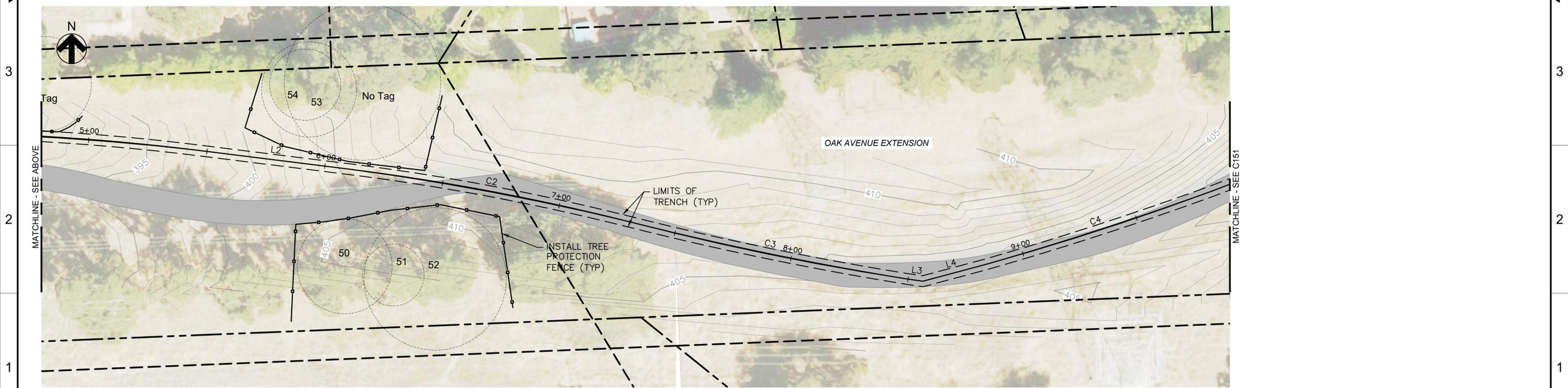
REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
5/3/2024



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
NO TAG	3+89	UNK.	Private Property	Protect
45	4+05	19.0	Interior Live Oak	Protect
46	4+19	20.0	Interior Live Oak	Protect
NO TAG	4+80	UNK.	Private Property	Protect
50	6+14	20.5	Blue Oak	Protect
51	6+36	14.5	Blue Oak	Protect
52	6+54	22.5	Blue Oak	Protect
53	5+89	7.0	Interior Live Oak	Protect
54	5+88	9.5	Interior Live Oak	Protect
NO TAG	6+11	20.0	Blue Oak	Protect

- NOTES**
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.
  - PLACEMENT OF ALL TREE PROTECTION FENCING SHALL BE COORDINATED WITH THE CITY ARBORIST AFTER THE TRANSMISSION PIPELINE HAS BEEN STAKED IN THE FIELD, BUT PRIOR TO START OF WORK.



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

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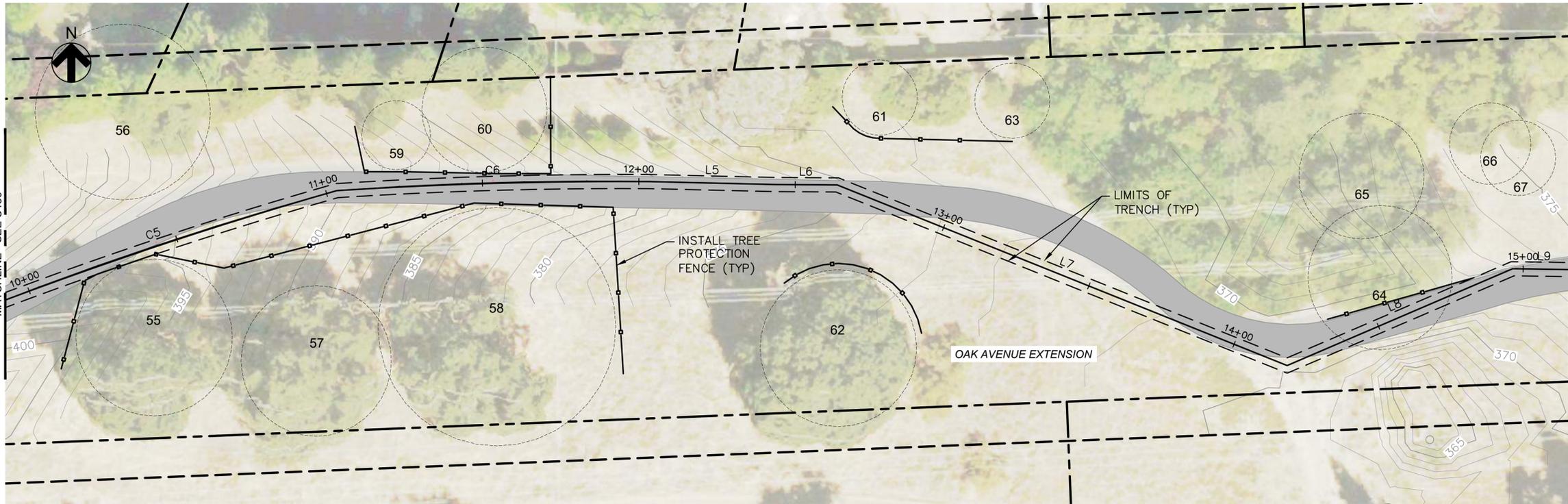
CFD NO. 18 - PHASE 2  
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PROJECT

TREE PROTECTION PLAN - 1

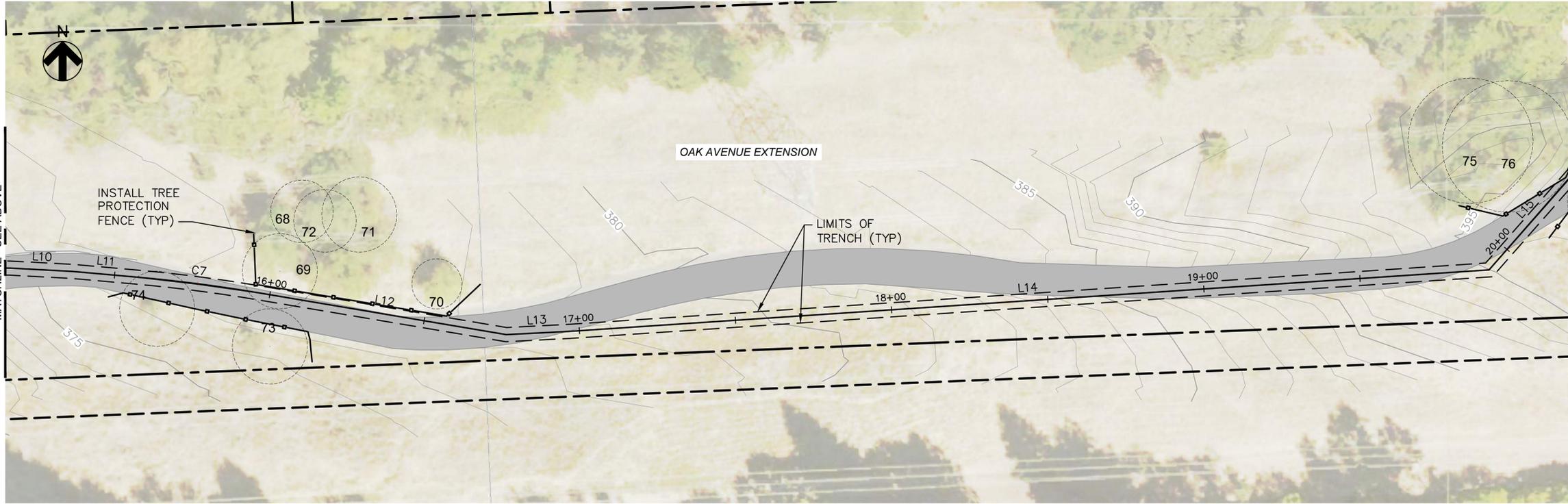


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**C150** SHEET 47 OF 86



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
55	10+33	29.0	Blue Oak	Protect
56	10+46	11.5	Interior Live Oak	No Impact
57	10+54	27.0	Blue Oak	Protect
58	11+53	27.5	Blue Oak	Protect
59	11+23	10.5	Interior Live Oak	Protect
60	11+51	23.0	Interior Live Oak	Protect
61	12+66	6.5	Interior Live Oak	Protect
62	12+83	31.5	Blue Oak	Protect
63	13+05	19.5	Interior Live Oak	Protect
64	14+57	31.5	Interior Live Oak	Protect
65	14+64	11.0	Oracle Oak	No Impact
66	14+97	20.5	Interior Live Oak	No Impact
67	14+98	7.0	Interior Live Oak	No Impact
68	16+06	6.5	Interior Live Oak	No Impact
69	16+02	7.5	Interior Live Oak	No Impact
70	16+52	6	Interior Live Oak	Protect
71	16+24	10.5	Interior Live Oak	No Impact
72	16+13	6	Interior Live Oak	No Impact
73	16+03	8.5	Blue Oak	Protect
74	15+65	8.5	Blue Oak	Protect
75	20+18	20.0	Interior Live Oak	No Impact
76	20+25	41.5	Interior Live Oak	Protect

- NOTES**
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.
  - PLACEMENT OF ALL TREE PROTECTION FENCING SHALL BE COORDINATED WITH THE CITY ARBORIST AFTER THE TRANSMISSION PIPELINE HAS BEEN STAKED IN THE FIELD, BUT PRIOR TO START OF WORK.

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

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PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
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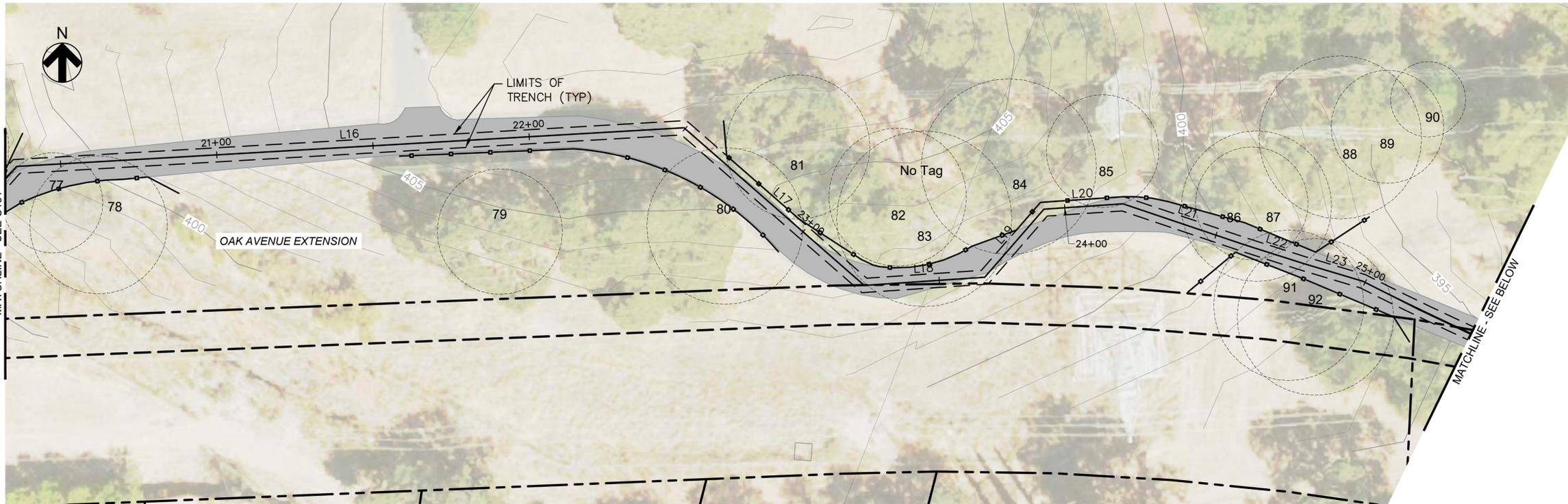
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TREE PROTECTION PLAN - 2



PAPER SIZE: 22x34 (ANSI D)  
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**C151** SHEET 48 OF 86



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
77	20+47	6.5	Interior Live Oak	Protect
78	20+66	9.0	Interior Live Oak	Protect
79	21+89	32.0	Blue Oak	Protect
80	22+80	35.0	Blue Oak	Protect
81	22+81	22.5	Blue Oak	Protect
82	23+39	23.0	Blue Oak	Protect
83	23+47	18.0	Blue Oak	Protect
84	23+93	21.5	Blue Oak	Protect
85	24+13	19.0	Blue Oak	Protect
86	24+58	18.5	Blue Oak	Protect
87	24+60	19.5	Blue Oak	Protect
88	24+78	24.0	Blue Oak	No Impact
89	24+93	20.5	Blue Oak	No Impact
90	24+99	6.5	Oracle Oak	No Impact
91	24+79	33.0	Interior Live Oak	Protect
92	24+88	44.5	Interior Live Oak	Protect
93	25+66	22.0	Interior Live Oak	Protect
94	25+63	6.0	Blue Oak	No Impact
95	25+72	22.5	Interior Live Oak	No Impact
96	25+75	11.5	Interior Live Oak	No Impact
101	25+89	9.0	Interior Live Oak	Protect
102	26+60	6.0	Blue Oak	No Impact

- NOTES**
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.
  - PLACEMENT OF ALL TREE PROTECTION FENCING SHALL BE COORDINATED WITH THE CITY ARBORIST AFTER THE TRANSMISSION PIPELINE HAS BEEN STAKED IN THE FIELD, BUT PRIOR TO START OF WORK.

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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

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PCE: C59049 DATE: 6/3/24

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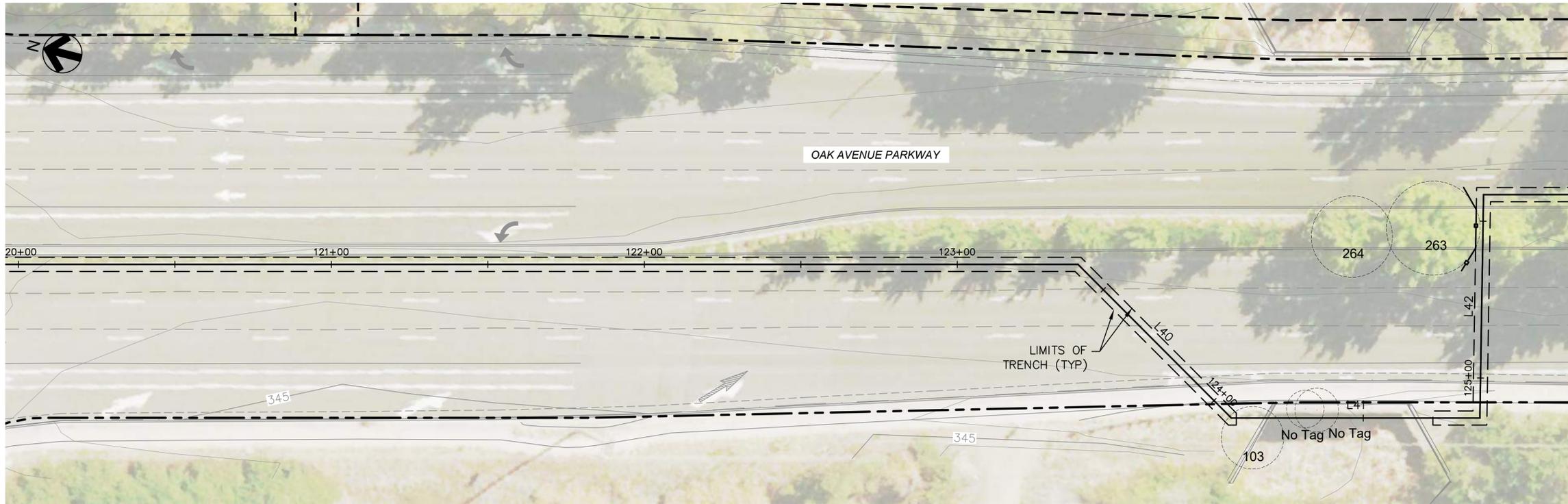
CFD NO. 18 - PHASE 2  
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PROJECT

TREE PROTECTION PLAN - 3



PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE

**C152** SHEET 49 OF 86



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
103	124+15	6.0	Valley Oak	Field Assess by Arborist
No Tag	124+31	3.0	Black Walnut	No Impact
No Tag	124+35	5.0	Black Walnut	No Impact
263	125+48	12.0	Northern Red Oak	Protect
264	125+44	9.5	Northern Red Oak	No Impact

- NOTES**
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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**CITY OF FOLSOM**  
50 NATOMAS STREET  
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DESIGNED BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
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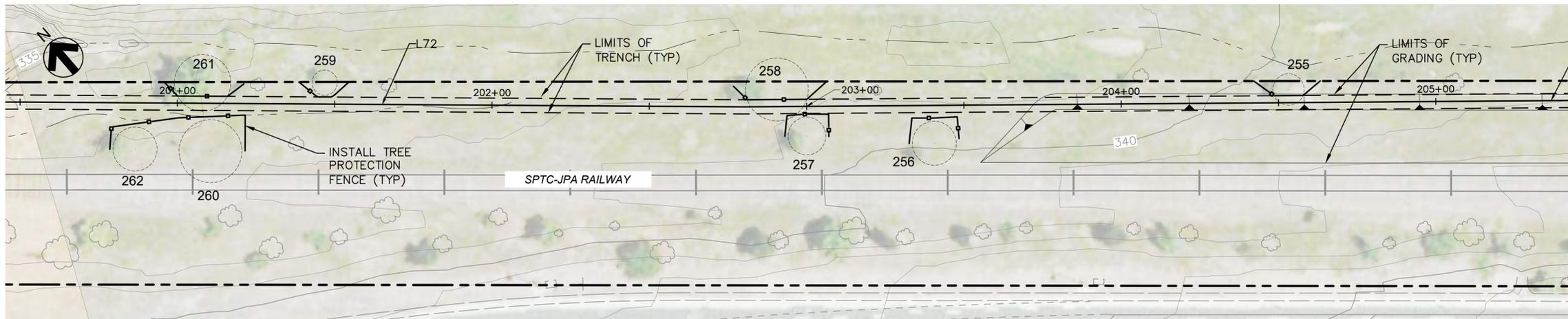
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PROJECT

TREE PROTECTION PLAN - 4



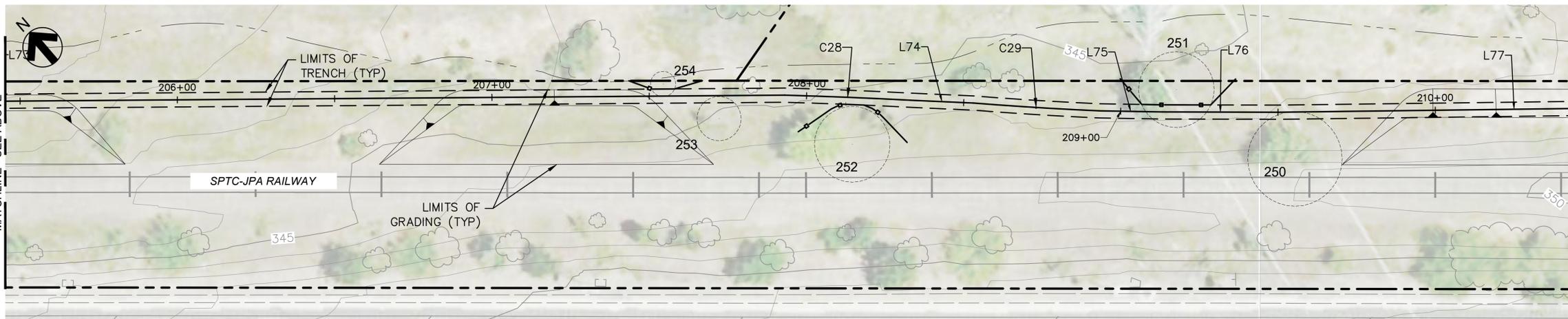
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**C153** SHEET 50 OF 86



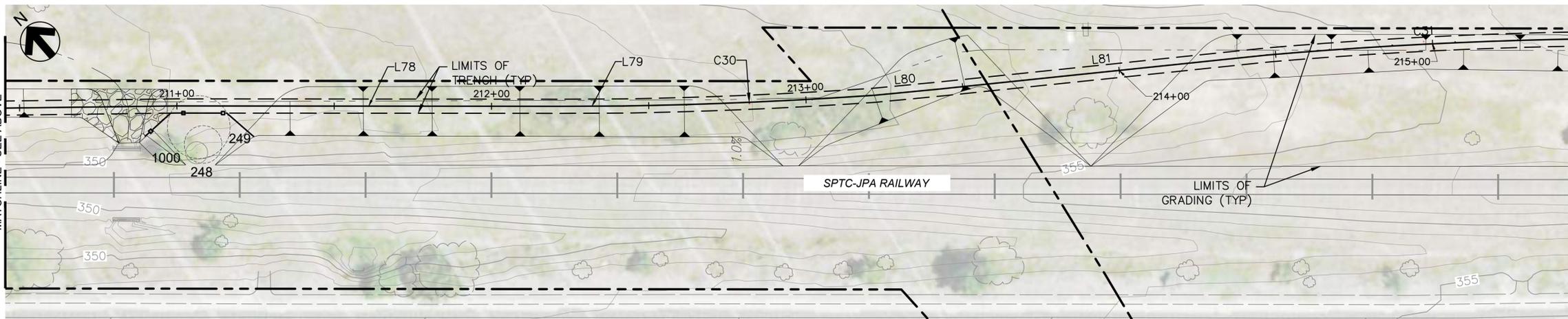
**TREE PROTECTION PLAN**

SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**

SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**

SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
248*	211+08	6.0	Red Push Pistachio	Protect
249*	211+07	7.0	Callery Pear	Protect
1000	211+07	7.0	Red Push Pistache	Protect
250	209+55	34.5	Black Walnut	Protect
251	209+18	29.5	Red Push Pistachio	Field Assess by Arborist
252	208+15	24.5	Red Push Pistachio	Protect
253*	207+72	2.0	Valley Oak	Protect
254*	207+54	1.0	Red Push Pistachio	Protect
255*	204+53	1.5	Red Push Pistachio	Protect
256	203+40	2.0	Valley Oak	Protect
257	203+00	3.5	Valley Oak	Protect
258	202+91	8.0	Valley Oak	Field Assess by Arborist
259	201+47	1.0	Red Push Pistachio	Protect
260	201+11	2.0	Blue Oak	Protect
261	201+08	10.0	Red Push Pistachio	Protect
262	200+89	3.0	Valley Oak	Protect

\* Consult with arborist on installation of aeration system per City of Folsom Std. LS-06. Refer to Det 5/C012

- NOTES
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.



REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGNED BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

TREE PROTECTION PLAN - 5



PAPER SIZE: 22x34 (ANSI D)

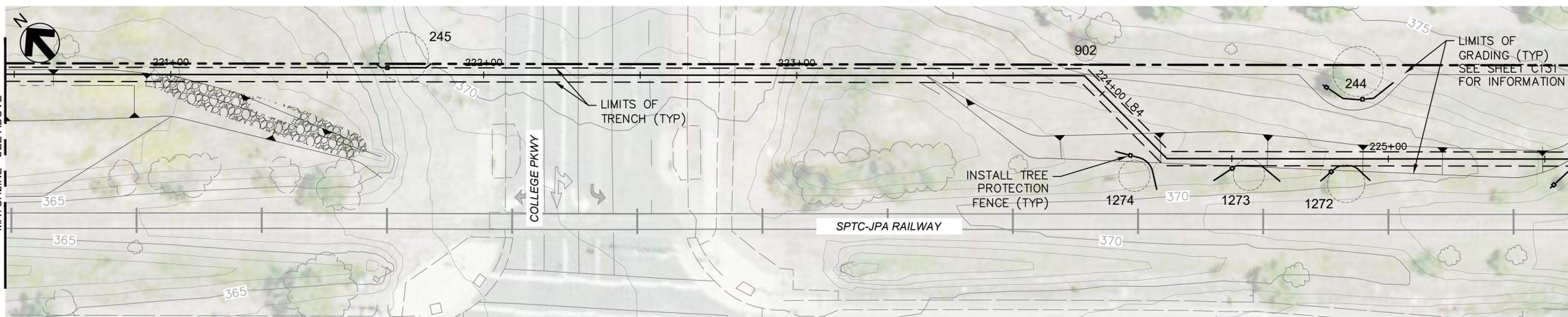
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**C154**

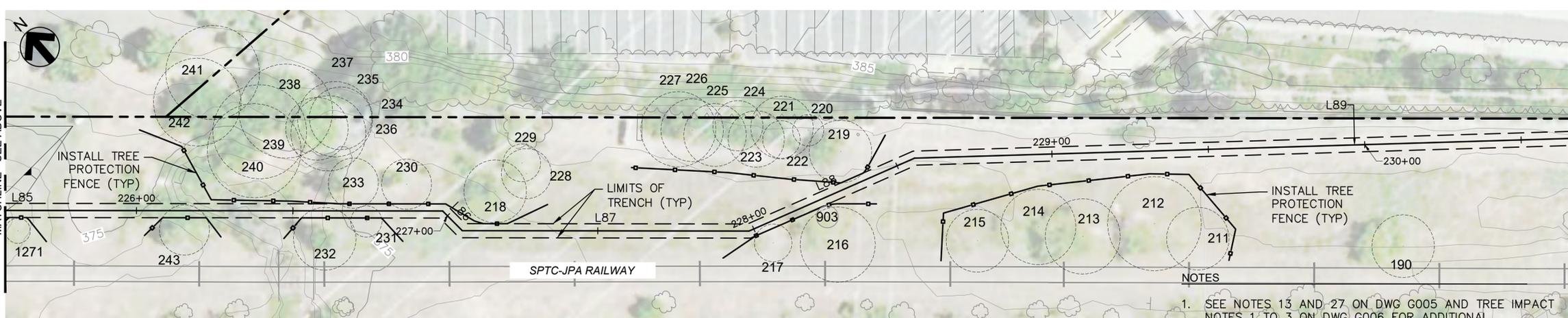
SHEET 51 OF 86



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

- NOTES**
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
901	215+50	7.0	London Planetree	No Impact
902	223+90	20.5	Callery Pear	Protect
190	230+11	20.0	Black Walnut	No Impact
211	229+46	6.0	Mexican Palo Verde	No Impact
212	229+32	4.0	Mexican Palo Verde	Protect
213	229+09	5.5	Mexican Palo Verde	Protect
214	228+95	3.5	Mexican Palo Verde	Protect
215	228+75	7.0	Mexican Palo Verde	Protect
216	228+20	9.0	Mexican Palo Verde	Protect
903	228+20	9.0	Mexican Palo Verde	Protect
217	228+04	1.5	Blue Oak	Protect
218	227+17	5.0	Siberian Elm	Protect
219	228+35	17.0	Callery Pear	Protect
220	228+29	2.5	Siberian Elm	Protect
221	228+21	6.0	Siberian Elm	Protect
222	228+20	3.0	Siberian Elm	Protect
223	228+12	7.5	Siberian Elm	Protect
224	227+95	2.5	Siberian Elm	Protect
225	227+87	6.0	Siberian Elm	Protect
226	227+80	8.0	Siberian Elm	Protect
227	227+76	5.5	Siberian Elm	Protect
228	227+27	1.0	Siberian Elm	Protect
229	227+26	1.0	Siberian Elm	No Impact
230	226+86	1.0	Siberian Elm	Protect
231	226+73	1.0	Valley Oak	Protect
232	226+60	7.5	Valley Oak	Protect
233	226+69	6.5	Valley Oak	Protect
234	226+65	3.0	Siberian Elm	No Impact
235	226+63	13.0	Siberian Elm	No Impact
236	226+61	3.5	Siberian Elm	No Impact
237	226+58	3.5	Siberian Elm	No Impact
238	226+48	21.5	Siberian Elm	No Impact
239	226+39	10.5	Siberian Elm	Protect
240	226+38	5.5	Siberian Elm	Protect
241	226+24	7.5	Siberian Elm	No Impact
242	226+19	9.5	Siberian Elm	Protect
243	226+15	3.0	Red Push Pistachio	Protect
244*	224+90	14.5	Callery Pear	Protect
245	221+74	5.5	Western Redbud	Protect
246	218+20	8.0	London Planetree	Protect
247*	217+17	3.0	Japanese Zelkova	Protect
1271	225+62	2.5	Red Push Pistachio	Protect
1272	224+87	1.5	Red Push Pistachio	Protect
1273	224+55	1.5	Red Push Pistachio	Protect
1274	224+26	1.5	Blue Oak	Protect

\* Consult with arborist on installation of aeration system per City of Folsom Std. LS-06. Refer to Det 5/C012

**HydroScience**  
741 ALLSTON WAY  
BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

DRAWN BY: MAF  
DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

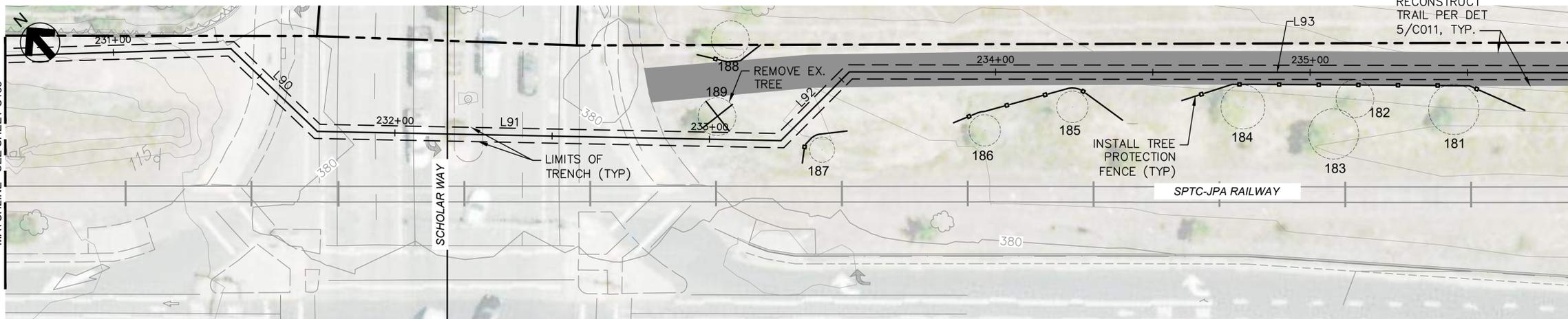
CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

TREE PROTECTION PLAN - 6

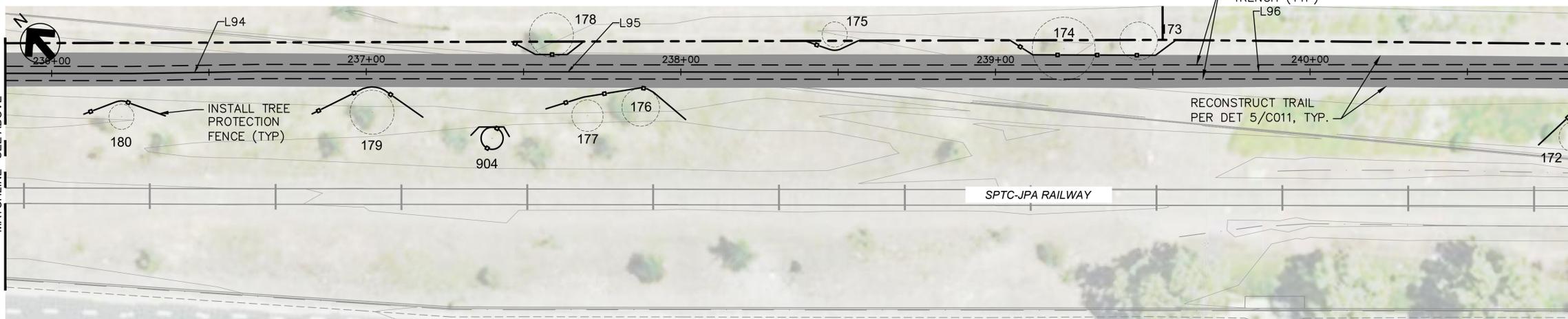
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**C155**  
SHEET 52 OF 86



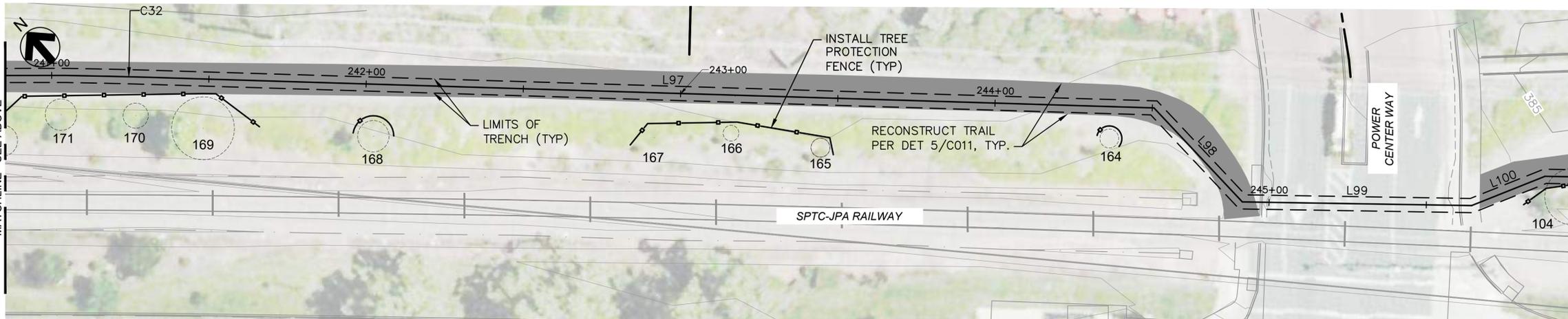
**TREE PROTECTION PLAN**

SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**

SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**

SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
104	245+99	3.5	Valley Oak	Protect
164	244+37	4.0	Valley Oak	Protect
165	243+45	2.0	Valley Oak	Protect
166	243+16	2.5	Valley Oak	Protect
167	242+92	3.5	Valley Oak	Protect
168	242+03	3.0	Washington Hawthorne	Protect
169	241+49	6.5	London Planetree	Protect
170	241+27	15.5	Lilac Chastetree	Protect
171	241+03	17.0	Lilac Chastetree	Protect
172	240+84	16.5	Lilac Chastetree	No Impact
173	239+46	1.0	Blue Oak	Protect
174	239+22	2.5	Interior Live Oak	Protect
175	238+49	3.0	Lilac Chastetree	Protect
176	237+87	8.5	Desert Willow	Protect
177	237+70	1.0	Blue Oak	Protect
178	237+59	7.0	Valley Oak	Protect
904	237+40	8.0	Interior Live Oak	Protect
179	237+02	4.0	Valley Oak	Protect
180	236+22	3.5	Valley Oak	Protect
181	235+46	5.0	Interior Live Oak	Protect
182	235+14	1.5	Black Walnut	Protect
183	235+07	3.5	Red Push Pistachio	Protect
184	234+79	3.0	Red Push Pistachio	Protect
185	234+24	2.0	Blue Oak	Protect
186	233+97	5.5	Black Walnut	Protect
187	233+30	1.5	Blue Oak	Protect
188	233+06	4.5	Red Push Pistachio	No Impact
189	233+02	3.0	Black Walnut	Remove

**NOTES**

- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
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BERKELEY, CA 94710  
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REV	DESCRIPTION	DATE



CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

DRAWN BY: MAF  
DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

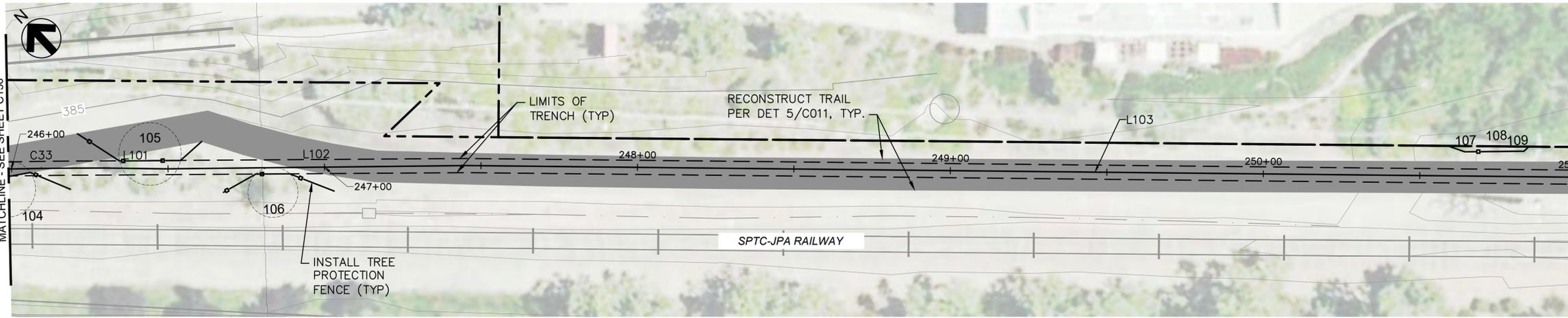
CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

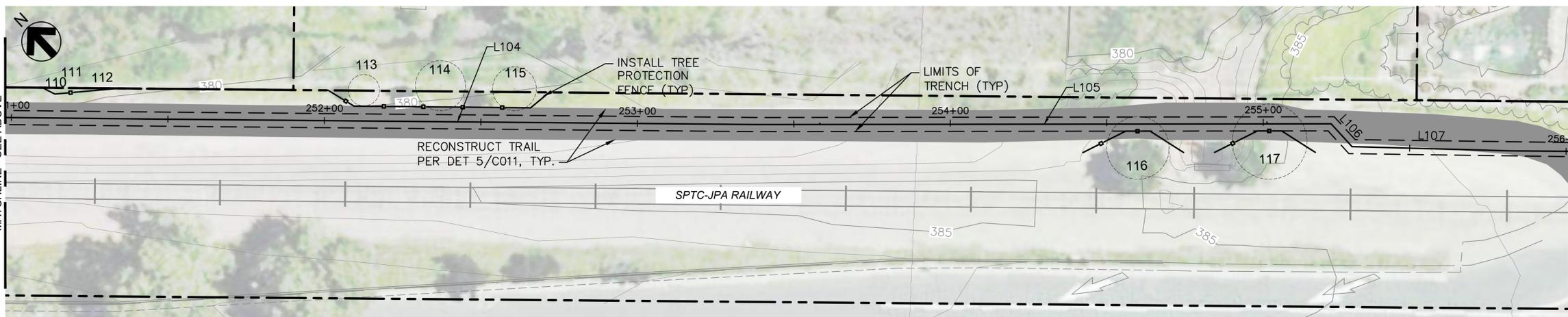
TREE PROTECTION PLAN - 7



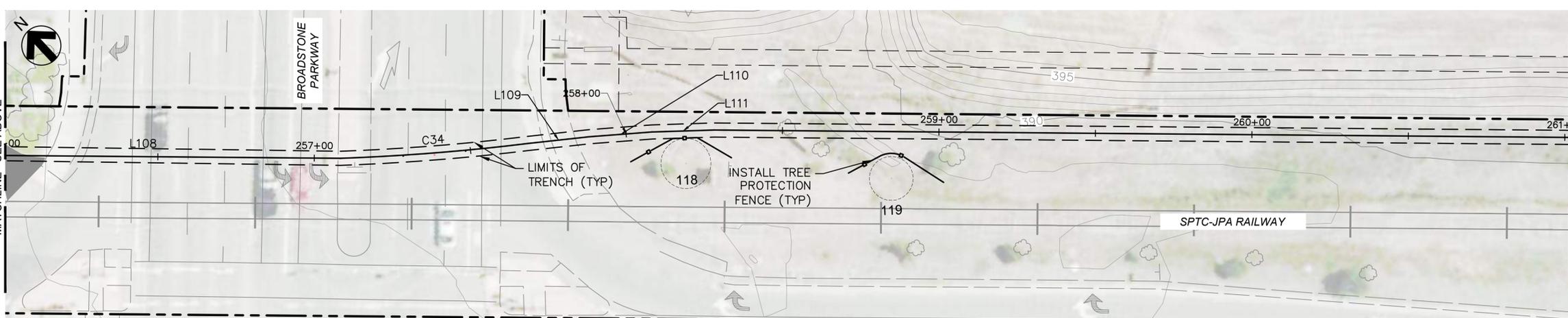
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THIS BAR IS 1 INCH AT FULL SCALE  
C156 SHEET 53 OF 86  
DRAWING NUMBER



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
104	245+99	3.5	Valley Oak	Protect
105	246+44	4.0	Valley Oak	Protect
106	246+83	5.5	Valley Oak	Protect
107	250+65	15.0	Arroyo Willow	Protect
108	250+70	9.0	Sandbar Willow	Protect
109	250+75	6.5	Sandbar Willow	Protect
110	251+15	4.5	Arroyo Willow	Protect
111	251+20	8.5	Arroyo Willow	Protect
112	251+25	4.5	Arroyo Willow	Protect
113	252+13	2.5	Red Maple	Protect
114	252+37	3.5	Red Maple	Protect
115	252+61	3.0	Red Maple	Protect
116	254+60	11.5	Valley Oak	Protect
117	255+02	10.5	Valley Oak	Protect
118	258+19	3.5	Red Push Pistachio	Protect
119	258+46	2.5	Blue Oak	Protect

- NOTES
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

DESIGNED BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

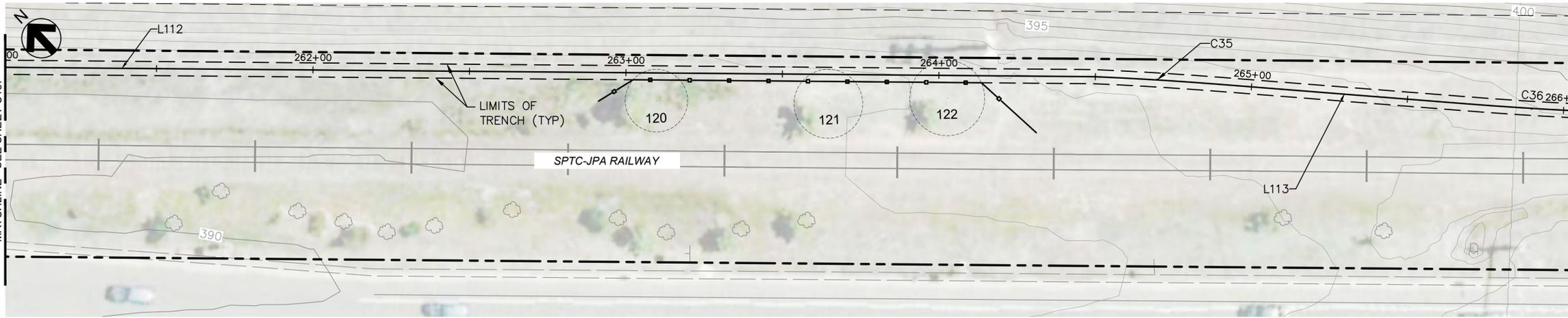
CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

TREE PROTECTION PLAN - 8



PAPER SIZE: 22x34 (ANSI D)  
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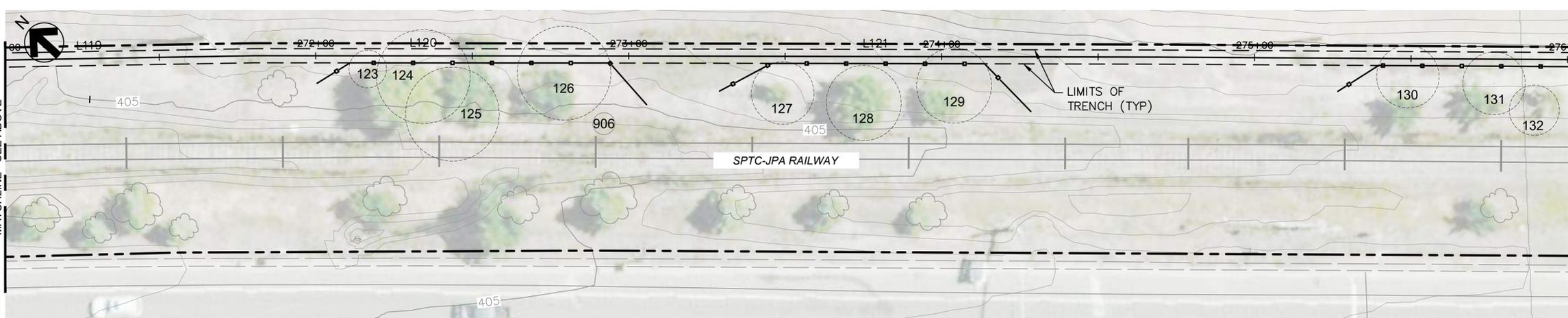
**C157** SHEET 54 OF 86



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
120	263+10	7.5	London Planetree	Protect
121	263+65	4.0	London Planetree	Protect
122	264+03	4.5	London Planetree	Protect
905	268+00	28.0	Red Willow	Protect
123	272+17	4.5	Cork Oak	Protect
124	272+34	15.0	Cork Oak	Field Assess by Arborist
125	272+44	11.5	Cork Oak	Protect
126	272+79	38.5	Cork Oak	Field Assess by Arborist
906	272+90	9.0	Red Willow	Protect
127	273+49	7.0	Washington Hawthorne	Protect
128	273+75	6.5	Red Push Pistachio	Protect
129	274+04	5.5	Red Push Pistachio	Protect
130	275+49	6.0	Red Push Pistachio	Protect
131	275+77	5.5	Red Push Pistachio	Protect
132	275+89	6.5	Red Push Pistachio	No Impact

- NOTES
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

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BERKELEY, CA 94710  
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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

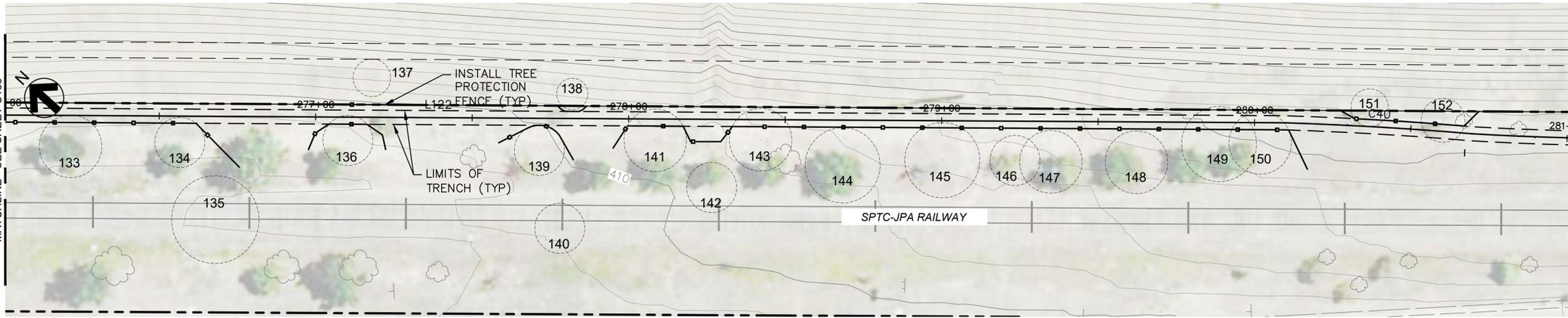
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TRANSMISSION PIPELINE  
PROJECT

TREE PROTECTION PLAN - 9

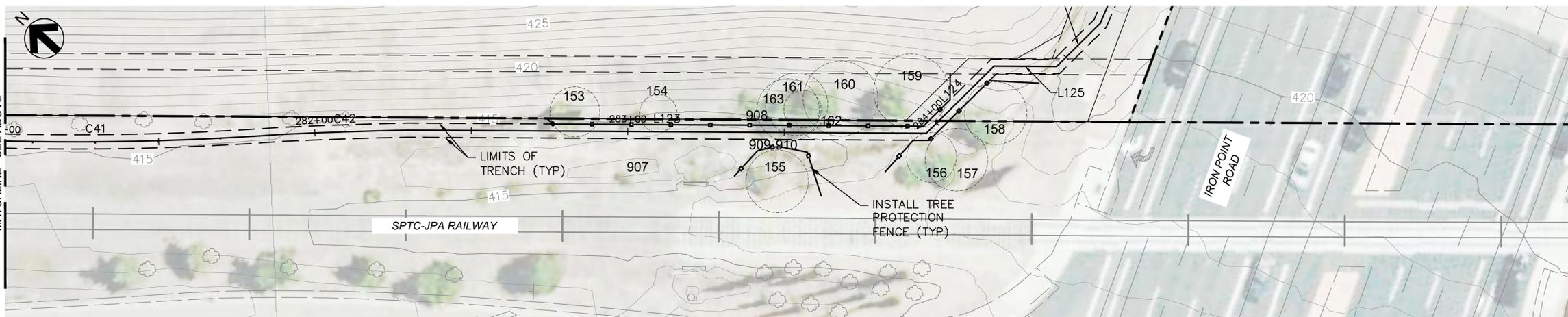
REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
5/3/2024

PAPER SIZE: 22x34 (ANSI D)  
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**C158** SHEET 55 OF 86



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"



**TREE PROTECTION PLAN**  
SCALE: 1" = 20'-0"

- NOTES**
- SEE NOTES 13 AND 27 ON DWG G005 AND TREE IMPACT NOTES 1 TO 3 ON DWG G006 FOR ADDITIONAL INFORMATION ABOUT TREE PROTECTION.
  - CONTRACTOR SHALL COORDINATE WITH THE CITY ARBORIST WHERE TRENCHING IS WITHIN 1 FT OF ANY TREE DRIPLINE.

IMPACTED TREES				
TREE #	LOCATION	DBH (IN)	SPECIES	IMPACT
133	276+22	4.5	Kentucky Coffeetree	Protect
134	276+57	5.0	Kentucky Coffeetree	Protect
135	276+68	9.0	London Planetree	No Impact
136	277+10	3.0	Kentucky Coffeetree	Protect
137	277+18	9.5	European Olive	Protect
138	277+32	1.5	European Olive	Protect
139	277+22	2.0	Red Push Pistachio	Protect
140	277+28	4.0	Red Push Pistachio	No Impact
141	278+09	5.5	Red Push Pistachio	Protect
142	278+27	3.0	Red Push Pistachio	No Impact
143	278+42	4.5	Red Push Pistachio	Protect
144	278+68	15.0	Red Push Pistachio	Protect
145	279+00	6.0	Blue Oak	Protect
146	279+24	2.5	Red Push Pistachio	Protect
147	279+35	7.5	London Planetree	Protect
148	279+62	3.5	Red Push Pistachio	Protect
149	279+89	6.0	Red Push Pistachio	Protect
150	280+02	8.0	Red Push Pistachio	Protect
151	280+36	2.5	Red Push Pistachio	Protect
152	280+60	5.0	Blue Oak	Protect
153	282+83	18.0	Mexican Fan Palm	Protect
154	283+10	4.5	Red Push Pistachio	Protect
907	283+02	31.0	Black Willow	Protect
908	283+40	8.5	Red Push Pistachio	Remove
909	283+45	10.5	Black Willow	Remove
910	283+52	10.0	Fremont Cottonwood	Remove
155	283+48	6.0	Interior Live Oak	Protect
156	283+95	12.0	Lilac Chastetree	Protect
157	283+96	17.0	Lilac Chastetree	Protect
158	284+01	22.5	Lilac Chastetree	Protect
159	284+16	8.5	Red Push Pistachio	Protect
160	283+68	13.5	Red Push Pistachio	Protect
161	283+54	8.5	Red Push Pistachio	Protect
162	283+56	1.0	Red Push Pistachio	Protect
163	283+51	4.0	Red Push Pistachio	Protect

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BERKELEY, CA 94710  
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REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

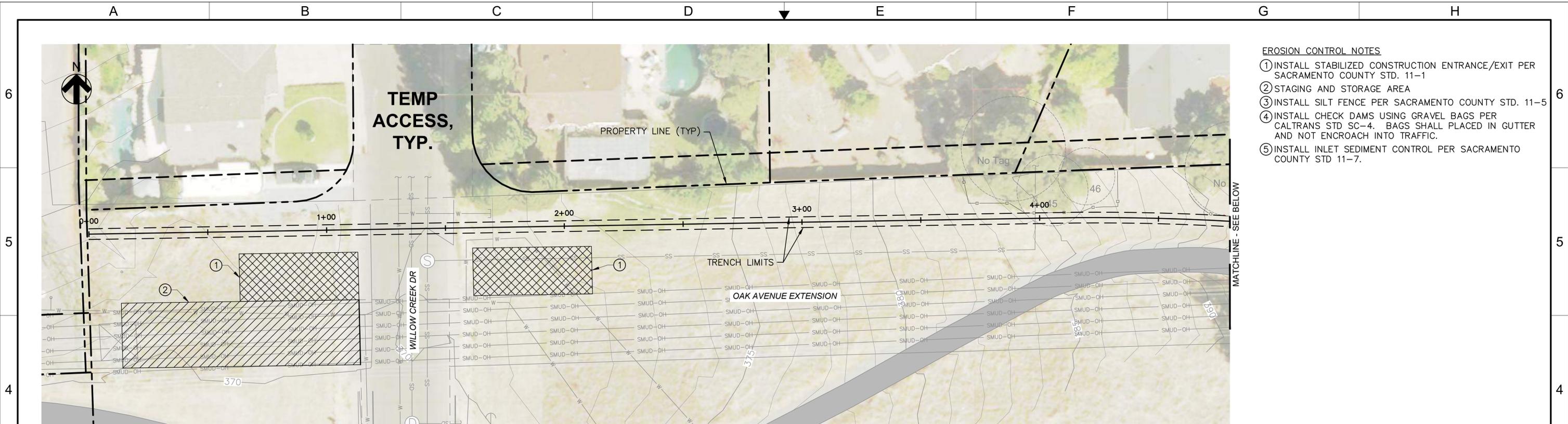
CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

TREE PROTECTION PLAN - 10

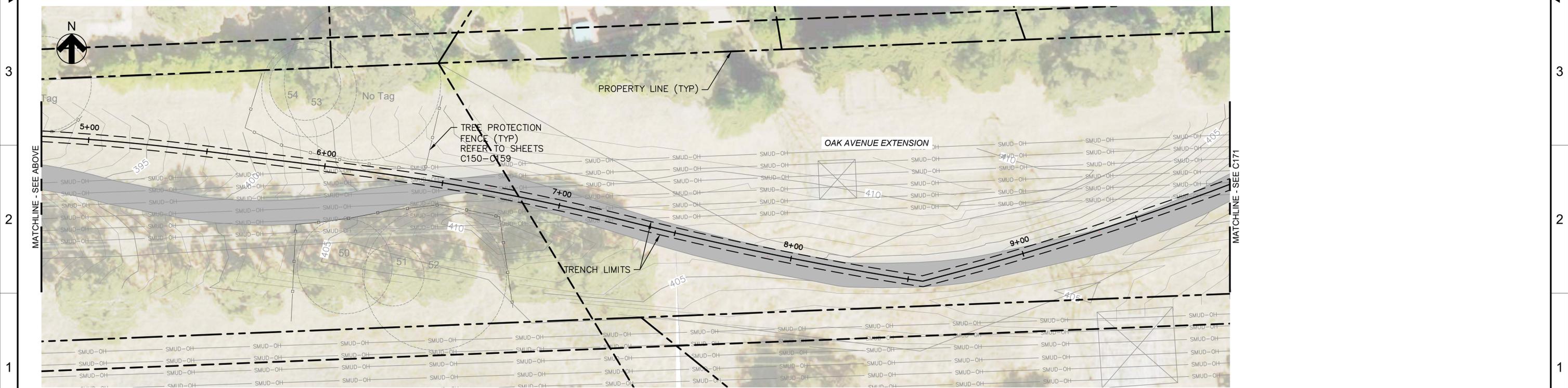
REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
5/3/2024

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE  
**C159** SHEET 56 OF 86  
DRAWING NUMBER



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
  - ③ INSTALL SILT FENCE PER SACRAMENTO COUNTY STD. 11-5
  - ④ INSTALL CHECK DAMS USING GRAVEL BAGS PER CALTRANS STD SC-4. BAGS SHALL PLACED IN GUTTER AND NOT ENCRACH INTO TRAFFIC.
  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

**HydroScience**  
741 ALLSTON WAY  
BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

DRAWN BY: MAF  
DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

CHECKED BY: CML  
PCE: C59049 DATE: 6/3/24

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

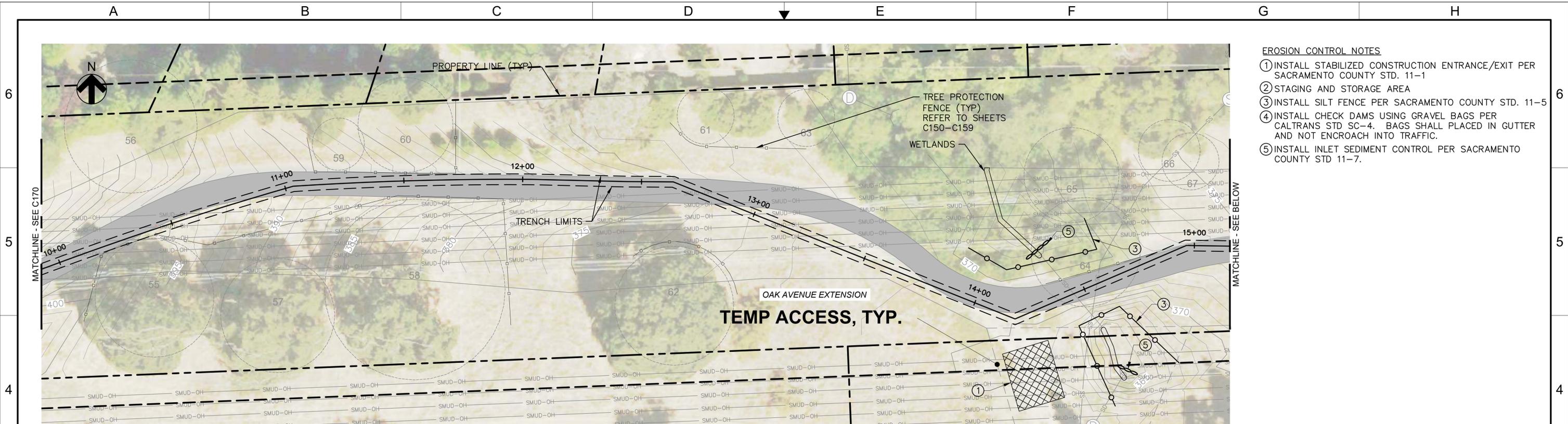
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EROSION CONTROL PLAN - 1



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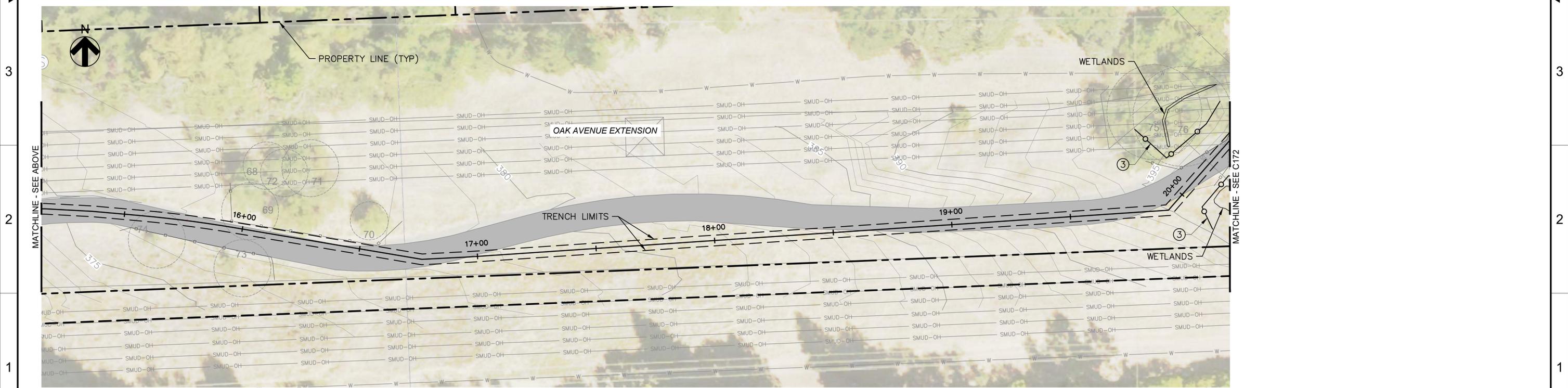
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C170 SHEET 57 OF 86



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
  - ③ INSTALL SILT FENCE PER SACRAMENTO COUNTY STD. 11-5
  - ④ INSTALL CHECK DAMS USING GRAVEL BAGS PER CALTRANS STD SC-4. BAGS SHALL PLACED IN GUTTER AND NOT ENCR OACH INTO TRAFFIC.
  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

**HydroScience**  
741 ALLSTON WAY  
BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

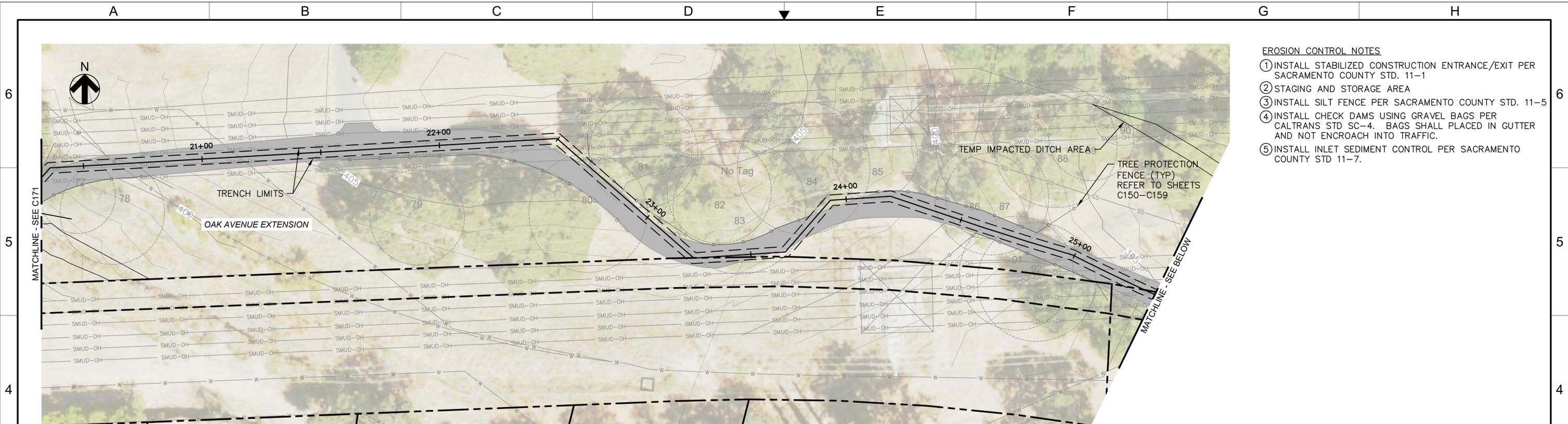
CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 2

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
5/3/2024

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE  
C171 SHEET 58 OF 86



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
  - ③ INSTALL SILT FENCE PER SACRAMENTO COUNTY STD. 11-5
  - ④ INSTALL CHECK DAMS USING GRAVEL BAGS PER CALTRANS STD SC-4. BAGS SHALL PLACED IN GUTTER AND NOT ENCR OACH INTO TRAFFIC.
  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

**HydroScience**  
741 ALLSTON WAY  
BERKELEY, CA 94710  
510.540.7100 hydroscience.com

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

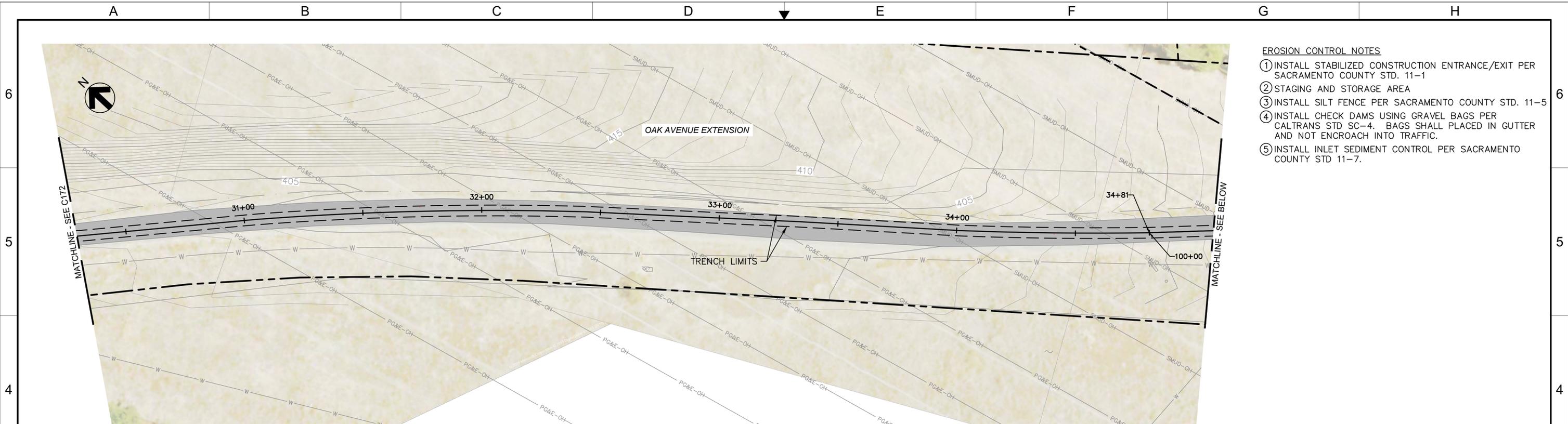
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FOLSOM, CA 95630

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PROJECT

ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 3

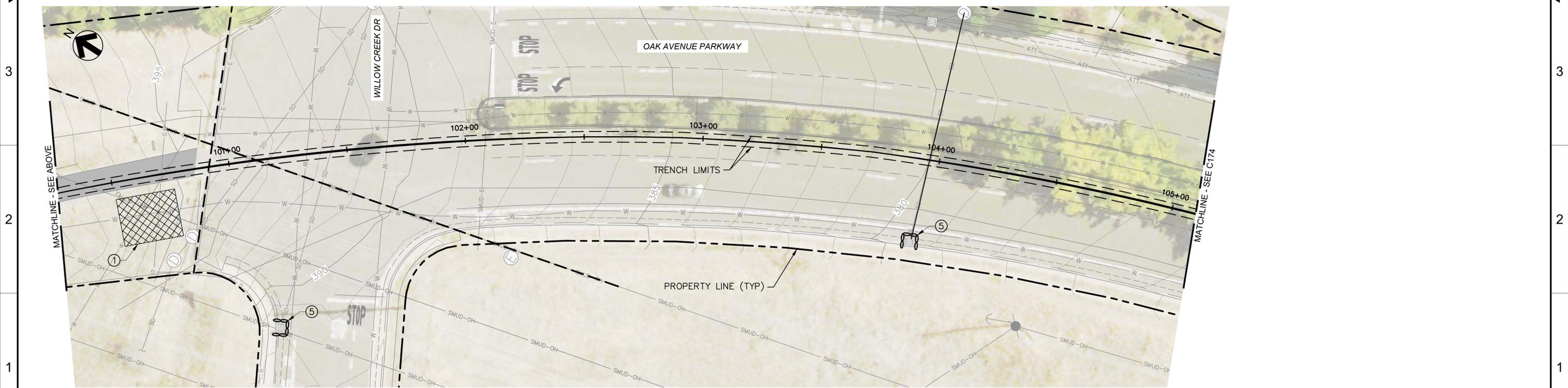
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CIVIL  
STATE OF CALIFORNIA  
C59049

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C172 SHEET 59 OF 86



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
 SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
  - ③ INSTALL SILT FENCE PER SACRAMENTO COUNTY STD. 11-5
  - ④ INSTALL CHECK DAMS USING GRAVEL BAGS PER CALTRANS STD SC-4. BAGS SHALL PLACED IN GUTTER AND NOT ENCROACH INTO TRAFFIC.
  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
 SCALE: 1" = 20'-0"

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 FOLSOM, CA 95630

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 PCE: C59049 DATE: 6/3/24

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ASBESTOS DUST MITIGATION AND  
 EROSION CONTROL PLAN - 4

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 STATE OF CALIFORNIA  
 C59049  
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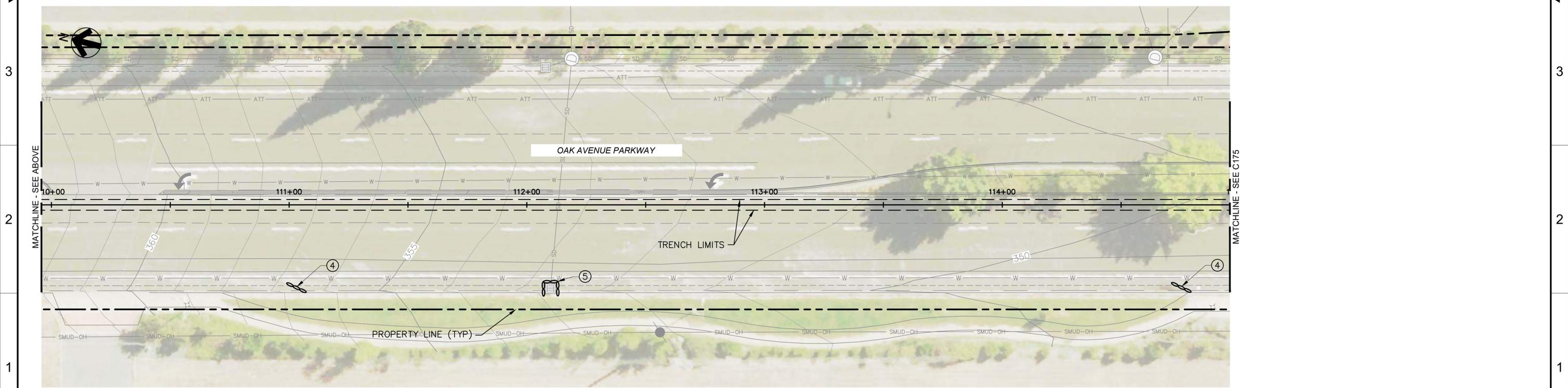
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C173 SHEET 60 OF 86



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
  - ③ INSTALL SILT FENCE PER SACRAMENTO COUNTY STD. 11-5
  - ④ INSTALL CHECK DAMS USING GRAVEL BAGS PER CALTRANS STD SC-4. BAGS SHALL PLACED IN GUTTER AND NOT ENCR OACH INTO TRAFFIC.
  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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**CITY OF FOLSOM**  
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50 NATOMAS STREET  
FOLSOM, CA 95630

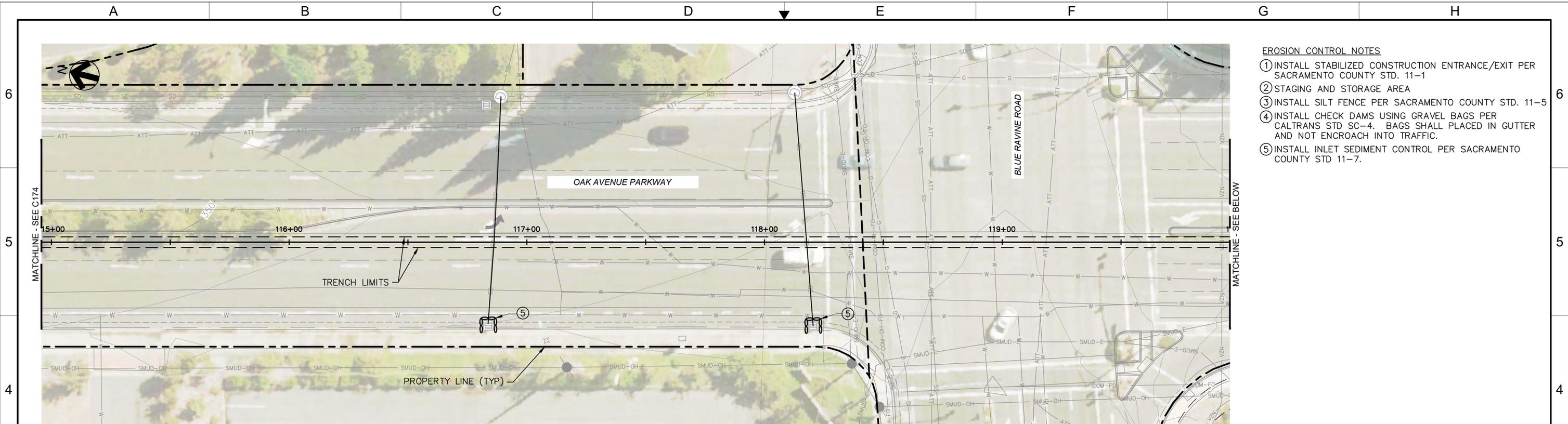
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ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 5

REGISTERED PROFESSIONAL ENGINEER  
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STATE OF CALIFORNIA  
C59049  
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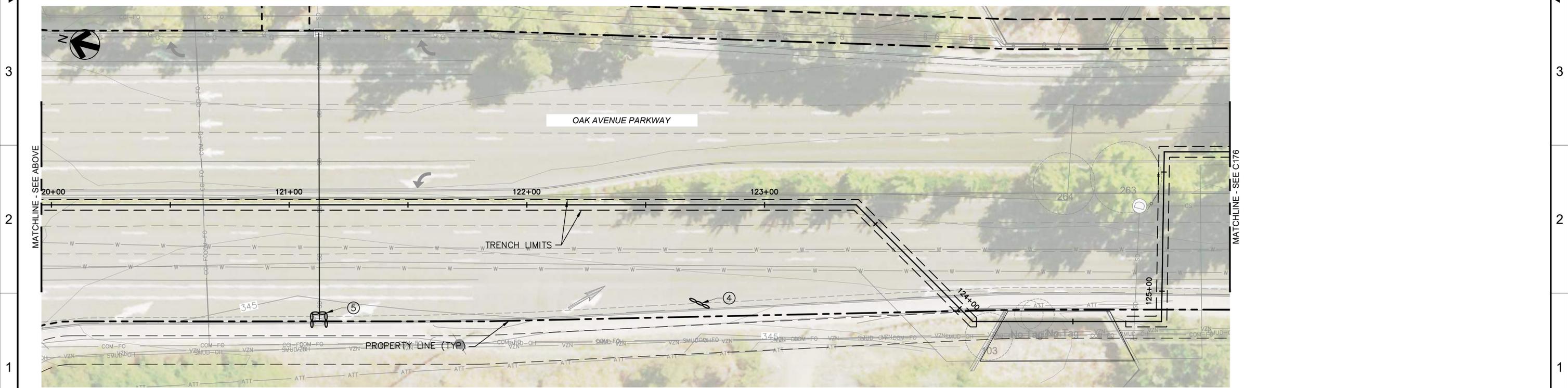
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C174 SHEET 61 OF 86

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**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
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  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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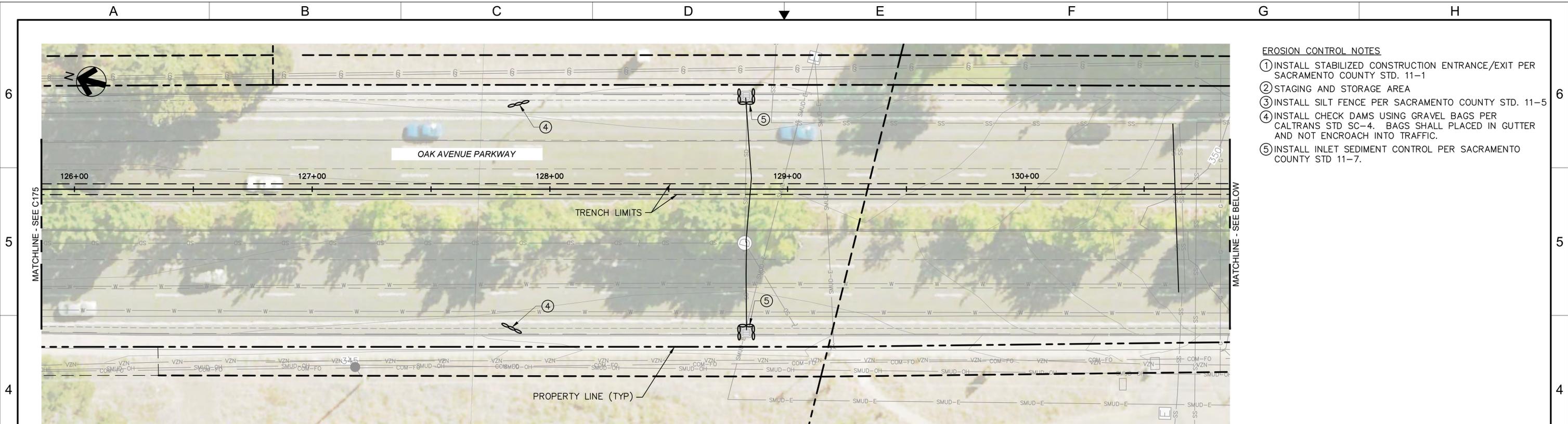
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FOLSOM, CA 95630

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TRANSMISSION PIPELINE  
PROJECT

ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 6

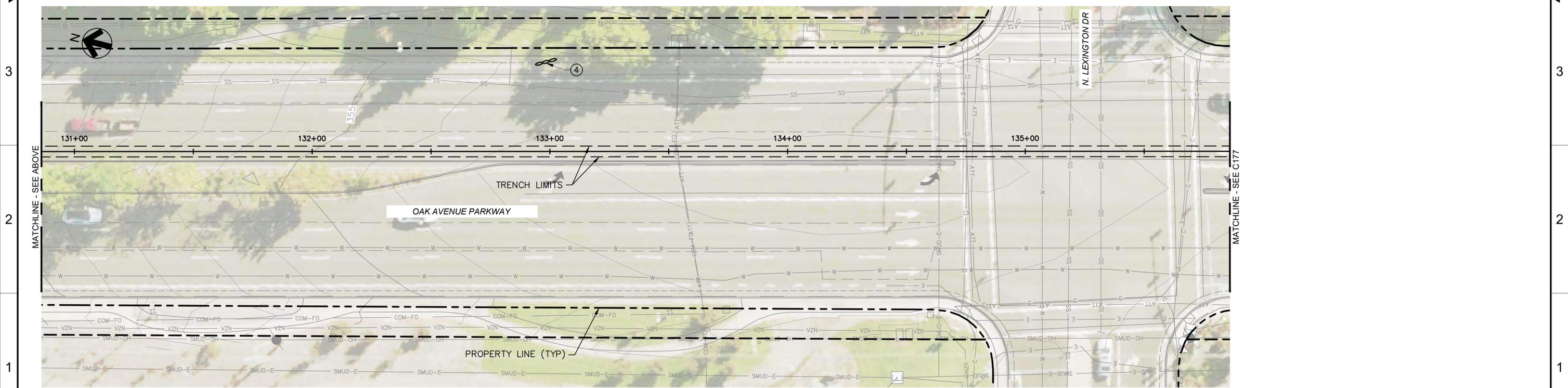
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C175 SHEET 62 OF 86



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
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**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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PROJECT

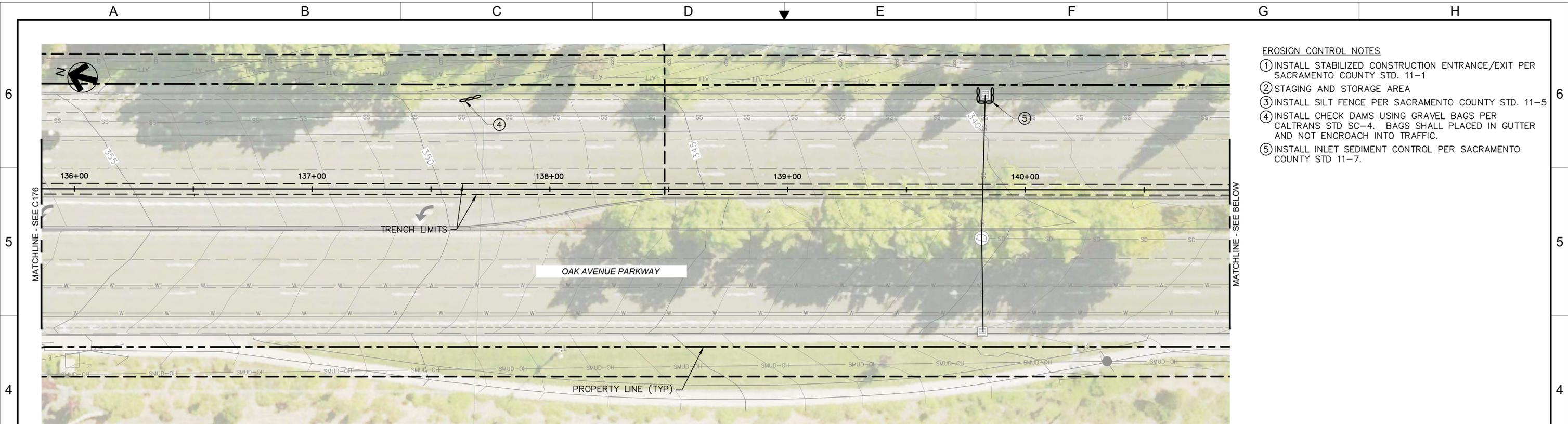
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EROSION CONTROL PLAN - 7

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- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
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**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
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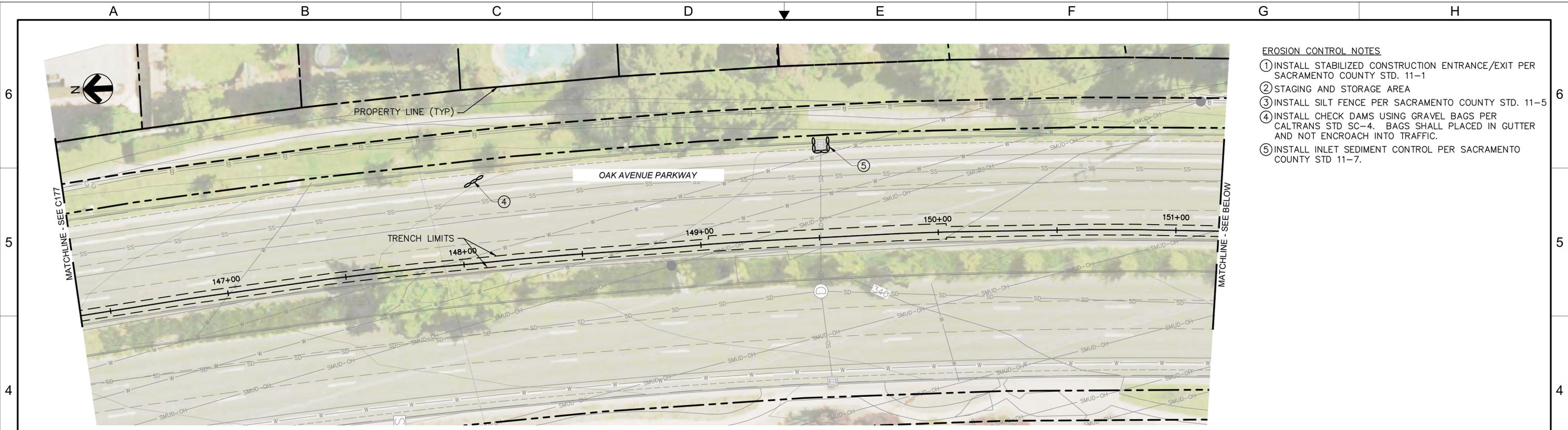
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TRANSMISSION PIPELINE  
PROJECT

ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 8

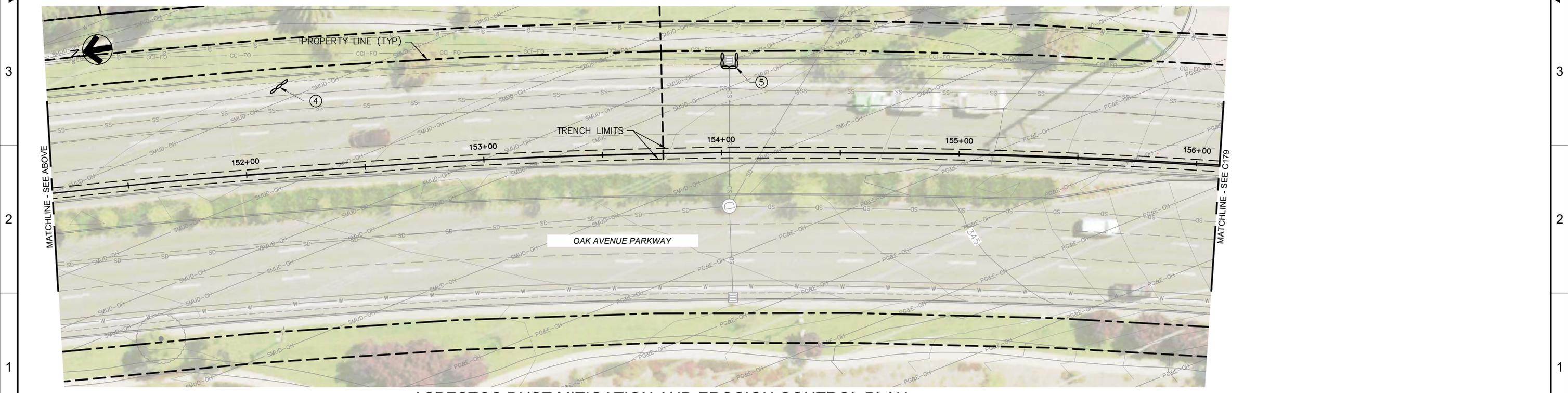
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C177 SHEET 64 OF 86  
DRAWING NUMBER



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
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**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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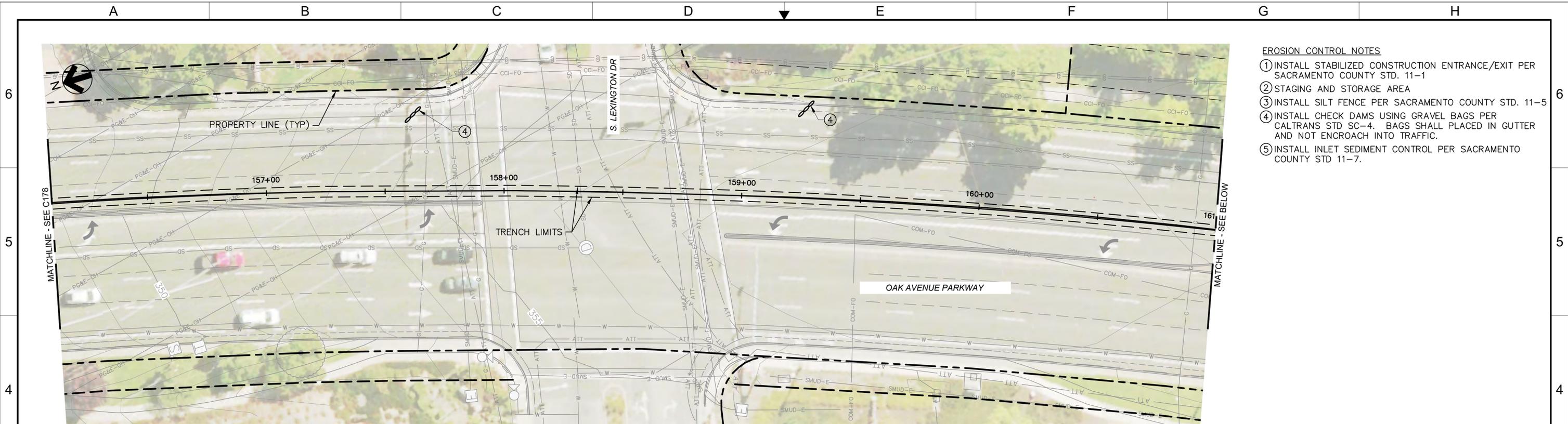
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FOLSOM, CA 95630

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PROJECT

ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 9

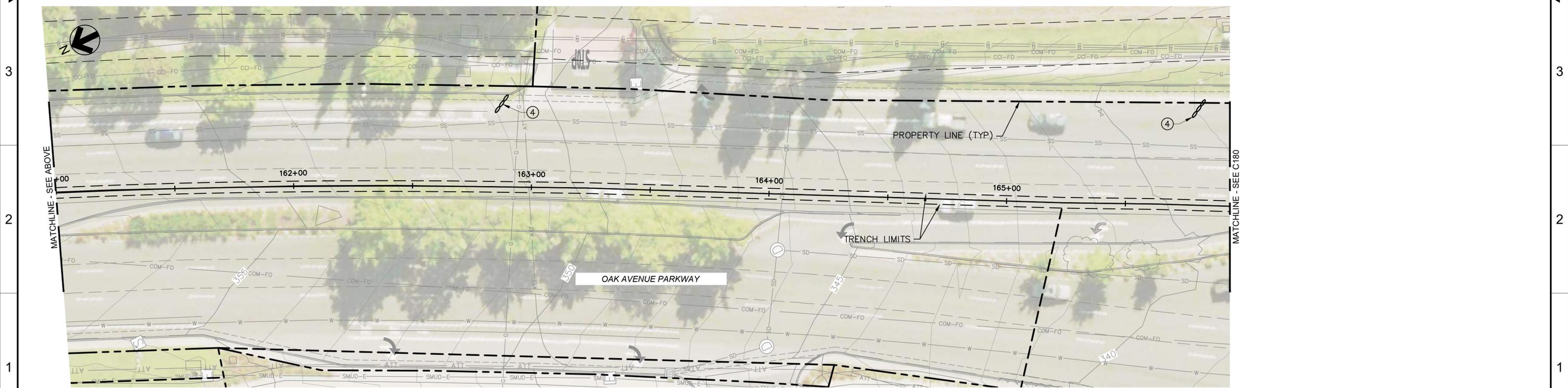
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C178 SHEET 65 OF 86  
DRAWING NUMBER



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
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  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 10

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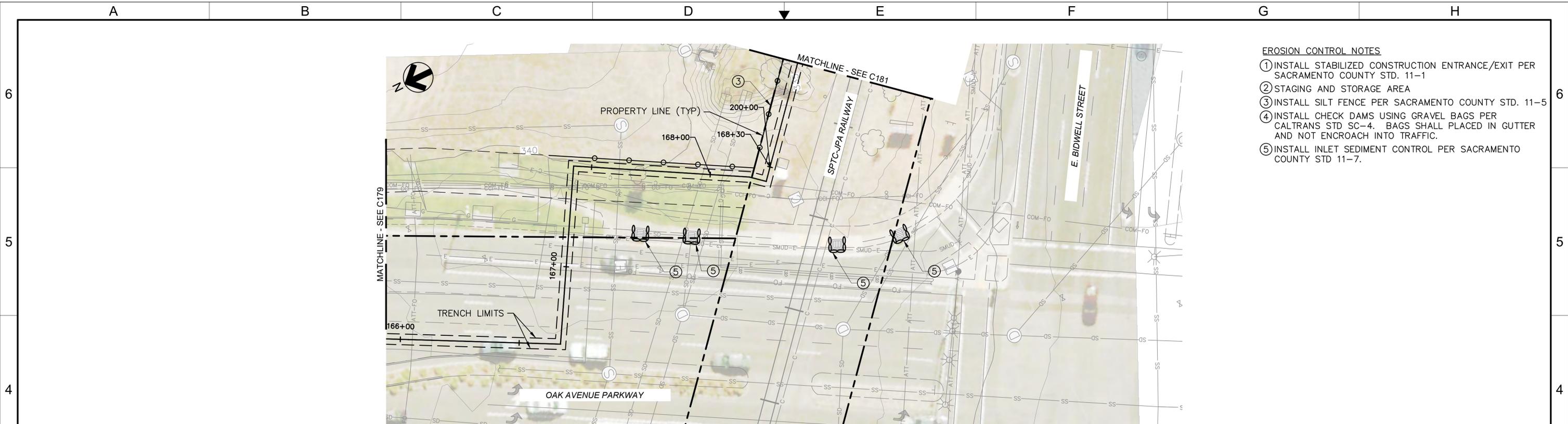


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**C179** SHEET 66 OF 86

DRAWING NUMBER



- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
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**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
 SCALE: 1" = 20'-0"

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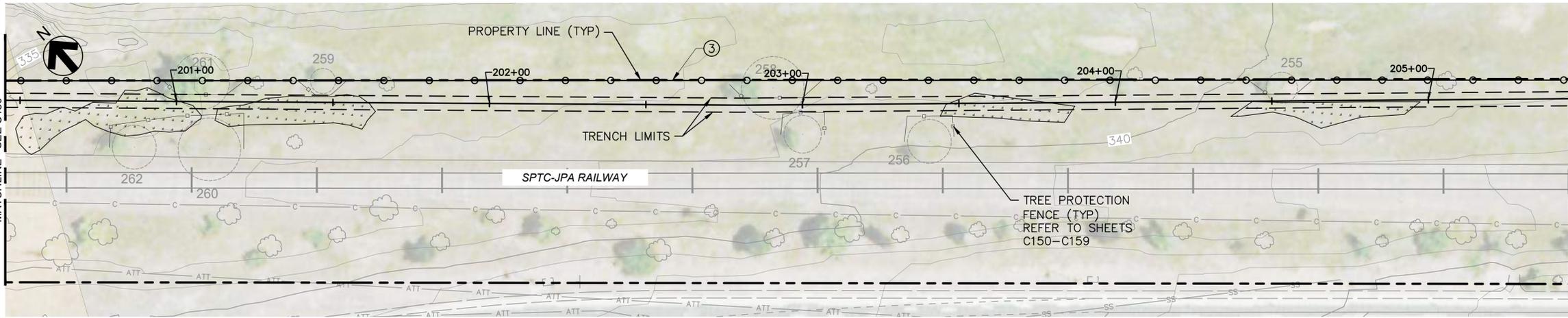
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ASBESTOS DUST MITIGATION AND  
 EROSION CONTROL PLAN - 11



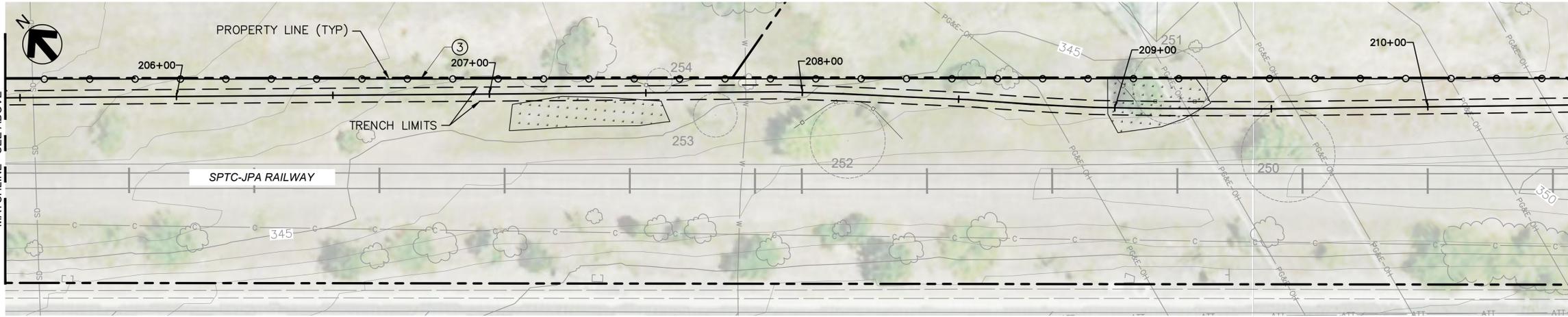
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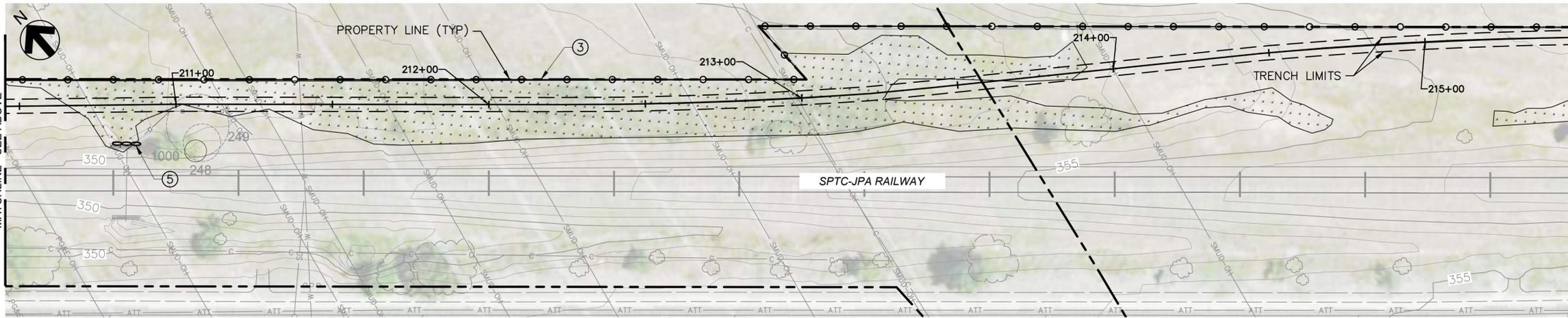


**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
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  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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PCE: C59049 DATE: 6/3/24

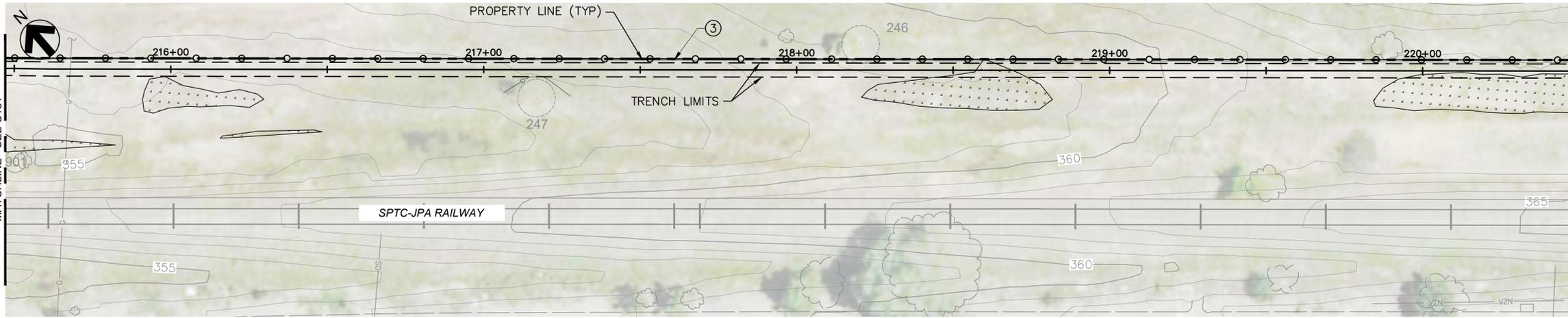
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ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 12



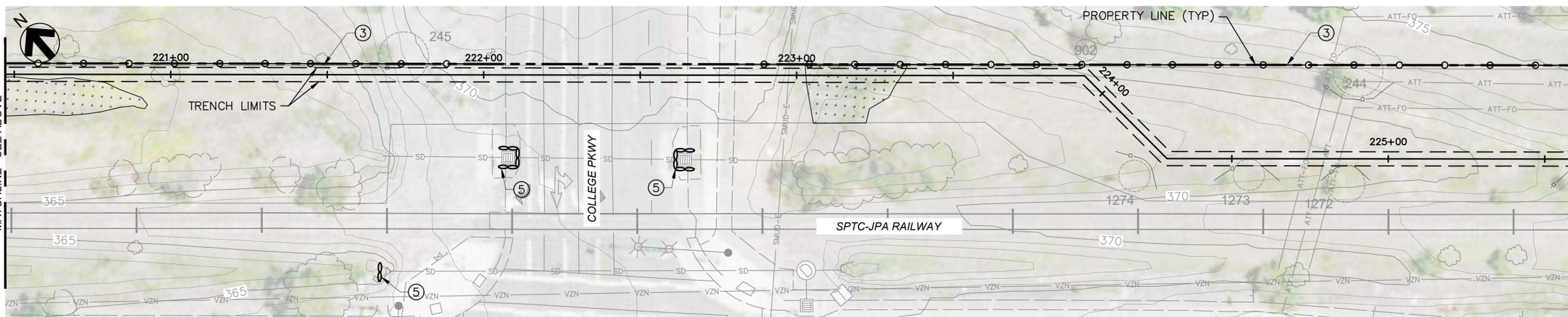
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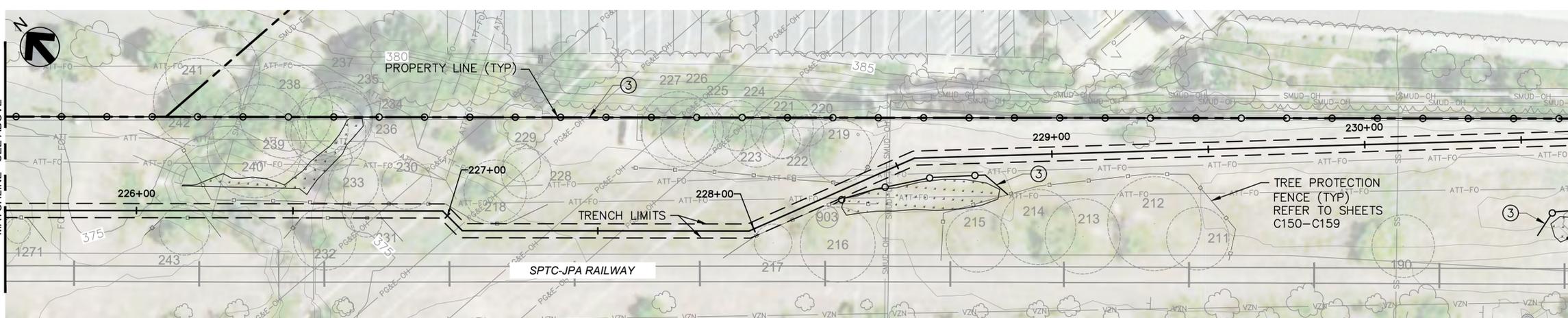


**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
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  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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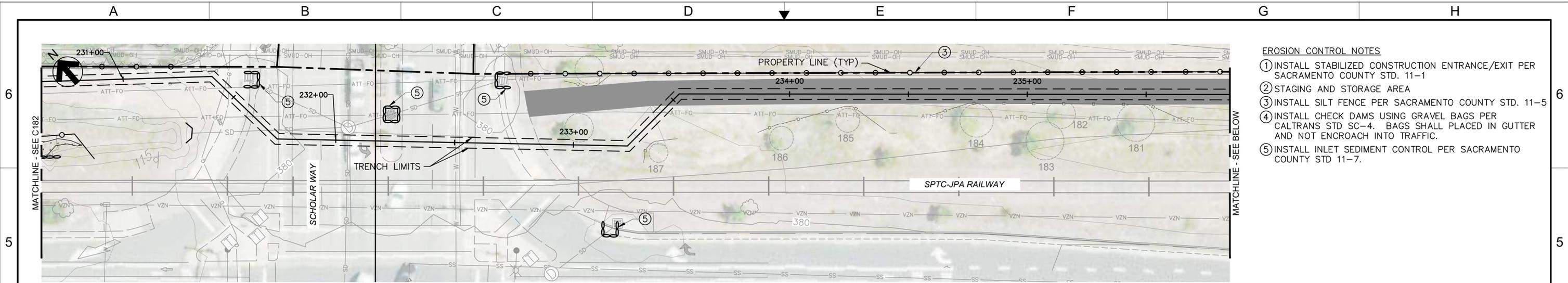
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FOLSOM, CA 95630

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PROJECT

ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 13

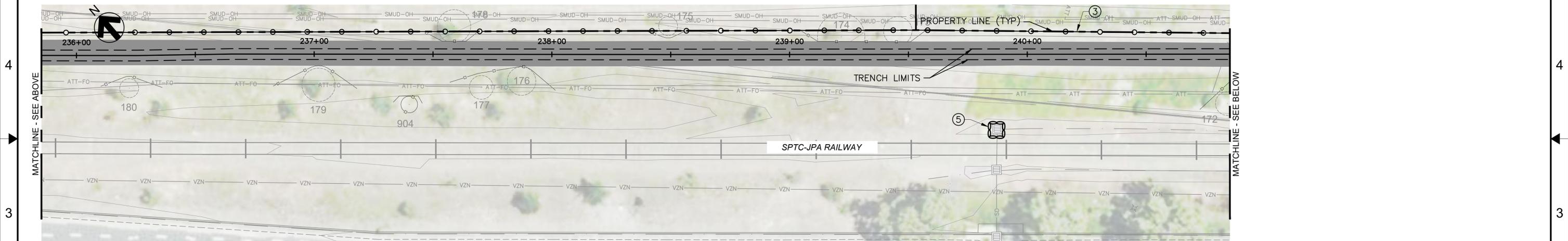


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SHEET 69 OF 86

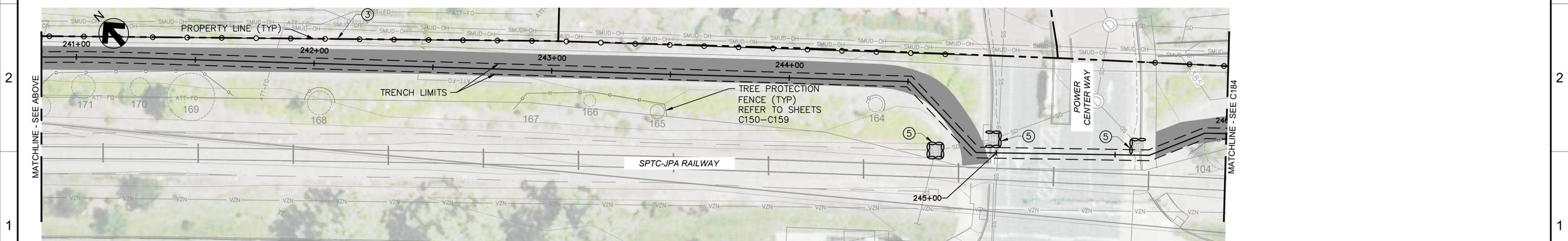


**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
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**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
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**CITY OF FOLSOM**  
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FOLSOM, CA 95630

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PCE: C59049 DATE: 6/3/24

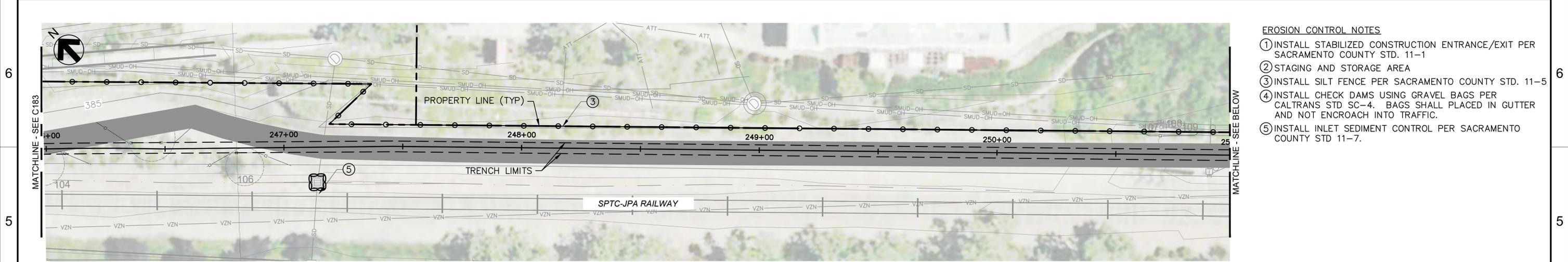
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ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 14

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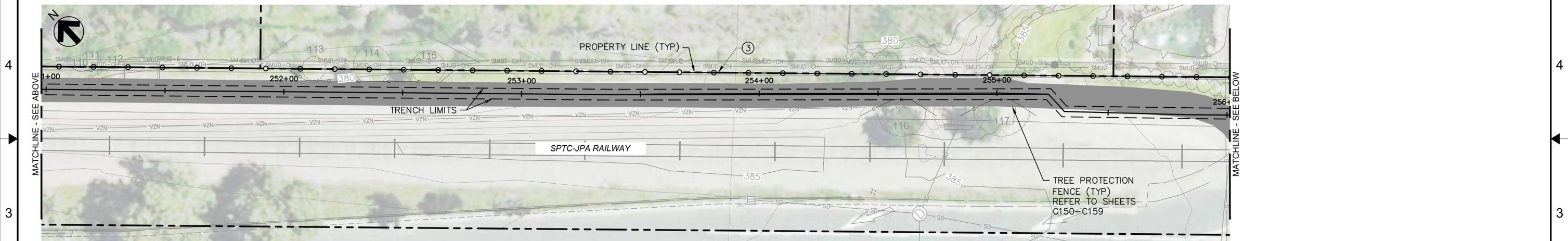
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70 OF 86

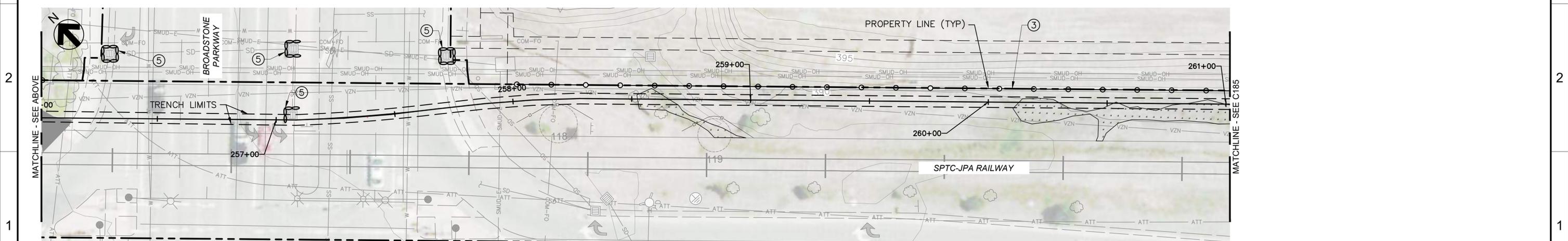


**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
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**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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TRANSMISSION PIPELINE  
PROJECT

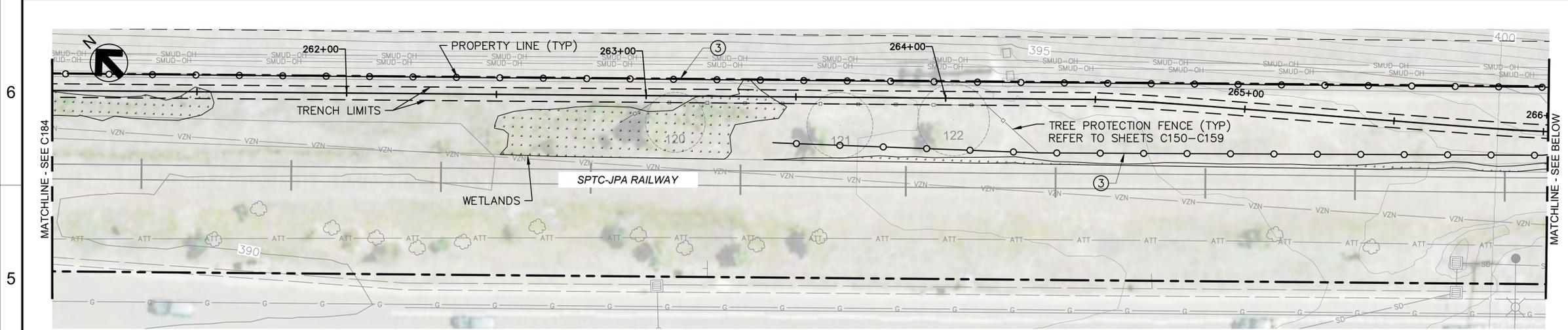
ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 15

REGISTERED PROFESSIONAL ENGINEER  
CALIFORNIA  
C59049  
CIVIL  
STATE OF CALIFORNIA  
5/5/2024

PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1 INCH AT FULL SCALE  
0" 12" 1"  
C184 SHEET 71 OF 86

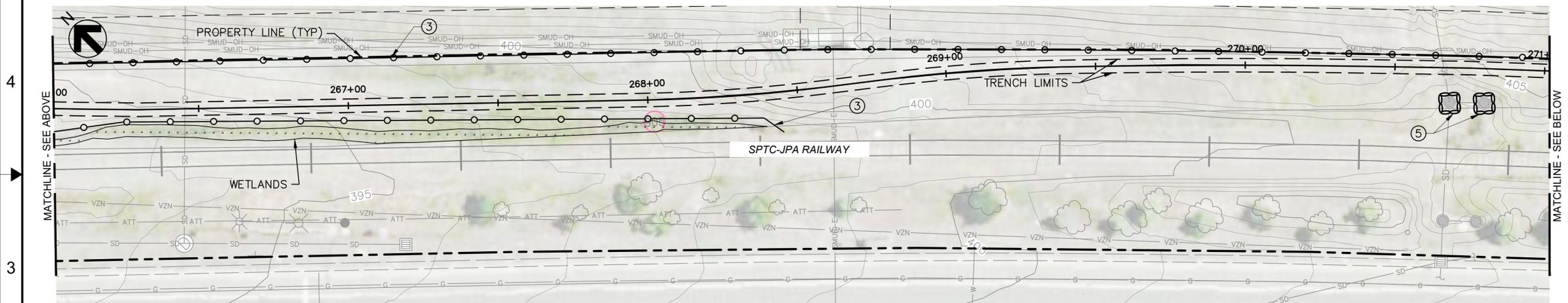
REGISTERED PROFESSIONAL ENGINEER  
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C59049  
CIVIL  
STATE OF CALIFORNIA  
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PAPER SIZE: 22x34 (ANSI D)  
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0" 12" 1"  
C184 SHEET 71 OF 86

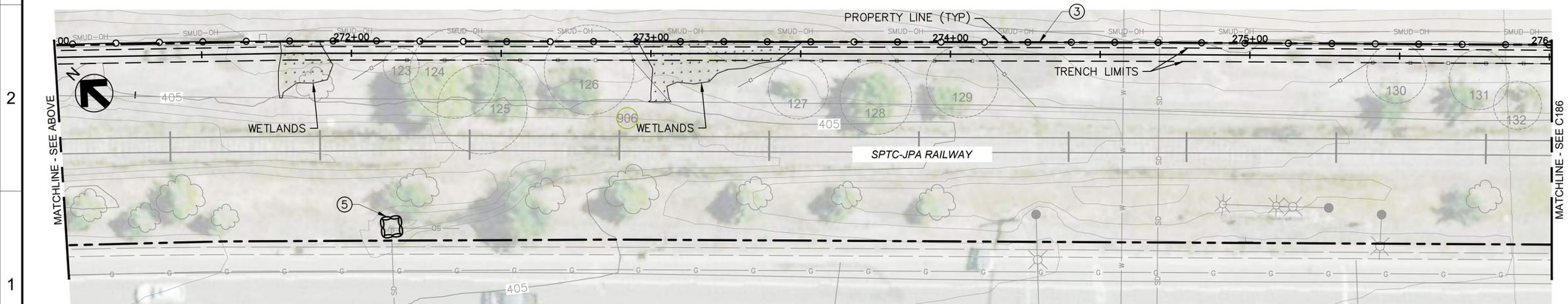


**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
  - ③ INSTALL SILT FENCE PER SACRAMENTO COUNTY STD. 11-5
  - ④ INSTALL CHECK DAMS USING GRAVEL BAGS PER CALTRANS STD SC-4. BAGS SHALL PLACED IN GUTTER AND NOT ENCR OACH INTO TRAFFIC.
  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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**CITY OF FOLSOM**  
DISTINCTIVE BY NATURE

CITY OF FOLSOM  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

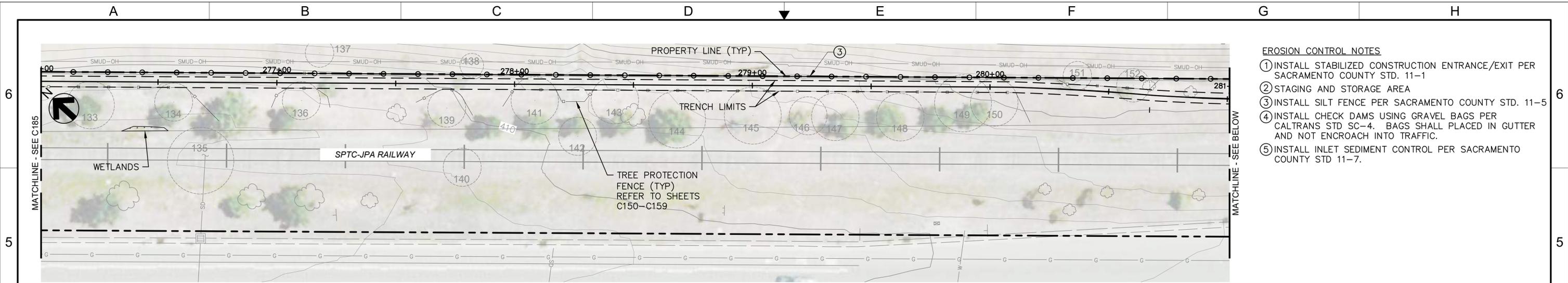
ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 16

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CIVIL  
STATE OF CALIFORNIA  
C59049  
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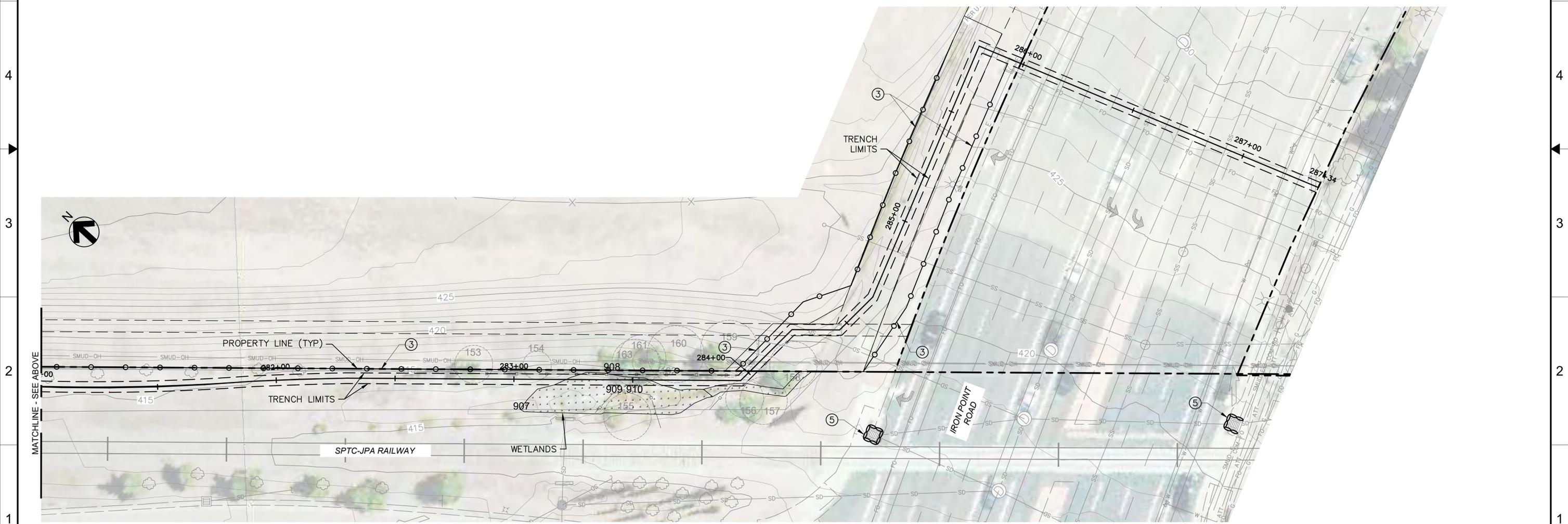
REVISIONS

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DESIGN BY: CML PCE: C59049 DATE: 6/3/24  
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- EROSION CONTROL NOTES**
- ① INSTALL STABILIZED CONSTRUCTION ENTRANCE/EXIT PER SACRAMENTO COUNTY STD. 11-1
  - ② STAGING AND STORAGE AREA
  - ③ INSTALL SILT FENCE PER SACRAMENTO COUNTY STD. 11-5
  - ④ INSTALL CHECK DAMS USING GRAVEL BAGS PER CALTRANS STD SC-4. BAGS SHALL PLACED IN GUTTER AND NOT ENCR OACH INTO TRAFFIC.
  - ⑤ INSTALL INLET SEDIMENT CONTROL PER SACRAMENTO COUNTY STD 11-7.

**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"



**ASBESTOS DUST MITIGATION AND EROSION CONTROL PLAN**  
SCALE: 1" = 20'-0"

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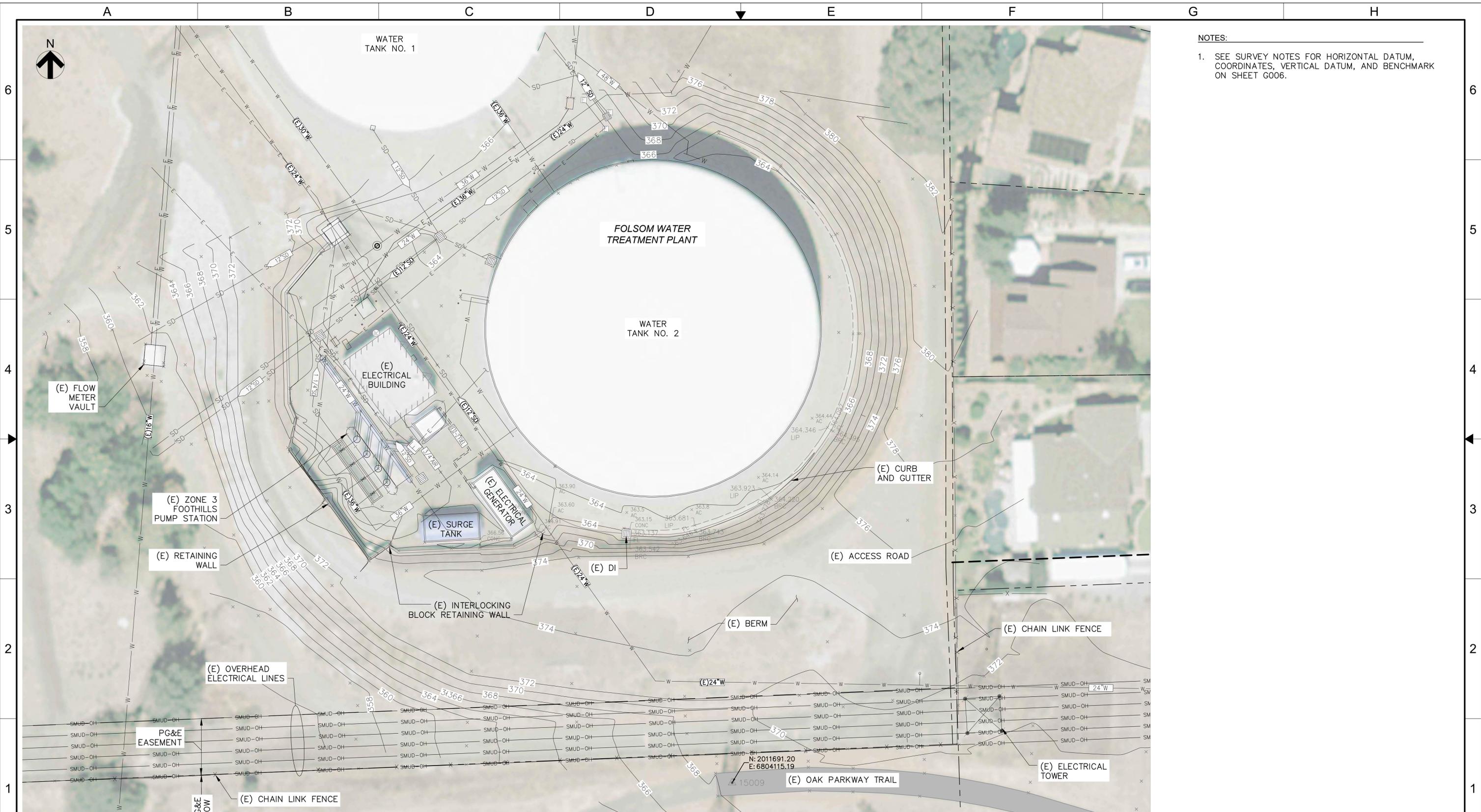
CITY OF FOLSOM  
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FOLSOM, CA 95630

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TRANSMISSION PIPELINE  
PROJECT

ASBESTOS DUST MITIGATION AND  
EROSION CONTROL PLAN - 17

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STATE OF CALIFORNIA  
C59049  
5/3/2024

PAPER SIZE: 22x34 (ANSI D)  
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C186 SHEET 73 OF 86



**NOTES:**  
 1. SEE SURVEY NOTES FOR HORIZONTAL DATUM, COORDINATES, VERTICAL DATUM, AND BENCHMARK ON SHEET G006.

**EXISTING CONDITIONS**  
 SCALE: 1" = 20'-0"

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**CITY OF FOLSOM**  
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 FOLSOM, CA 95630

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 PCE: C59049 DATE: 6/3/24

**CITY OF FOLSOM**  
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 FOLSOM, CA 95630

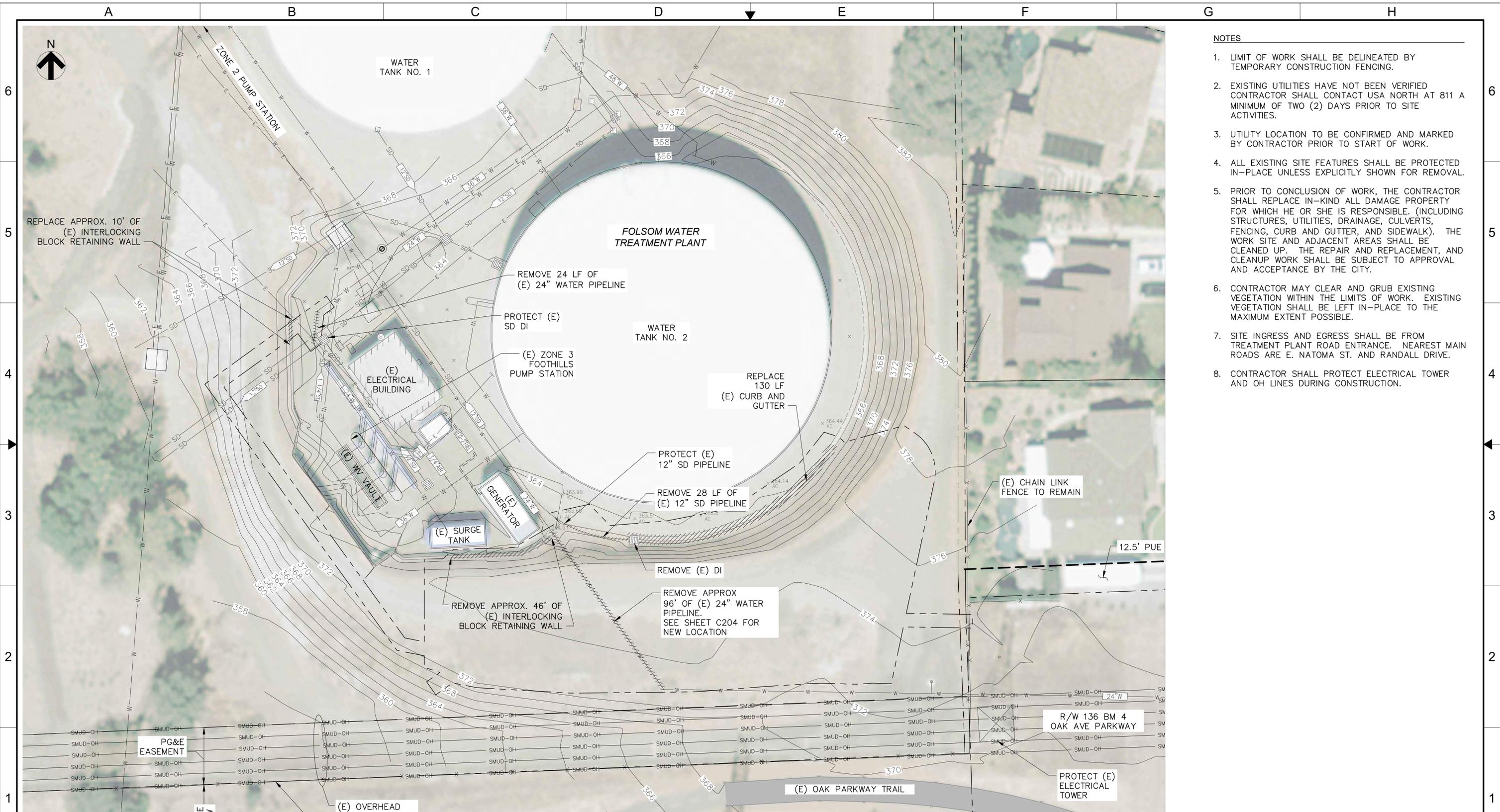
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 TRANSMISSION PIPELINE  
 PROJECT

WATER TREATMENT PLANT  
 EXISTING CONDITIONS

REGISTERED PROFESSIONAL ENGINEER  
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C200 SHEET 74 OF 86  
 DRAWING NUMBER



- NOTES**
1. LIMIT OF WORK SHALL BE DELINEATED BY TEMPORARY CONSTRUCTION FENCING.
  2. EXISTING UTILITIES HAVE NOT BEEN VERIFIED. CONTRACTOR SHALL CONTACT USA NORTH AT 811 A MINIMUM OF TWO (2) DAYS PRIOR TO SITE ACTIVITIES.
  3. UTILITY LOCATION TO BE CONFIRMED AND MARKED BY CONTRACTOR PRIOR TO START OF WORK.
  4. ALL EXISTING SITE FEATURES SHALL BE PROTECTED IN-PLACE UNLESS EXPLICITLY SHOWN FOR REMOVAL.
  5. PRIOR TO CONCLUSION OF WORK, THE CONTRACTOR SHALL REPLACE IN-KIND ALL DAMAGE PROPERTY FOR WHICH HE OR SHE IS RESPONSIBLE. (INCLUDING STRUCTURES, UTILITIES, DRAINAGE, CULVERTS, FENCING, CURB AND GUTTER, AND SIDEWALK). THE WORK SITE AND ADJACENT AREAS SHALL BE CLEANED UP. THE REPAIR AND REPLACEMENT, AND CLEANUP WORK SHALL BE SUBJECT TO APPROVAL AND ACCEPTANCE BY THE CITY.
  6. CONTRACTOR MAY CLEAR AND GRUB EXISTING VEGETATION WITHIN THE LIMITS OF WORK. EXISTING VEGETATION SHALL BE LEFT IN-PLACE TO THE MAXIMUM EXTENT POSSIBLE.
  7. SITE INGRESS AND EGRESS SHALL BE FROM TREATMENT PLANT ROAD ENTRANCE. NEAREST MAIN ROADS ARE E. NATOMA ST. AND RANDALL DRIVE.
  8. CONTRACTOR SHALL PROTECT ELECTRICAL TOWER AND OH LINES DURING CONSTRUCTION.

**DEMOLITION & PROTECTION PLAN**  
SCALE: 1" = 20'-0"

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PCE: C59049 DATE: 6/3/24

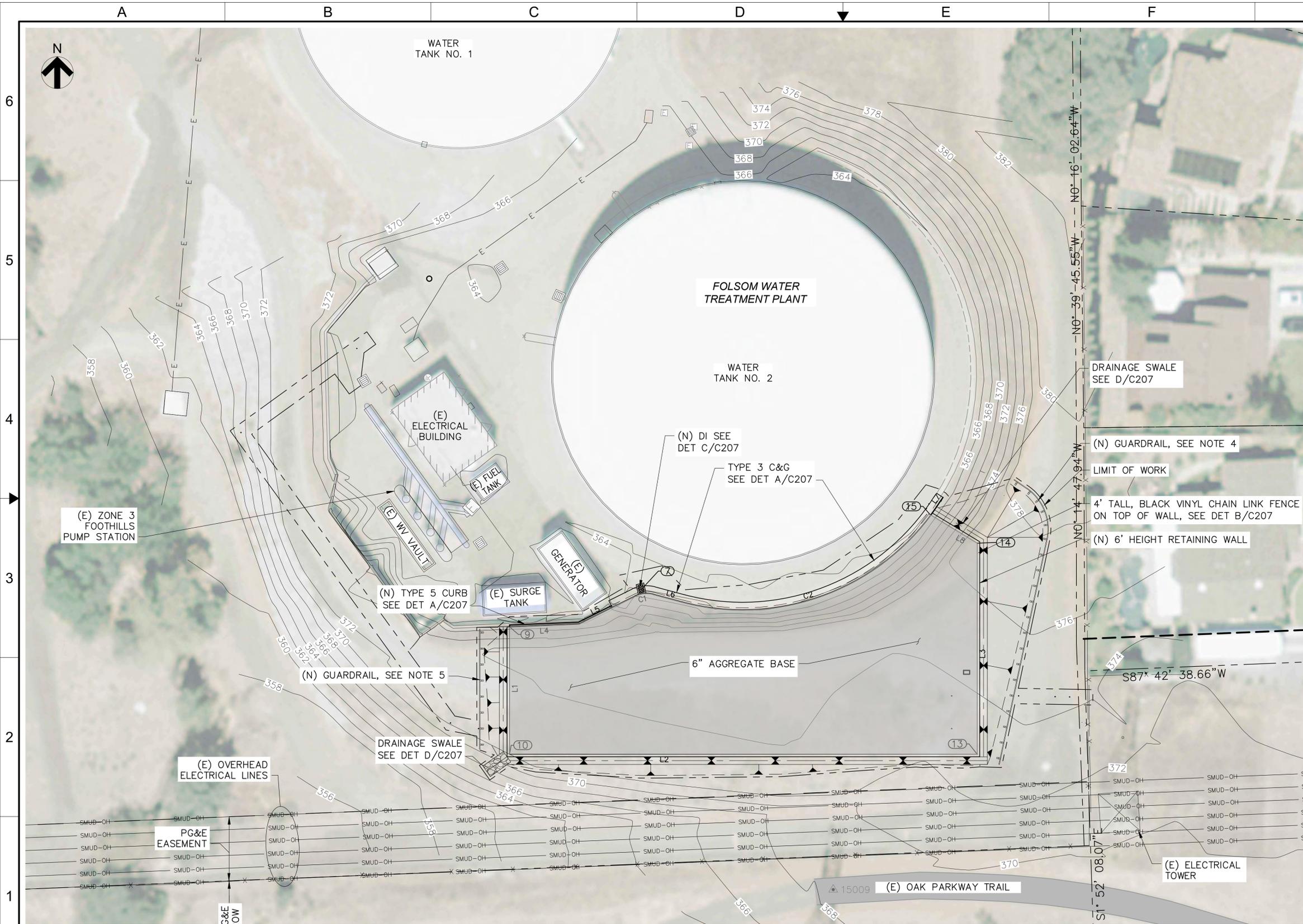
**CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT**

**WATER TREATMENT PLANT  
DEMOLITION & PROTECTION PLAN**



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**C201** SHEET 75 OF 86  
DRAWING NUMBER



- NOTE**
1. CONTRACTOR SHALL FIELD VERIFY UNDERGROUND UTILITIES PRIOR TO BEGINNING WORK.
  2. CONTRACTOR SHALL FIELD VERIFY EXISTING DIMENSIONS PRIOR TO FABRICATION AND INSTALLATION.
  3. CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF EXISTING STRUCTURES AND FACILITIES THROUGHOUT THE CONSTRUCTION PERIOD, UNLESS SPECIFICALLY IDENTIFIED FOR REMOVAL OR DEMOLITION. CONTRACTOR SHALL REPAIR ALL DAMAGED IMPROVEMENTS TO PRE-PROJECT CONDITIONS AND THE CITY'S ACCEPTANCE.
  4. INSTALL GUARDRAIL, APPROX 119 FEET. SEE DET E/C207.
  5. INSTALL GUARDRAIL, APPROX 47 FEET. SEE DET E/C207.

CURVE TABLE			
CURVE #	LENGTH	RADIUS	DELTA
C1	7.20	10.00	41.25
C2	115.63	91.83	72.14

LINE TABLE		
LINE #	LENGTH	DIRECTION
L1	49.70	S0° 00' 00.00"E
L2	183.02	N90° 00' 00.00"W
L3	82.39	S0° 00' 00.00"E
L4	27.18	S87° 37' 50.71"W
L5	24.53	N63° 37' 55.39"E
L6	11.79	S75° 07' 18.04"E
L7	2.18	N36° 06' 31.13"E
L8	21.16	N58° 53' 45.06"W

HORIZONTAL CONTROL			
ID #	NORTHING	EASTING	DESCRIPTION
7	2011808.40	6804040.09	DI
9	2011793.76	6803988.57	WALL CORNER
10	2011744.20	6803988.52	WALL CORNER
13	2011744.06	6804171.54	WALL CORNER
14	2011826.45	6804171.54	WALL CORNER
15	2011837.49	6804153.23	WALL CORNER

**SITE PLAN**  
SCALE: 1" = 20'-0"

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**CITY OF FOLSOM**  
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DATE: 6/3/24

DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24

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TRANSMISSION PIPELINE  
PROJECT

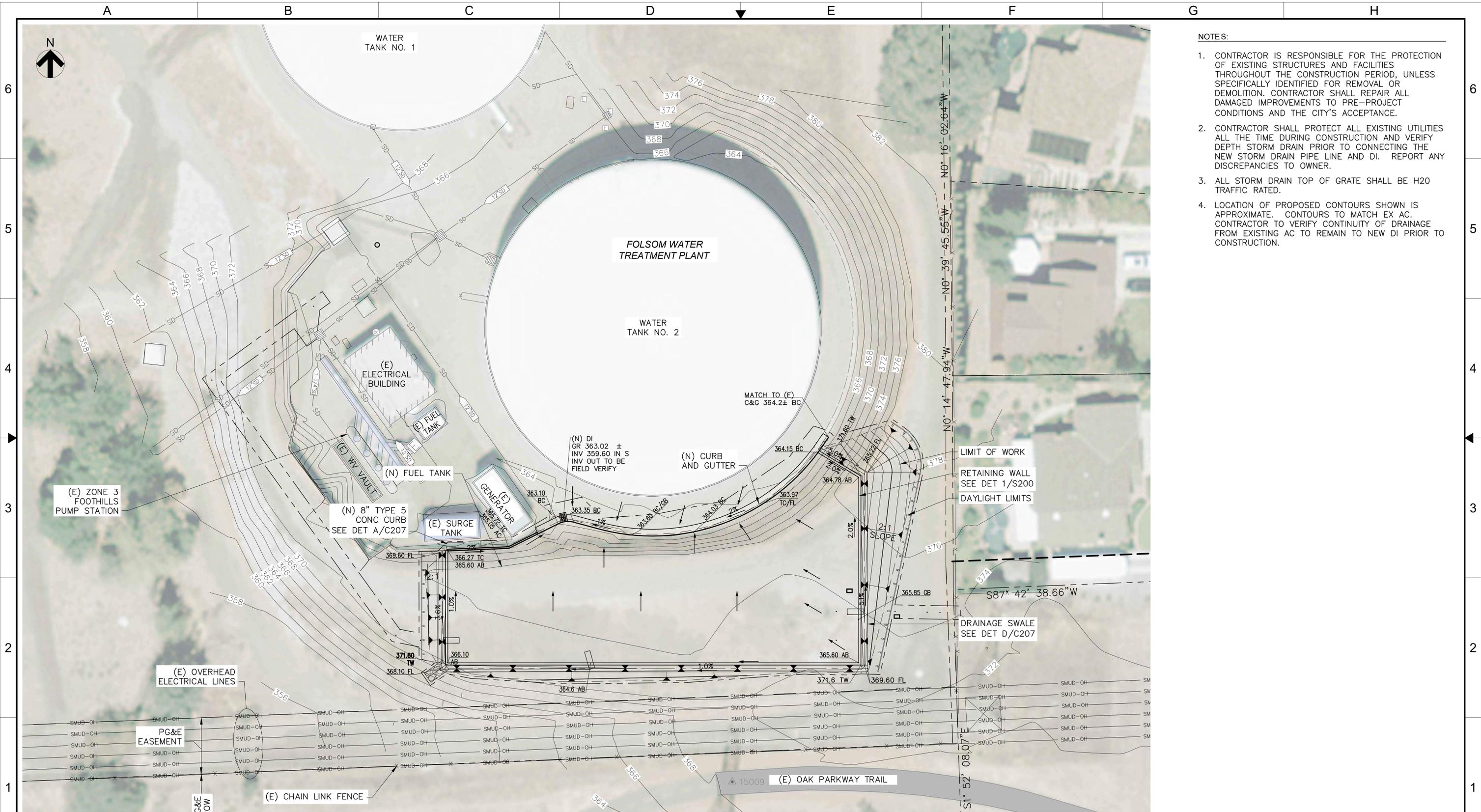
WATER TREATMENT PLANT  
HORIZONTAL CONTROL & PAVING  
PLAN

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049

PAPER SIZE: 22x34 (ANSI D)

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C202 SHEET 76 OF 86



- NOTES:**
1. CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF EXISTING STRUCTURES AND FACILITIES THROUGHOUT THE CONSTRUCTION PERIOD, UNLESS SPECIFICALLY IDENTIFIED FOR REMOVAL OR DEMOLITION. CONTRACTOR SHALL REPAIR ALL DAMAGED IMPROVEMENTS TO PRE-PROJECT CONDITIONS AND THE CITY'S ACCEPTANCE.
  2. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES ALL THE TIME DURING CONSTRUCTION AND VERIFY DEPTH STORM DRAIN PRIOR TO CONNECTING THE NEW STORM DRAIN PIPE LINE AND DI. REPORT ANY DISCREPANCIES TO OWNER.
  3. ALL STORM DRAIN TOP OF GRATE SHALL BE H20 TRAFFIC RATED.
  4. LOCATION OF PROPOSED CONTOURS SHOWN IS APPROXIMATE. CONTOURS TO MATCH EX AC. CONTRACTOR TO VERIFY CONTINUITY OF DRAINAGE FROM EXISTING AC TO REMAIN TO NEW DI PRIOR TO CONSTRUCTION.

**GRADING & DRAINAGE**  
SCALE: 1" = 20'-0"

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REV	DESCRIPTION	DATE

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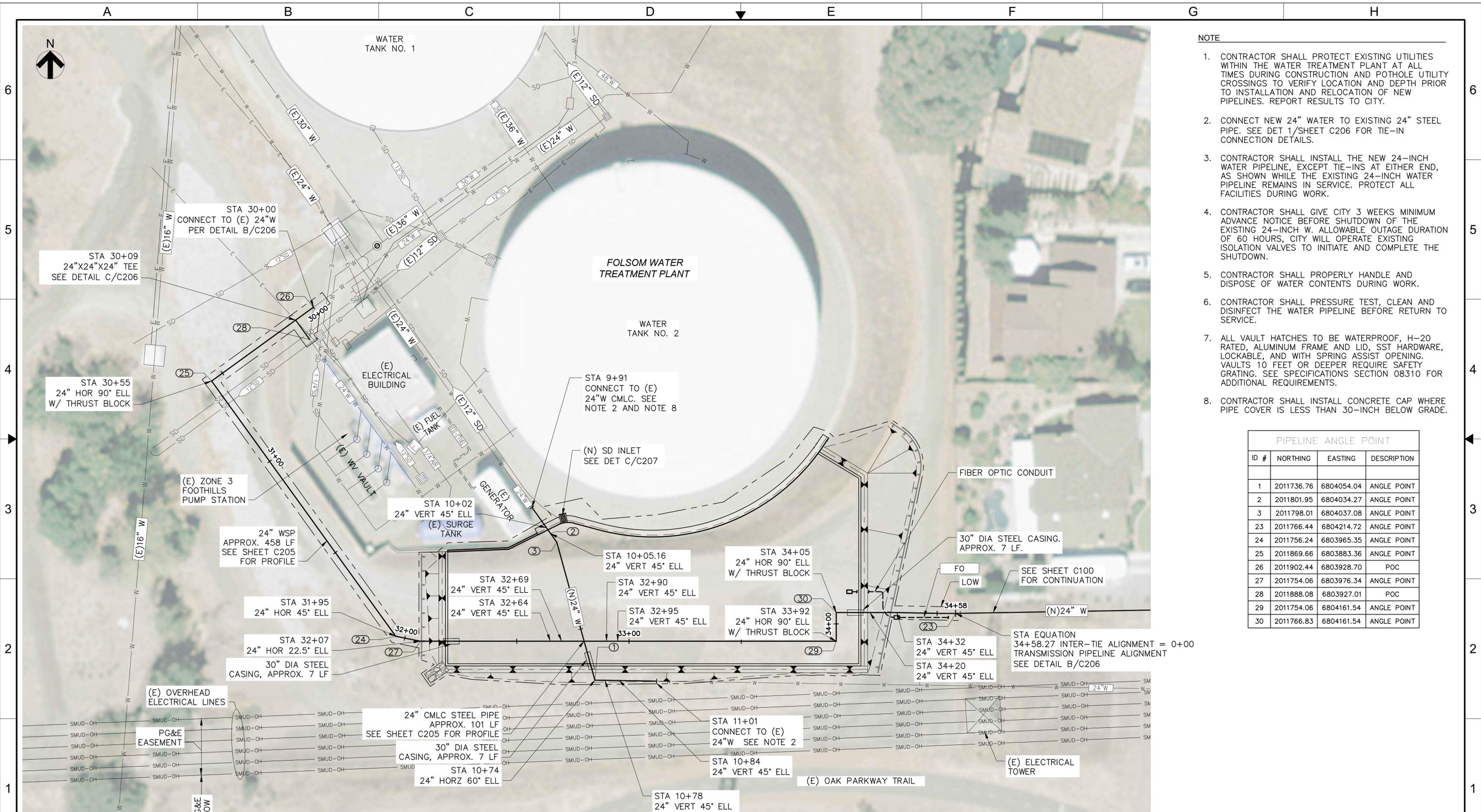
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 DESIGN BY: CML PCE: C59049 DATE: 6/3/24  
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**CFD NO. 18 - PHASE 2**  
**TRANSMISSION PIPELINE**  
**PROJECT**

**WATER TREATMENT PLANT**  
**GRADING & DRAINAGE PLAN**

PAPER SIZE: 22x34 (ANSI D)  
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**C203** SHEET 77 OF 86  
 DRAWING NUMBER



- NOTE**
- CONTRACTOR SHALL PROTECT EXISTING UTILITIES WITHIN THE WATER TREATMENT PLANT AT ALL TIMES DURING CONSTRUCTION AND POTHOLE UTILITY CROSSINGS TO VERIFY LOCATION AND DEPTH PRIOR TO INSTALLATION AND RELOCATION OF NEW PIPELINES. REPORT RESULTS TO CITY.
  - CONNECT NEW 24" WATER TO EXISTING 24" STEEL PIPE. SEE DET 1/SHEET C206 FOR TIE-IN CONNECTION DETAILS.
  - CONTRACTOR SHALL INSTALL THE NEW 24-INCH WATER PIPELINE, EXCEPT TIE-INS AT EITHER END, AS SHOWN WHILE THE EXISTING 24-INCH WATER PIPELINE REMAINS IN SERVICE. PROTECT ALL FACILITIES DURING WORK.
  - CONTRACTOR SHALL GIVE CITY 3 WEEKS MINIMUM ADVANCE NOTICE BEFORE SHUTDOWN OF THE EXISTING 24-INCH W. ALLOWABLE OUTAGE DURATION OF 60 HOURS. CITY WILL OPERATE EXISTING ISOLATION VALVES TO INITIATE AND COMPLETE THE SHUTDOWN.
  - CONTRACTOR SHALL PROPERLY HANDLE AND DISPOSE OF WATER CONTENTS DURING WORK.
  - CONTRACTOR SHALL PRESSURE TEST, CLEAN AND DISINFECT THE WATER PIPELINE BEFORE RETURN TO SERVICE.
  - ALL VAULT HATCHES TO BE WATERPROOF, H-20 RATED, ALUMINUM FRAME AND LID, SST HARDWARE, LOCKABLE, AND WITH SPRING ASSIST OPENING. VAULTS 10 FEET OR DEEPER REQUIRE SAFETY GRATING. SEE SPECIFICATIONS SECTION 08310 FOR ADDITIONAL REQUIREMENTS.
  - CONTRACTOR SHALL INSTALL CONCRETE CAP WHERE PIPE COVER IS LESS THAN 30-INCH BELOW GRADE.

PIPELINE ANGLE POINT			
ID #	NORTHING	EASTING	DESCRIPTION
1	2011736.76	6804054.04	ANGLE POINT
2	2011801.95	6804034.27	ANGLE POINT
3	2011798.01	6804037.08	ANGLE POINT
23	2011766.44	6804214.72	ANGLE POINT
24	2011756.24	6803965.35	ANGLE POINT
25	2011869.66	6803883.36	ANGLE POINT
26	2011902.44	6803928.70	POC
27	2011754.06	6803976.34	ANGLE POINT
28	2011888.08	6803927.01	POC
29	2011754.06	6804161.54	ANGLE POINT
30	2011766.83	6804161.54	ANGLE POINT

**YARD PIPING PLAN**  
SCALE: 1" = 20'-0"

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**CITY OF FOLSOM**  
50 NATOMAS STREET  
FOLSOM, CA 95630

CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

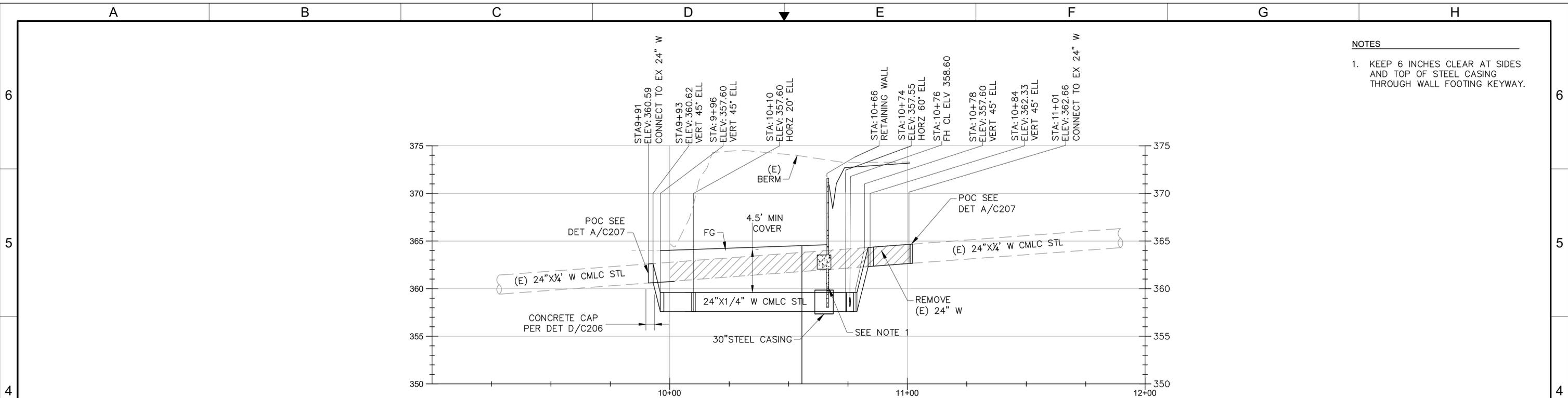
WATER TREATMENT PLANT  
YARD PIPING PLAN

REGISTERED PROFESSIONAL ENGINEER  
COURTNEY L. CLAY  
C59049  
CIVIL  
STATE OF CALIFORNIA  
6/3/2024

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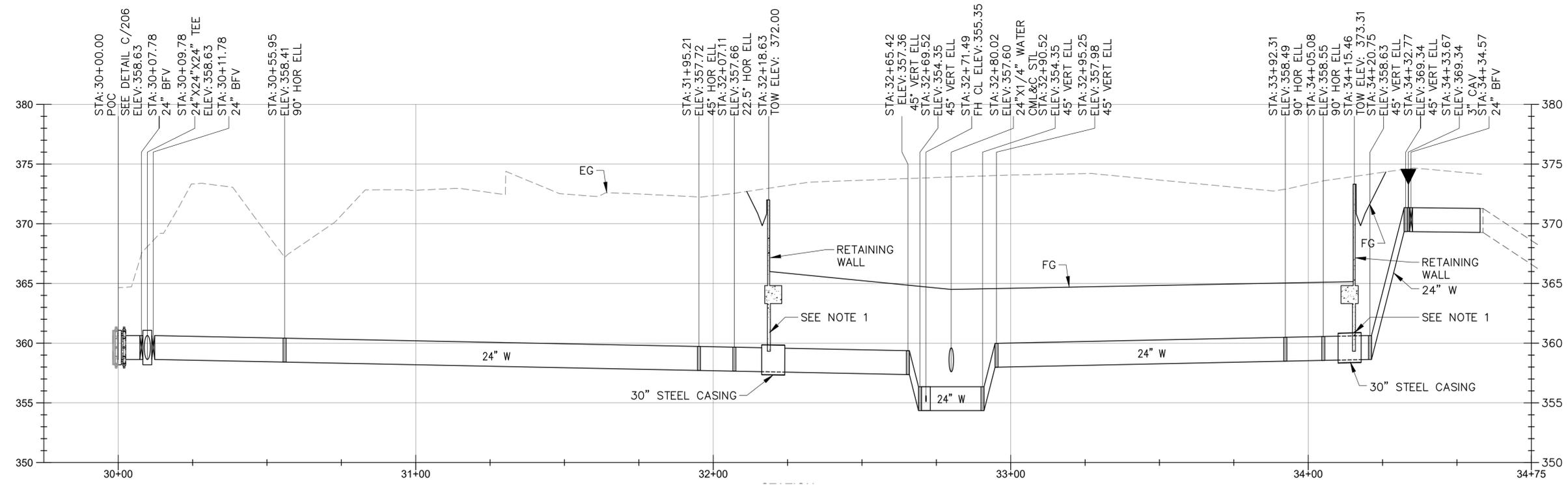
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DESIGN BY: CML  
PCE: C59049 DATE: 6/3/24  
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PCE: C59049 DATE: 6/3/24



- NOTES**
- KEEP 6 INCHES CLEAR AT SIDES AND TOP OF STEEL CASING THROUGH WALL FOOTING KEYWAY.

**24" WATER RELOCATION PIPE PROFILE**

SCALE: 1" = 20'-0" VERT SCALE 1" = 5'



**ZONE 3 INTERTIE - 24" WATER PIPE PROFILE**

SCALE: 1" = 20'-0" VERT SCALE 1" = 5'

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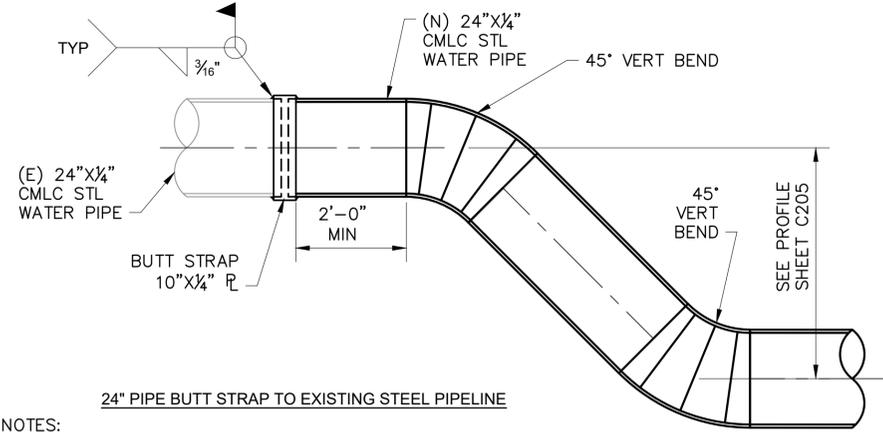
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 TRANSMISSION PIPELINE  
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WATER TREATMENT PLANT  
 PIPING PROFILES



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**C205** SHEET 79 OF 86  
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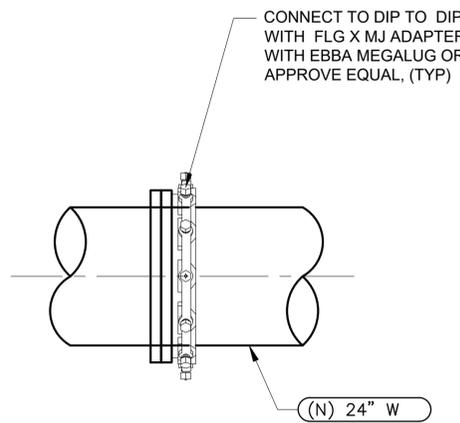


**24\"/>**

- NOTES:
- BUTT-STRAPS SHALL BE WELDED OUTSIDE JOINT.
  - WELD THE LONGITUDINAL JOINTS IN THE BUTT-STRAP USING FULL PENETRATION WELDS BEFORE MAKING THE CIRCUMFERENTIAL FILLET WELDS.
  - DO NOT MAKE ALIGNMENT CHANGES AT BUTT-STRAP JOINTS.
  - DO NOT USE MITERED BUTT-STRAPS.
  - NOT USED.
  - CONTRACTOR TO REPLACE AND REPAIR COATING AS NEEDED.
  - CONTRACTOR TO REPLACE AND REPAIR LINING AS NEEDED.
  - APPLY MORTAR COATING OVER BUTT STRAPS.

**BUTT STRAP TIE-IN-DETAIL**

NOT TO SCALE



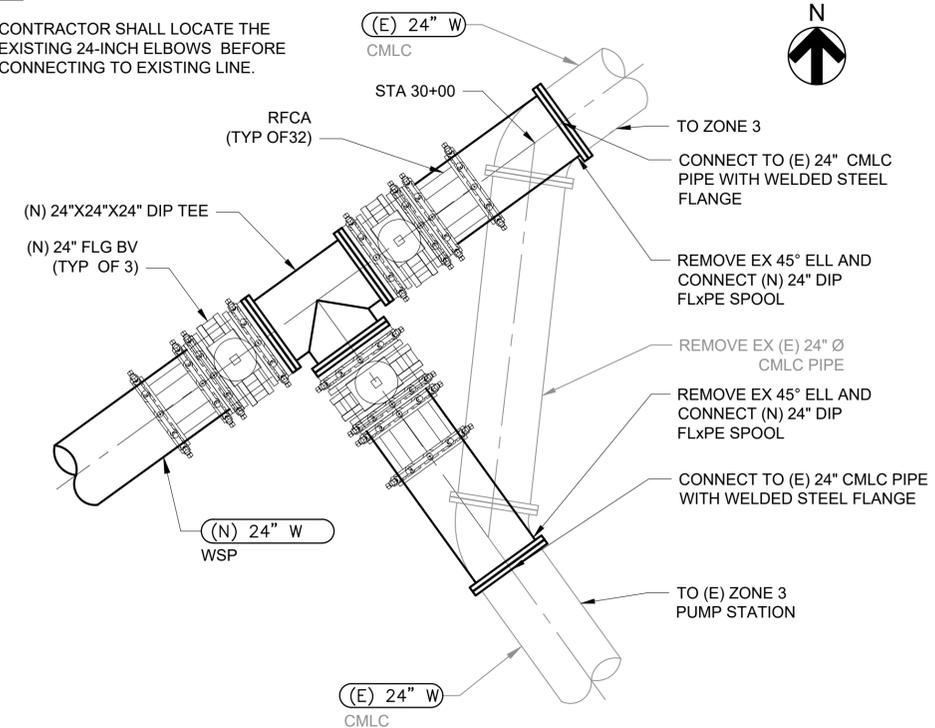
**DIP CONNECTION DETAIL**

SCALE: 1/2\"/>



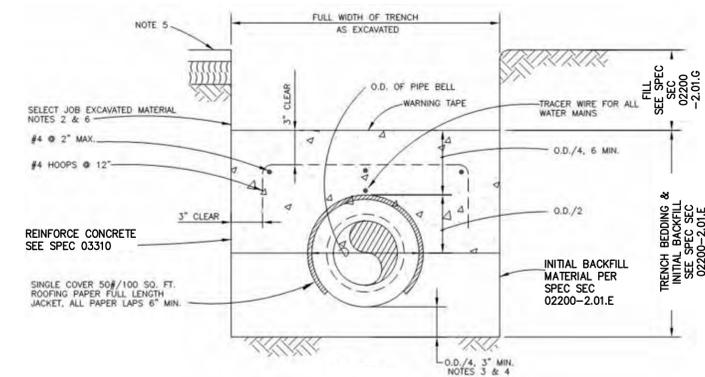
**NOTES:**

- CONTRACTOR SHALL LOCATE THE EXISTING 24-INCH ELBOWS BEFORE CONNECTING TO EXISTING LINE.



**ZONE 3 WATERLINE TIE-IN DETAIL**

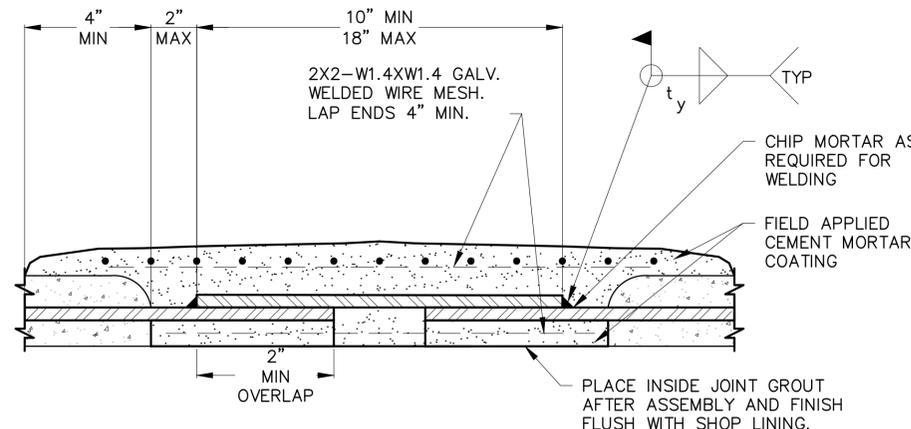
SCALE: 1/4\"/>



- NOTES:
- CONCRETE CAP PIPE REQUIRED WHERE PIPE COVER IS LESS THAN 30\"/>

**CONCRETE CAP DETAIL**

NOT TO SCALE



- NOTES:
- SEE BUTT-STRAPS NOTES DETAIL A/-.

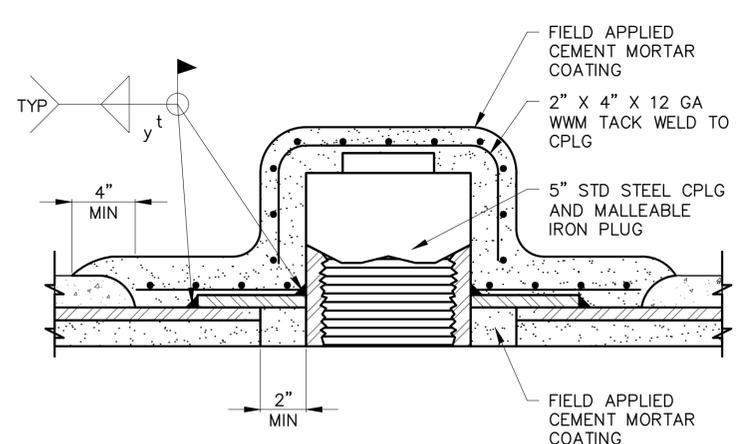
**BUTT STRAP - MORTAR LINED AND COATED STEEL PIPE**

NOT TO SCALE



**HANDHOLE - MORTAR LINED AND COATED STEEL PIPE**

NOT TO SCALE



REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
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CFD NO. 18 - PHASE 2  
TRANSMISSION PIPELINE  
PROJECT

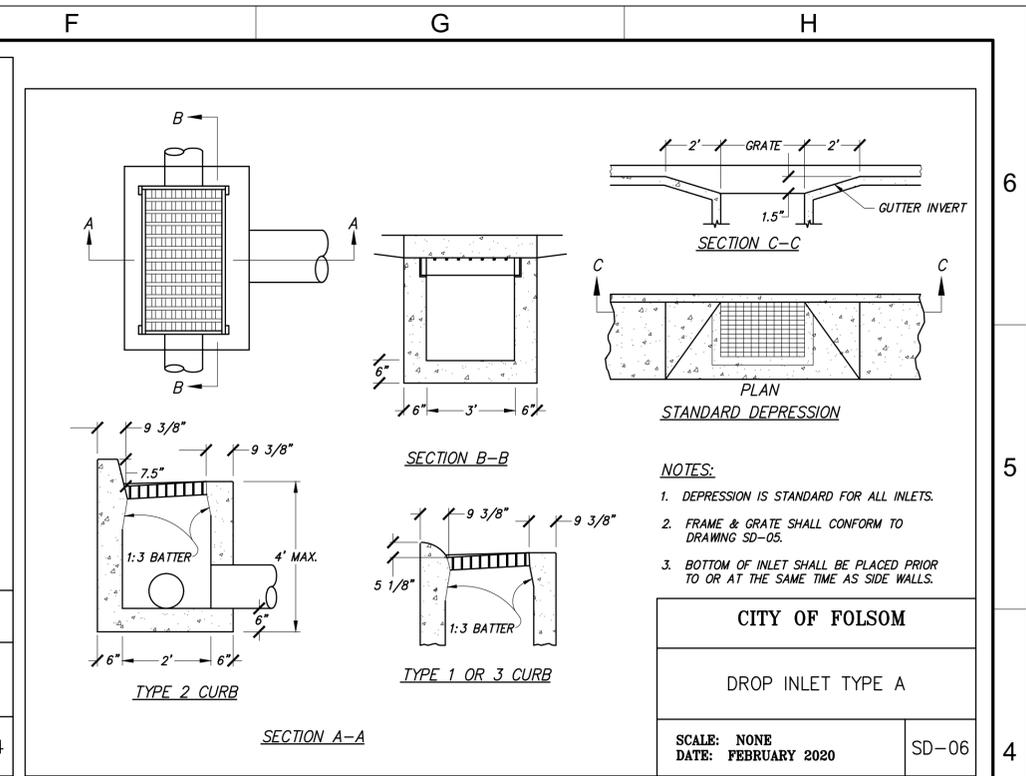
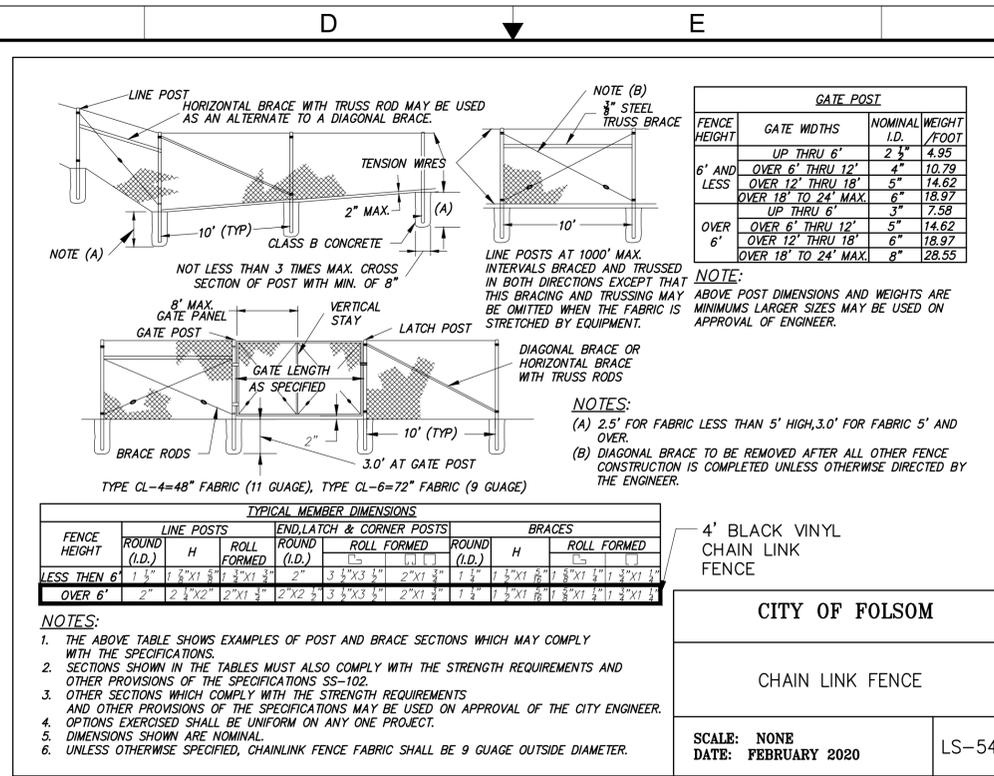
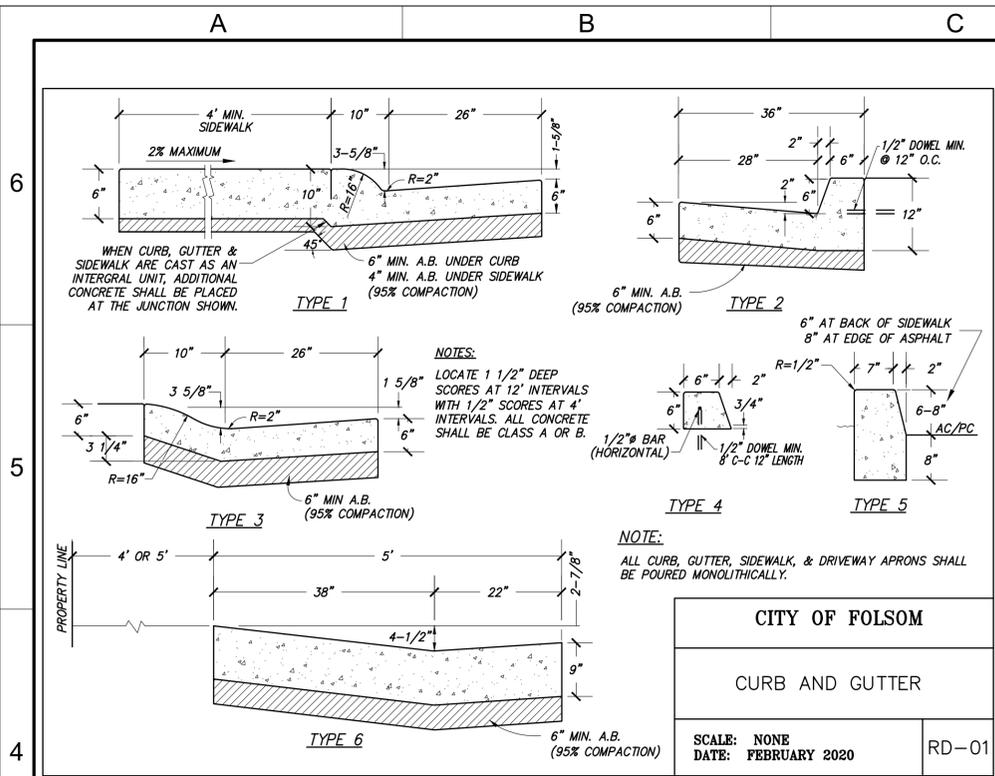
WATER TREATMENT PLANT  
CIVIL DETAILS - 1

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049  
6/3/2024

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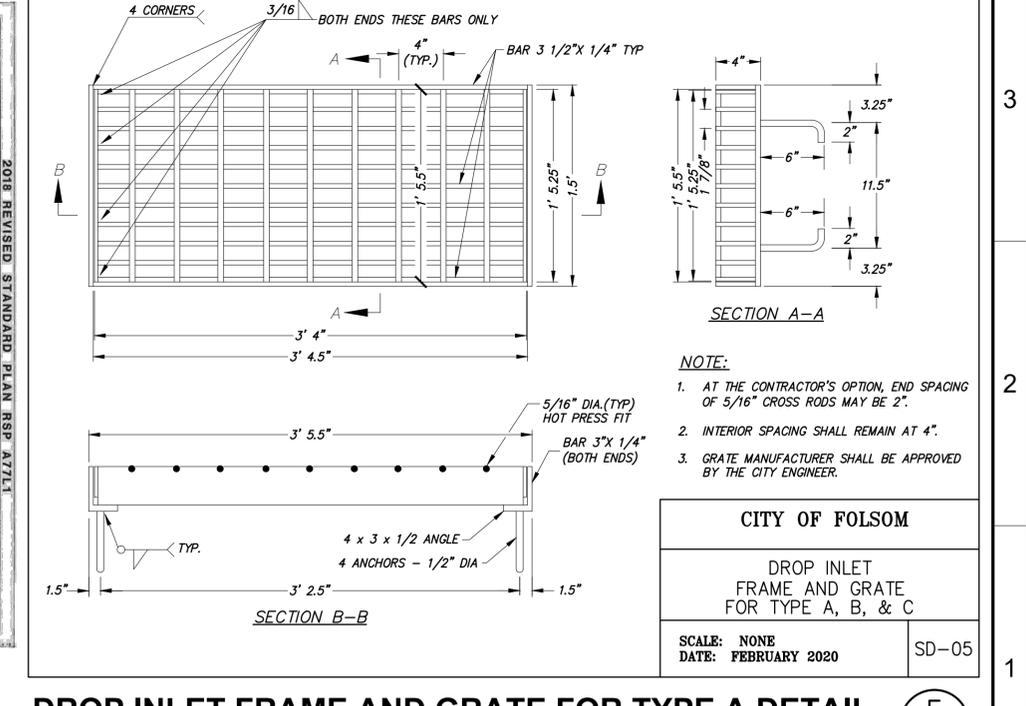
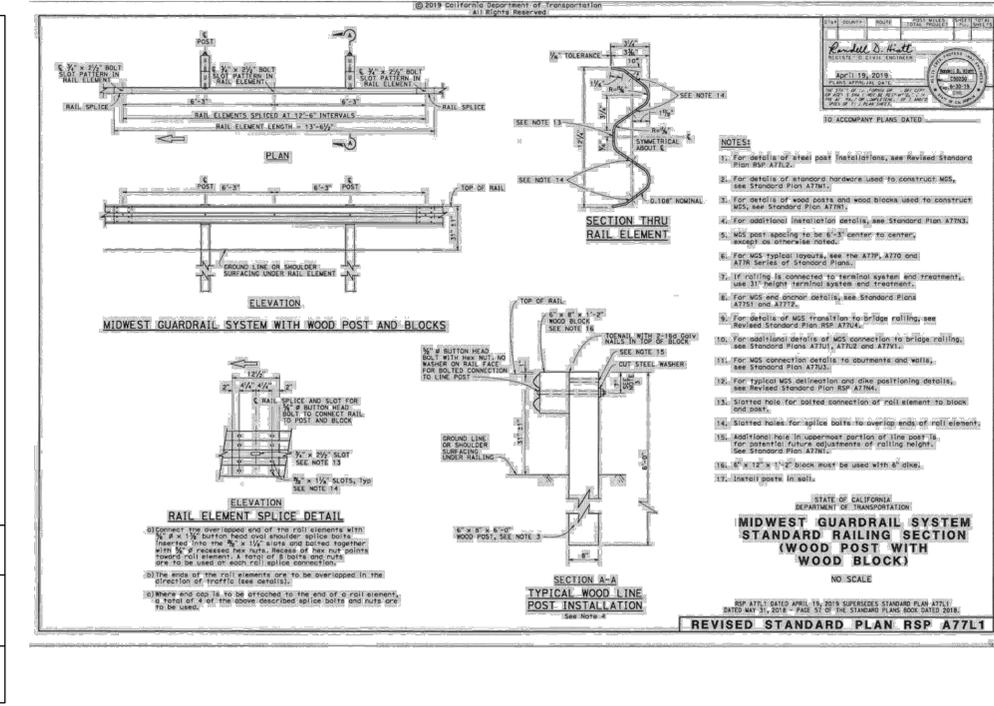
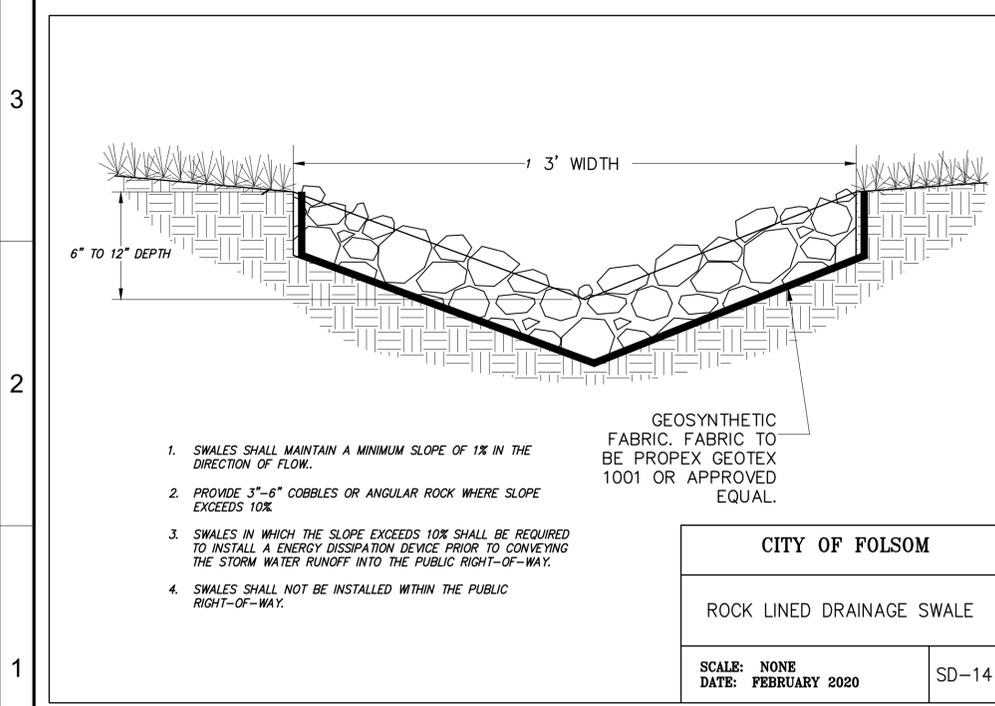
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CHECKED BY: CML DATE: 6/3/24



**TYPE 3 AND 5 CURB AND GUTTER DETAIL**  
NOT TO SCALE

**CHAIN LINK FENCE DETAIL**  
NOT TO SCALE

**DROP INLET TYPE A**  
NOT TO SCALE



**ROCK LINED DRAINAGE SWALE DETAIL**  
NOT TO SCALE

**GUARDRAIL DETAIL**  
NOT TO SCALE

**DROP INLET FRAME AND GRATE FOR TYPE A DETAIL**  
NOT TO SCALE

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**CITY OF FOLSOM**  
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FOLSOM, CA 95630

**CFD NO. 18 - PHASE 2 TRANSMISSION PIPELINE PROJECT**

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**WATER TREATMENT PLANT CIVIL DETAILS - 2**

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**C207**  
SHEET 81 OF 86

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
C59049

**GENERAL:**

- INTERPRETATION OF DRAWINGS & SPECIFICATIONS
  - WHERE APPLICABLE, SPECIFICATIONS HAVE BEEN PREPARED FOR THIS PROJECT AND ARE ARRANGED IN SEVERAL SECTIONS, BUT SUCH SEPARATION SHALL NOT BE CONSIDERED AS THE LIMITS OF THE WORK REQUIRED BY ANY SEPARATE TRADE. THE TERMS AND CONDITIONS OF SUCH LIMITATIONS ARE WHOLLY BETWEEN THE CONTRACTOR AND HIS SUBCONTRACTORS.
  - IN GENERAL, THE WORKING DETAILS WILL INDICATE DIMENSIONS, POSITIONS AND KIND OF CONSTRUCTION, AND THE SPECIFICATIONS WILL INDICATE QUALITIES AND METHODS. ANY WORK INDICATED ON THE WORKING DETAILS MENTIONED BUT NOT IN THE SPECIFICATIONS, OR VICE VERSA, SHALL BE FURNISHED AS THOUGH FULLY SET FORTH IN BOTH. WORK NOT PARTICULARLY DETAILED, MARKED OR SPECIFIED, SHALL BE THE SAME AS SIMILAR PARTS THAT ARE DETAILED, MARKED OR SPECIFIED. IF CONFLICTS OCCUR BETWEEN DRAWINGS AND SPECIFICATIONS, THE MOST EXPENSIVE MATERIALS OR METHODS WILL PREVAIL.
  - SHOULD AN ERROR APPEAR IN THE WORKING DETAILS OR SPECIFICATIONS OR IN WORK DONE BY OTHERS AFFECTING THIS WORK, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT ONCE AND IN WRITING. IF THE CONTRACTOR PROCEEDS WITH THE WORK SO AFFECTED WITHOUT HAVING GIVEN SUCH WRITTEN NOTICE AND WITHOUT RECEIVING THE NECESSARY APPROVAL, DECISION OR INSTRUCTION IN WRITING FROM THE OWNER, THEN HE SHALL HAVE NO VALID CLAIM AGAINST THE OWNER, FOR THE COST OF SO PROCEEDING AND SHALL MAKE GOOD ANY RESULTING DAMAGE OR DEFECT. NO VERBAL APPROVAL, DECISION, OR INSTRUCTION SHALL BE VALID OR BE THE BASIS FOR ANY CLAIM AGAINST THE OWNER, ITS OFFICERS, EMPLOYEES, OR AGENTS. THE FOREGOING INCLUDES TYPICAL ERRORS IN THE SPECIFICATIONS OR NOTATIONAL ERRORS IN THE WORKING DETAILS WHERE THE INTERPRETATION IS DOUBTFUL OR WHERE THE ERROR IS SUFFICIENTLY APPARENT AS TO PLACE A REASONABLY PRUDENT CONTRACTOR ON NOTICE THAT SHOULD HE ELECT TO PROCEED, HE IS DOING SO AT HIS OWN RISK.
- CONSTRUCTION SHALL CONFORM TO THE 2019 CBC AND ALL APPLICABLE CODES AND REGULATIONS.
- SHOP DRAWING NOTE:
  - SHOP DRAWINGS SHALL BE SUBMITTED IN THE FORM OF ONE REPRODUCIBLE AND TWO COPIES OF EACH SHEET.
  - THE PURPOSE OF SHOP DRAWING SUBMITTALS BY THE CONTRACTOR IS TO DEMONSTRATE TO THE STRUCTURAL ENGINEER THAT HE UNDERSTANDS THE DESIGN CONCEPT BY INDICATING WHICH MATERIALS HE INTENDS TO FURNISH AND INSTALL, AND BY DETAILING THE FABRICATION AND INSTALLATION METHODS HE INTENDS TO USE.
  - PRIOR TO FABRICATION, SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW TO THE STRUCTURAL ENGINEER. SHOP DRAWING SUBMITTALS SHALL INCLUDE, BUT ARE NOT NECESSARILY LIMITED TO CONCRETE MIX DESIGNS, STRUCTURAL STEEL, REINFORCING STEEL, MASONRY UNITS, GROUT MIX DESIGNS, GLUED LAMINATED BEAMS, AND PRE-FABRICATED WOOD ROOF FRAMING ITEMS SUCH AS I-JOISTS AND TRUSSES WHERE THESE ELEMENTS ARE INDICATED ON THE DRAWINGS.
  - PRIOR TO SUBMISSION THE CONTRACTOR SHALL REVIEW ALL SUBMITTALS FOR CONFORMANCE WITH THE CONTRACT DOCUMENTS AND SHALL STAMP SUBMITTALS AS BEING "REVIEWED FOR CONFORMANCE"
  - SHOP DRAWING SUBMITTALS PROCESSED BY THE STRUCTURAL ENGINEER ARE NOT CHANGE ORDERS.
  - ANY DETAIL ON THE SHOP DRAWING THAT DEVIATES FROM THE CONTRACT DOCUMENTS SHALL CLEARLY BE MARKED WITH THE NOTE "THIS IS A CHANGE".
  - SHOP DRAWINGS OR CALCULATIONS SUBMITTED FOR REVIEW THAT REQUIRE RESUBMITTAL FOR RE-REVIEW SHALL BE BILLED HOURLY FOR SUCH TIME TO THE GENERAL CONTRACTOR. RE-REVIEW WILL NOT PROCEED WITHOUT WRITTEN APPROVAL FROM THE GENERAL CONTRACTOR FOR ADDITIONAL ENGINEERING REVIEW SERVICES.
- SAFETY NOTE:
  - IT IS THE CONTRACTORS RESPONSIBILITY TO COMPLY WITH THE PERTINENT SECTIONS, AS THEY APPLY TO THIS PROJECT, OF THE "CONSTRUCTION SAFETY ORDERS" ISSUED BY THE STATE OF CALIFORNIA LATEST EDITION, AND ALL OSHA REQUIREMENTS.
  - THE OWNER AND THE STRUCTURAL ENGINEER DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONTRACTOR'S FAILURE TO COMPLY WITH THESE REQUIREMENTS.
  - THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE DESIGN AND CONSTRUCTION OF ALL FORMS AND SHORING REQUIRED.
- THE CONTRACTOR SHALL NOTIFY THE STRUCTURAL ENGINEER WHERE A CONFLICT OR A DISCREPANCY OCCURS BETWEEN THE STRUCTURAL DRAWINGS AND ANY OTHER PORTION OF THE CONTRACT DOCUMENTS OR EXISTING FIELD CONDITIONS. SUCH NOTIFICATION SHALL BE GIVEN IN DUE TIME SO AS NOT TO AFFECT THE CONSTRUCTION SCHEDULE. CONTRACTOR SHALL VERIFY ALL DIMENSIONS WITH STRUCTURAL DRAWINGS PRIOR TO COMMENCING ANY WORK.
- WHERE NO SPECIFIC DETAIL IS SHOWN, THE CONSTRUCTION SHALL BE IDENTICAL OR SIMILAR TO THAT INDICATED FOR LIKE CASES OF CONSTRUCTION ON THIS PROJECT. SHOULD THERE BE ANY QUESTION, CONTACT THE STRUCTURAL ENGINEER PRIOR TO PROCEEDING.
- WHEN CONSTRUCTION ATTACHES TO AN EXISTING BUILDING, A COMPLETE SET OF DRAWINGS OF THE EXISTING BUILDING SHALL BE KEPT ON THE JOB SITE. CONTRACTOR TO OBTAIN THESE DRAWINGS FROM THE OWNER.
- ANY SUBSTITUTIONS FOR STRUCTURAL MEMBERS, HARDWARE, OR DETAILS SHALL BE REVIEWED BY THE STRUCTURAL ENGINEER. SUCH REVIEW WILL BE BILLED ON A TIME AND MATERIALS BASIS TO THE GENERAL CONTRACTOR WITH NO GUARANTEE THAT THE SUBSTITUTION WILL BE ALLOWED.
- DO NOT SCALE DRAWINGS. CONTACT THE STRUCTURAL ENGINEER FOR ANY DIMENSIONS NOT SHOWN.
- THESE DRAWINGS ARE NOT COMPLETE UNTIL REVIEWED AND ACCEPTED BY THE LOCAL BUILDING OFFICIAL AND SIGNED BY THE OWNER AND THE STRUCTURAL ENGINEER.
- ALL DRAWINGS AND WRITTEN MATERIAL APPEARING HEREIN CONSTITUTES THE ORIGINAL AND UNPUBLISHED WORK OF THE STRUCTURAL ENGINEER AND THE SAME MAY NOT BE DUPLICATED, USED OR DISCLOSED WITHOUT WRITTEN CONSENT OF THE STRUCTURAL ENGINEER.
- THE STRUCTURE SHOWN ON THESE DRAWINGS IS STRUCTURALLY SOUND ONLY IN ITS COMPLETED FORM. THE STABILITY OF THIS STRUCTURE DEPENDS ON THE DIAPHRAGMS AND THE BRACING MEMBERS SHOWN. THE CONTRACTOR IS TO PROVIDE FOR THE DESIGN AND CONSTRUCTION OF SHORING FOR ALL EARTH, FORMS, CONCRETE, STEEL, WOOD, AND MASONRY TO RESIST GRAVITY, EARTH, WIND, SEISMIC, AND CONSTRUCTION LOADS. SHORING SHALL REMAIN IN PLACE UNTIL ALL DIAPHRAGMS AND LATERAL RESISTING ELEMENTS ARE IN PLACE IN THEIR ENTIRETY.

**CONCRETE MASONRY:**

- 28-DAY COMPRESSIVE STRENGTH OF CONCRETE MASONRY (F'm) SHALL BE F'm = 2000 PSI FOR ALL USES. FULL MASONRY STRESSES ARE USED IN DESIGN.
- CONCRETE BLOCK UNITS SHALL CONFORM TO ASTM C-90.
- MORTAR SHALL BE TYPE S BY VOLUME: 1 PART PORTLAND CEMENT; OVER 1/4 TO 1/2 PART HYDRATED LIME OR LIME PUTTY; AND AGGREGATE VOLUME OF 2 1/4 TO 3 TIMES COMBINED VOLUME OF CEMENT AND LIME.
- GROUT SHALL BE BY VOLUME: 1 PART PORTLAND CEMENT; 0 TO 1/20 PART HYDRATED LIME OR LIME PUTTY. FINE AGGREGATE OF 2 1/4 TO 3 TIMES THE COMBINED VOLUME OF CEMENT AND LIME. COARSE AGGREGATE IN THE AMOUNT OF 1 TO 2 TIMES THE COMBINED VOLUME OF CEMENT AND LIME MAY BE ADDED WHERE THE LEAST CLEAR CELL DIMENSION IS 4". NOT MORE THAN 5% OF THE COARSE AGGREGATE SHALL PASS THE NO. 8 SIEVE AND 100% SHALL PASS THE 3/8" SIEVE.
- COMPLIANCE WITH THE REQUIREMENTS FOR THE SPECIFIED COMPRESSIVE STRENGTH OF MASONRY, F'm SHALL BE IN ACCORDANCE WITH 2019 CBC SECTION 2105.3-MASONRY PRISM TESTING, OR SECTION 2105.2.2.1-UNIT STRENGTH METHOD.

FOR UNIT STRENGTH METHOD SEE TABLE BELOW FOR REQUIRED 28-DAY COMPRESSIVE STRENGTH OF THE CONCRETE BLOCK UNITS, GROUT, AND MORTAR.

REQUIRED 28-DAY COMPRESSIVE STRENGTH			
SPECIFIED F'm	CONCRETE BLOCK UNITS (PSI)	GROUT (PSI)	MORTAR (PSI)
1,500	1,900	1,900 MIN	1,800
2,000	2,800	2,800 MIN	1,800
2,500	3,750	3,750 MIN	1,800

- UNIT STRENGTH METHOD SHALL NOT BE USED FOR SPECIFIED COMPRESSIVE STRENGTHS IN EXCESS OF 2,500 PSI.
- REINFORCING STEEL SHALL CONFORM TO ASTM A615-GRADE 60.
  - ALL REINFORCEMENT SHALL BE CONTINUOUS. STAGGER SPLICES WHERE POSSIBLE. LAP BARS 72 DIAMETERS MINIMUM, UNLESS NOTED OTHERWISE.
  - VERTICAL REINFORCING SHALL BE HELD IN POSITION AT TOP AND BOTTOM AND AT INTERVALS NOT TO EXCEED 200 BAR DIAMETERS.
  - EACH VERTICAL BAR IN WALLS SHALL LAP 72 DIAMETERS WITH A DOWEL OF THE SAME SIZE EXTENDING INTO THE FOUNDATION. CARRY EACH DOWEL TO WITHIN 3" OF THE BOTTOM OF THE FOUNDATION AND TERMINATE WITH 90° HOOK. DOWELS SHALL BE STRAIGHT AND PLUMB.
  - PLACE ALL HORIZONTAL BARS IN BOND BEAM UNITS. WHEN 2 BARS ARE USED, STAGGER LAPS A MINIMUM OF 5'-0".
  - PROVIDE (2) #5 BARS (FULL HEIGHT OF WALL AT JAMB AND EXTENDING A MINIMUM OF 2'-6" PAST EDGES OF OPENINGS AT HEAD AND SILL) EACH SIDE OF ALL OPENINGS AND EACH END OF ALL WALLS, UNLESS NOTED OTHERWISE ON DRAWINGS.
  - BEFORE BLOCK IS PLACED ON CONCRETE, THOROUGHLY CLEAN CONCRETE AND REMOVE ALL LAITANCE AND LOOSE MATERIAL. ROUGHEN CONCRETE SURFACE TO 1/8" AMPLITUDE.
  - CONCRETE BLOCK MASONRY SHALL BE BUILT TO PRESERVE THE UNOBSTRUCTED VERTICAL CONTINUITY OF THE CELLS. ALL HEAD AND BED JOINTS SHALL BE SOLIDLY FILLED WITH MORTAR FOR A DISTANCE IN FROM THE FACE OF THE UNIT NOT LESS THAN THE THICKNESS OF THE FACE SHELL. BOND SHALL BE PROVIDED BY LAPPING SUCCESSIVE COURSES OR BY EQUIVALENT MECHANICAL ANCHORAGE.
  - VERTICAL CELLS SHALL HAVE VERTICAL ALIGNMENT SUFFICIENT TO MAINTAIN A CLEAR UNOBSTRUCTED CONTINUOUS VERTICAL CELL MEASURING NOT LESS THAN 2"x3".
  - CLEAN OUT OPENINGS SHALL BE PROVIDED IN THE BOTTOM COURSE OF WALL TO BE FILLED AT EACH LIFT OR POUR OF GROUT WHERE SUCH LIFT OR POUR OF GROUT IS IN EXCESS OF 5'-0" IN HEIGHT. SPACING OF CLEAN OUTS SHALL NOT EXCEED 32" CC. THE CLEAN OUTS SHALL BE SEALED AFTER INSPECTION AND BEFORE GROUTING.
  - THOROUGHLY CLEAN ALL CELLS AND BOND BEAMS OF MORTAR PROJECTIONS, MORTAR DROPPINGS, OR OTHER FOREIGN MATERIAL BEFORE GROUTING.
  - ALL CELLS SHALL BE FILLED SOLIDLY WITH GROUT. GROUT SHALL BE PLACED IN A CONTINUOUS POUR IN LIFTS NOT EXCEEDING 5'-4". ALL GROUTING SHALL BE DONE UNDER THE CONTINUOUS OBSERVATION OF THE OWNER'S TESTING LABORATORY.
  - ALL GROUT SHALL BE THOROUGHLY CONSOLIDATED BY MECHANICAL VIBRATION DURING PLACEMENT IN A MANNER TO PROVIDE SOLIDLY GROUTED SPACES.
  - WHEN GROUTING IS STOPPED FOR ONE HOUR OR LONGER, HORIZONTAL CONSTRUCTION JOINTS SHALL BE FORMED BY STOPPING THE POUR OF GROUT 1 1/2" BELOW THE TOP OF THE UPPERMOST UNIT.
  - ALL EMBEDDED ITEMS (BOLTS, ETC.) SHALL BE SECURELY POSITIONED PRIOR TO GROUTING. PROVIDE A MINIMUM OF 1" GROUT AROUND ALL BOLTS IN MASONRY. SEE TYPICAL DETAILS SHEET.
  - PIPES AND ELECTRICAL CONDUITS SHALL NOT BE EMBEDDED IN CONCRETE MASONRY EXCEPT WHERE SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER.
  - USE OPEN END BLOCK FOR ALL STACK BOND CONSTRUCTION.

**GEOTECHNICAL:**

- FOUNDATION DESIGN IS BASED ON THE GEOTECHNICAL REPORT BY BLACKBURN CONSULTING (NO. 3279X)
- ALL BUILDING PAD PREPARATION AND FOUNDATION WORK SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE GEOTECHNICAL REPORT. COPIES OF THE REPORT MAY BE OBTAINED FROM THE ENGINEER UPON REQUEST.
- THE GEOTECHNICAL ENGINEER SHALL OBSERVE ALL FOOTING EXCAVATIONS PRIOR TO PLACEMENT OF REINFORCING STEEL AND CONCRETE.
- FOUNDATION DEPTHS INDICATED ON PLANS ARE FOR ESTIMATING PURPOSES ONLY. ACTUAL DEPTHS ARE TO BE DETERMINED BY THE GEOTECHNICAL ENGINEER ON THE JOBSITE.
- WHEN STRUCTURAL OBSERVATION IS REQUIRED, STRUCTURAL ENGINEER SHALL OBSERVE FOOTING REINFORCING STEEL PRIOR TO CONCRETE PLACEMENT. PROVIDE 48 HOURS NOTICE TO STRUCTURAL ENGINEER PRIOR TO CONCRETE PLACEMENT.
- THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL EXCAVATION PROCEDURES INCLUDING, BUT NOT LIMITED TO, LAGGING, SHORING, AND PROTECTION OF ADJACENT PROPERTY, STRUCTURES, STREETS, AND UTILITIES IN ACCORDANCE WITH THE LOCAL BUILDING DEPARTMENT.
- FOUNDATION TYPE:

<b>SPREAD FOOTING ALLOWABLE PRESSURES:</b>	
D+L	1,750 PSF (1/2 INCREASE FOR WIND/SEISMIC)
<b>RETAINING WALLS:</b>	
ACTIVE SOIL PRESSURE	59 PSF/FT (2:1 BACKFILL)
PASSIVE PRESSURE	200 PCF
COEFFICIENT OF FRICTION	0.45

**CONCRETE AND REINFORCING STEEL:**

- CONCRETE CONSTRUCTION SHALL CONFORM TO ACI 318-14 & ACI 350.
- THE MINIMUM 28 DAY STRENGTH AND TYPE OF CONCRETE SHALL BE AS FOLLOWS:  
CONCRETE 145 PCF  
F'c= 3,000 PSI (MINIMUM 5.5 SACKS CEMENT PER CU. YD.)
- ALL CONCRETE SHALL BE READY-MIX IN ACCORDANCE WITH ASTM-C94.
- CONCRETE MIX DESIGN SHALL BE REVIEWED BY THE OWNER'S TESTING LABORATORY AND SUBMITTED TO THE STRUCTURAL ENGINEER FOR APPROVAL. SELECTION OF CONCRETE MIX PROPORTIONS SHALL BE PER 2019 CBC SECTION 1903.
- CEMENT SHALL CONFORM TO ASTM C-150 TYPE V.
- CONCRETE AGGREGATES: NATURAL SAND AND ROCK AGGREGATES CONFORMING TO ASTM C-33.
- REINFORCING SHALL CONFORM TO ASTM A706 GRADE 60.
- WELDING OF REINFORCING STEEL SHALL CONFORM TO AWS D1.4 USING PROPER LOW HYDROGEN ELECTRODES. TACK WELDING TO REBAR IS STRICTLY PROHIBITED. SEE "REBAR WELDING".
- REINFORCING STEEL SHALL BE DETAILED, FABRICATED, AND INSTALLED ACCORDING TO "MANUAL OF STANDARD PRACTICE FOR REINFORCED CONCRETE CONSTRUCTION" BY CRSI.
- WIRE FABRIC SHALL CONFORM TO ASTM A-1064.
- DIMENSIONS SHOWN FOR LOCATION OF REINFORCING ARE TO THE FACE OF MAIN BARS AND DENOTE CLEAR COVERAGE. UNLESS OTHERWISE NOTED, CONCRETE COVERAGE SHALL BE AS FOLLOWS:  
CONCRETE DEPOSITED DIRECTLY AGAINST GROUND (EXCEPT SLABS) 3"  
FORMED CONCRETE EXPOSED TO WEATHER OR GROUND OR LIQUID  
#6 AND LARGER 2"  
#5 AND SMALLER 2"  
BEAMS (TOP BARS) 1 1/2"  
BEAMS (ALL OTHER MAIN REINFORCING) 2"  
COLUMN MAIN REINFORCING 2"  
WALLS AND SLABS (INTERIOR DRY FACES) 3/4"  
SLABS ON GROUND WITH ONE LAYER OF REINFORCEMENT POSITION IN CENTER OF SLAB
- REINFORCING STEEL PLACEMENT:
  - ALL BARS SHOWN WITH LAPS OR SPLICES SHALL HAVE MIN LAP LENGTH UNLESS OTHERWISE NOTED.
  - DOWEL ALL VERTICAL REBAR IN WALLS AND COLUMNS FROM FOUNDATION WITH SAME SIZE AND SPACING AS VERTICAL BARS.
  - SPLICES IN ADJACENT BARS SHALL BE NOT LESS THAN 5'-0" APART.
  - SPLICE CONTINUOUS BARS IN SOIL-BEARING GRADE BEAMS AS FOLLOWS: BOTTOM BARS AT MID-SPAN, TOP BARS AT CENTERLINE OF SUPPORT, UNLESS NOTED OTHERWISE.
  - SPLICE CONTINUOUS BARS IN BEAMS, SPANDRELS, WALL BEAMS ETC. AS FOLLOWS: BOTTOM BARS AT CENTERLINE OF SUPPORT, TOP BARS AT MIDSPAN, UNLESS NOTED OTHERWISE.
  - REINFORCING BARS SHALL BE RUN IN A MANNER THAT FORMS A CONTINUOUS SYSTEM OF BARS TYING ALL PARTS OF THE STRUCTURE TOGETHER. EXTEND ALL REINFORCING BARS AS FAR AS POSSIBLE IN EACH CONCRETE MEMBER AND TERMINATE BAR TO PROVIDE 2" OF CONCRETE COVER END OF BAR OR FACE OR BEND.
  - BEAM STIRRUPS AND COLUMN TIES SHALL HOOK 135 DEGREES AROUND A CORNER BAR UNLESS NOTED OTHERWISE.
- GENERAL:
  - NO PIPES OR DUCTS SHALL BE PLACED IN CONCRETE SLABS, BEAMS, WALLS OR GRADE BEAMS UNLESS SPECIFICALLY DETAILED.
  - REFER TO ARCHITECTURAL, STRUCTURAL, ELECTRICAL AND MECHANICAL DRAWINGS FOR ALL OPENINGS, FLANGES, MOULDS, GROOVES, CLIPS AND GROUNDS TO BE CAST IN CONCRETE.
  - CONSTRUCTION JOINTS SHALL BE MADE ROUGH AND ALL LAITANCE REMOVED FROM THE SURFACE. CONCRETE MAY BE ROUGHENED BY CHIPPING THE ENTIRE SURFACE, SANDBLASTING, OR HOSING THE SURFACE 4 TO 6 HOURS AFTER THE POUR WITH A FINE SPRAY.
  - REMOVE ALL DEBRIS FROM THE FORMS BEFORE PLACING ANY CONCRETE.
  - REINFORCING, DOWELS, BOLTS, ANCHORS, SLEEVES, ETC. TO BE EMBEDDED IN CONCRETE SHALL BE SECURELY POSITIONED BEFORE PLACING CONCRETE. OBTAIN APPROVAL OF ALL AFFECTED TRADES PRIOR TO PLACING CONCRETE.
  - MAXIMUM FREE FALL OF CONCRETE SHALL BE 3'-0".
  - WALLS SHALL BE PLACED IN HORIZONTAL LAYERS OF 2'-0" MAX DEPTH.
  - CONCRETE IN WALLS, PIERS, OR COLUMNS SHALL SET AT LEAST 2 HOURS BEFORE PLACING CONCRETE IF IT SUPPORTS BEAMS, SPANDRELS, OR SLABS.
  - REINFORCE ALL SLABS ON GRADE AS SHOWN ON DRAWINGS.
  - HORIZONTAL WALL BARS IN DOUBLE LAYER WALLS SHALL BE STAGGERED. USE #2 SPREADERS APPROXIMATELY EVERY THIRD INTERSECTION EACH DIRECTION FOR ALL DOUBLE LAYER WALLS. PLACE SPREADERS IN VERTICAL LINES WITH FORM TIES.
  - NO WOOD SPREADERS ARE ALLOWED. NO WOOD STAKES ARE ALLOWED IN AREAS TO BE CONCRETED.
  - MINIMUM WALL REINFORCING FOR TEMPERATURE AND SHRINKAGE CONTROL ARE:  
WALL THICKNESS SINGLE LAYER DOUBLE LAYER  
7" OR LESS #4 @ 12" CC EW #4 @ 16" CC EW  
8" #4 @ 10" CC EW  
9" AND 10" #4 @ 12" CC EW  
11" AND 12" #4 @ 12" CC EW
- NOTIFY THE ENGINEER 48 HOURS PRIOR TO PLACING CONCRETE.
- REINFORCEMENT LAP SPLICE LENGTHS ARE:  
3,000 PSI 3,500 PSI 4,000 PSI  
#6 AND SMALLER 44d 41d 38d  
#7 AND LARGER 55d 51d 48d
- SPLICE LENGTHS SHOWN APPLY TO LAP CLASS B NORMAL WEIGHT CONCRETE FOR THE STRENGTHS SHOWN. THE REINFORCING IS UNCOATED GRADE 60 REINFORCING.
- INCREASE LAP SPLICE LENGTHS BY 30% FOR TOP REINFORCING. TOP REINFORCING IS HORIZONTAL REINFORCING WITH MORE THAN 12" OF CONCRETE BELOW THE SPLICE.
- INCREASE LAP LENGTHS BY 30% IF LIGHTWEIGHT CONCRETE IS USED.
- WHERE CLEAR SPACING OF BARS IS LESS THAN 2 db OR WHERE CLEAR COVER IS LESS THAN 1 db INCREASE LAP LENGTHS BY 50%, UNO.
- MAXIMUM SPACING OF WALL CONST. JOINTS IS 30ft.



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FOLSOM SOUTH AREA GROUP  
TRANSMISSION PIPELINE AND  
PUMP STATION PROJECT

GENERAL NOTES 1



PAPER SIZE: 22x34 (ANSI D)  
THIS BAR IS 1/4 INCH AT FULL SCALE  
S001 SHEET 82 OF 86  
DRAWING NUMBER

**DESIGN CRITERIA:**

1. CODE: 2019 CALIFORNIA BUILDING CODE (CBC)		
2. DESIGN LIVE LOADS:	<b>LIVE LOAD</b>	<b>REMARKS</b>
AREA ROOF		
FLAT TO < 5:12	L <sub>r</sub> = 20 PSF	REDUCIBLE PER CODE
3. WIND DESIGN PARAMETERS:		
BASIC WIND SPEED (3-SEC GUST)	V = 105 MPH	
RISK CATEGORY	IV	
EXPOSURE CATEGORY	C	
4. EARTHQUAKE DESIGN PARAMETERS:		
SEISMIC IMPORTANCE FACTOR, I <sub>e</sub>	1.5	
COMPONENT IMPORTANCE FACTOR, I <sub>c</sub>	1.5	
RISK CATEGORY	IV	
SITE CLASS	C	
SEISMIC DESIGN CATEGORY	D	
MAPPED SPECTRAL RESPONSE PARAMETERS:		
S <sub>s</sub>	0.41	
S <sub>i</sub>	0.21	
DESIGN SPECTRAL RESPONSE PARAMETERS:		
S <sub>ss</sub>	0.36	
S <sub>si</sub>	0.21	
PGA	0.18	
SEISMIC FORCE RESISTING SYSTEM:		
SPECIAL REINFORCED MASONRY WALLS		

**ABBREVIATIONS:**

AB	AGGREGATE BASE, ANCHOR BOLT	H	HIGH
ADDNL	ADDITIONAL	HA	HEADED ANCHOR
AL	ALUMINUM	HOG	HOT DIP GALVANIZED
ARCH	ARCHITECTURAL	HORIZ	HORIZONTAL
BETW	BETWEEN	HR	HANDRAIL
BEV	BEVELLED	HSB	HIGH STRENGTH BOLT
BLKG	WOOD BLOCKING	HSS	HOLLOW STRUCTURAL STEEL
BLW	BELOW	IE	INVERT ELEVATION
BM	BEAM	JT	JOINT
BOTT	BOTTOM	KP	KICK PLATE
BRG	BEARING	L	LONG
CC	CENTER TO CENTER	LS	LAG SCREW
CHKD PL	CHECKERED PLATE	MANUF	MANUFACTURER
CLR	CLEAR	MAX	MAXIMUM
☉	CENTERLINE	MB	MACHINE BOLT
CMU	CONCRETE MASONRY UNIT	MECH	MECHANICAL
CNTSK	COUNTERSINK	MIN	MINIMUM
COL	COLUMN	MTG	MOUNTING
CONC	CONCRETE	(N)	NEW
CNJ	CONSTRUCTION JOINT	NTS	NOT TO SCALE
CONT	CONTINUOUS	O/	OVER
CJ	CONTROL JOINT, CONTRACTION JOINT	OH	OPPOSITE HAND
db	BAR DIAMETER	☐	PLATE
DIA	DIAMETER	PLC'S	PLACES
DIM	DIMENSION	PT	PRESSURE TREATED
DN	DOWN	REINF	REINFORCING
(E)	EXISTING	REQ'D	REQUIRED
EA	EACH	REQMT'S	REQUIREMENTS
EF	EACH FACE	SAD	SEE ARCHITECTURAL DRAWINGS
EJ	EXPANSION JOINT	SIM	SIMILAR
EL, (ELEV)	ELEVATION	SMS	SHEET METAL SCREW
EMB	EMBEDMENT	SOG	SLAB ON GRADE
EN	EDGE NAILING	SP	STRUCTURAL PLYWOOD
EQ	EQUAL	SS	STAINLESS STEEL
EQUIP	EQUIPMENT	STIFF	STIFFENER
ES	EACH SIDE	STAGG	STAGGER
EW	EACH WAY	SQ	SQUARE
EWEF	EACH WAY EACH FACE	SYMM	SYMMETRICAL
EWF	ELECTRICALLY WELDED FABRIC	T&B	TOP AND BOTTOM
FB	FLAT BAR	TOC	TOP OF CONCRETE
FD	FLOOR DRAIN	TOF	TOP OF FRAMING
FF	FINISHED FLOOR	TOM	TOP OF MASONRY
FG	FINAL GRADE	TOP	TOP OF PLATE
FLG	FLANGE	TOS	TOP OF STEEL
FN	FIELD NAILING	TOW	TOP OF WALL
FOM	FACE OF MASONRY	TYP	TYPICAL
FS	FACE OF STUD	UNO (UON)	UNLESS NOTED OTHERWISE
FTG	FOOTING	VERT	VERTICAL
GA	GAGE	W	WIDE
GAF	GALVANIZE AFTER FABRICATION	W/	WITH
GALV	GALVANIZED	WHS	WELDED HEADED STUD
GC	GENERAL CONTRACTOR	WP	WORKING POINT
GS	GALVANIZED STEEL	WS	WATERSTOP

**TABLE 1705.3**

REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD	IBC REFERENCE
1. INSPECT REINFORCEMENT, INCLUDING PRESTRESSING TENDONS, AND VERIFY PLACEMENT		X	ACI 318 CH. 20, 25.2, 25.3, 26.6.1-26.6.3	1908.4
2. REINFORCING BAR WELDING: A. VERIFY WELDABILITY OF REINFORCING BARS OTHER THAN ASTM A706 B. INSPECT SINGLE-PASS FILLET WELDS, 5/16" MAX C. INSPECT ALL OTHER WELDS			AWS D1.4 ACI 318: 26.6.4	
3. INSPECT ANCHORS CAST IN CONCRETE		X	ACI 318: 17.8.2	
4. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS A. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS B. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED 4.a	X		ACI 318: 17.8.2.4 ACI 318: 17.8.2	
5. VERIFY USE OF REQUIRED DESIGN MIX		X	ACI 318: CH. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X		ASTM C172 ASTM C31 ACI 318: 26.4, 26.12	1908.10
7. INSPECT CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES	X		ACI 318: 26.5	1908.6, 1908.7, 1908.8
8. VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES		X	ACI 318: 26.5.3-26.5.5	1908.9
9. INSPECT PRESTRESSED CONCRETE FOR: A. APPLICATION OF PRESTRESSING FORCES; AND B. GROUTING OF BONDED PRESTRESSING TENDONS			ACI 318: 26.10	
10. INSPECT ERECTION OF PRECAST CONCRETE MEMBERS			ACI 318: CH. 26.8	
11. VERIFY IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS			ACI 318: 26.11.2	
12. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED		X	ACI 318: 26.11.1.2(b)	
A. WHERE APPLICABLE, SEE ALSO SECTION 1705.12, SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE. B. SPECIFIC REQUIREMENTS FOR SPECIAL INSPECTION SHALL BE INCLUDED IN THE RESEARCH REPORT FOR THE ANCHOR ISSUED BY AN APPROVED SOURCE IN ACCORDANCE WITH 17.8.2 IN ACI 318, OR OTHER QUALIFICATION PROCEDURES. WHERE SPECIFIC REQUIREMENTS ARE NOT PROVIDED, SPECIAL INSPECTION REQUIREMENTS SHALL BE SPECIFIED BY THE REGISTERED DESIGN PROFESSIONAL AND SHALL BE APPROVED BY THE BUILDING OFFICIAL PRIOR TO THE COMMENCEMENT OF THE WORK.				

**TABLE 1705.6**

REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY		X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL		X
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS		X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL	X	
5. PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY		X

**TABLE 3.1.2**

MASONRY LEVEL B QUALITY ASSURANCE

MINIMUM TESTS				
VERIFICATION OF SLUMP FLOW AND VISUAL STABILITY INDEX (VSI) AS DELIVERED TO THE PROJECT SITE IN ACCORDANCE WITH SPECIFICATION ARTICLE 1.5 B.1.b.3 FOR SELF CONSOLIDATING GROUT				
VERIFICATION OF $f'_m$ AND $f'_{ac}$ IN ACCORDANCE WITH SPECIFICATION ARTICLE 1.4 B PRIOR TO CONSTRUCTION, EXCEPT WHERE SPECIFICALLY EXEMPTED BY THIS CODE				
MINIMUM SPECIAL INSPECTION				
INSPECTION TASK	FREQUENCY (a)		REFERENCE FOR CRITERIA	
	CONTINUOUS	PERIODIC	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/ ASCE 6
1. VERIFY COMPLIANCE WITH THE APPROVED SUBMITTALS		X		Art. 1.5
2. AS MASONRY CONSTRUCTION BEGINS, VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE: a. PROPORTIONS OF SITE-PREPARED MORTAR b. CONSTRUCTION OF MORTAR JOINTS c. GRADE AND SIZE OF PRESTRESSING TENDONS AND ANCHORAGE d. LOCATION OF REINFORCEMENT, CONNECTORS, AND PRESTRESSING TENDONS AND ANCHORAGES e. PRESTRESSING TECHNIQUE f. PROPERTIES OF THIN-BED MORTAR FOR AAC MASONRY		X		Art. 2.1, 2.6A Art. 3.3B Art. 2.4B, 2.4H Art. 3.4, 3.6A Art. 3.6B Art. 2.1C
3. PRIOR TO GROUTING, VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE: a. GROUT SPACE b. GRADE, TYPE, AND SIZE OF REINFORCEMENT AND ANCHOR BOLTS, AND PRESTRESSING TENDONS AND ANCHORAGES c. PLACEMENT OF REINFORCEMENT, CONNECTORS, AND PRESTRESSING TENDONS AND ANCHORAGES d. PROPORTIONS OF SITE-PREPARED GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS e. CONSTRUCTION OF MORTAR JOINTS		X		Art. 3.2D, 3.2F Art. 2.4, 3.4 Sec. 6.1 Sec. 6.1, 6.2.1, 6.2.6, 6.2.7 Art. 3.2E, 3.4, 3.6A Art. 2.6B, 2.4G.1.b Art. 3.3B
4. VERIFY DURING CONSTRUCTION a. SIZE AND LOCATION OF STRUCTURAL ELEMENTS b. TYPE, SIZE, AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION c. WELDING OF REINFORCEMENT d. PREPARATION, CONSTRUCTION, AND PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40°F [4.4°C]) OR HOT WEATHER (TEMPERATURE ABOVE 90°F [32.2°C]) e. APPLICATION AND MEASUREMENT OF PRESTRESSING FORCE f. PLACEMENT OF GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS IS IN COMPLIANCE g. PLACEMENT OF AAC MASONRY UNITS AND CONSTRUCTION OF THIN-BED MORTAR JOINTS	X (b)	X (c)		Art. 3.3F Sec. 1.2.1(e), 6.1.4.3, 6.2.1 Sec. 8.1.6.7.2, 9.3.3.4(c), 11.3.3.4(b) Art. 1.8C, 1.8D Art. 3.6B Art. 3.5, 3.6C Art. 3.3 B.9, 3.3 F.1.b
5. OBSERVE PREPARATION OF GROUT SPECIMENS, MORTAR SPECIMENS, AND/OR PRISMS		X		Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B.4
A. FREQUENCY REFERS TO THE FREQUENCY OF SPECIAL INSPECTION, WHICH MAY BE CONTINUOUS DURING THE TASK LISTED OR PERIODIC DURING THE LISTED TASK, AS DEFINED IN THE TABLE. B. REQUIRED FOR THE FIRST 5,000 SQUARE FEET (465 SQUARE METERS) OF AAC MASONRY. C. REQUIRED AFTER THE FIRST 5,000 SQUARE FEET (465 SQUARE METERS) OF AAC MASONRY.				



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4370 TOWN CENTER BLVD., STE. 100  
EL DORADO HILLS, CA 95762

FOLSOM SOUTH AREA GROUP  
TRANSMISSION PIPELINE AND  
PUMP STATION PROJECT

GENERAL NOTES 2

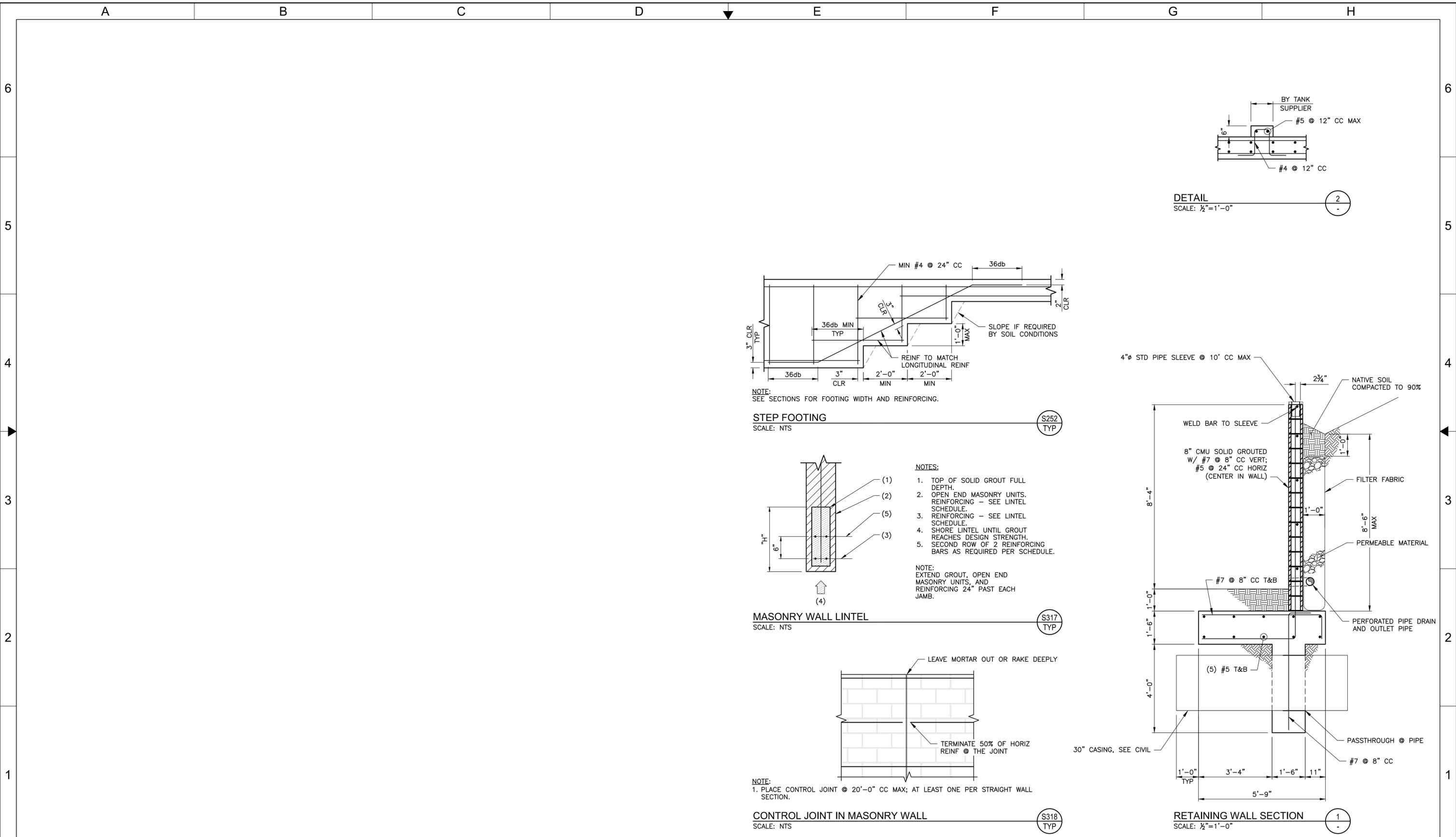


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S002 SHEET 83 OF 86  
DRAWING NUMBER

REV	DESCRIPTION	DATE
	REVISIONS	

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REV	DESCRIPTION	DATE



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DATE: 6/3/24

DESIGN BY: BAF  
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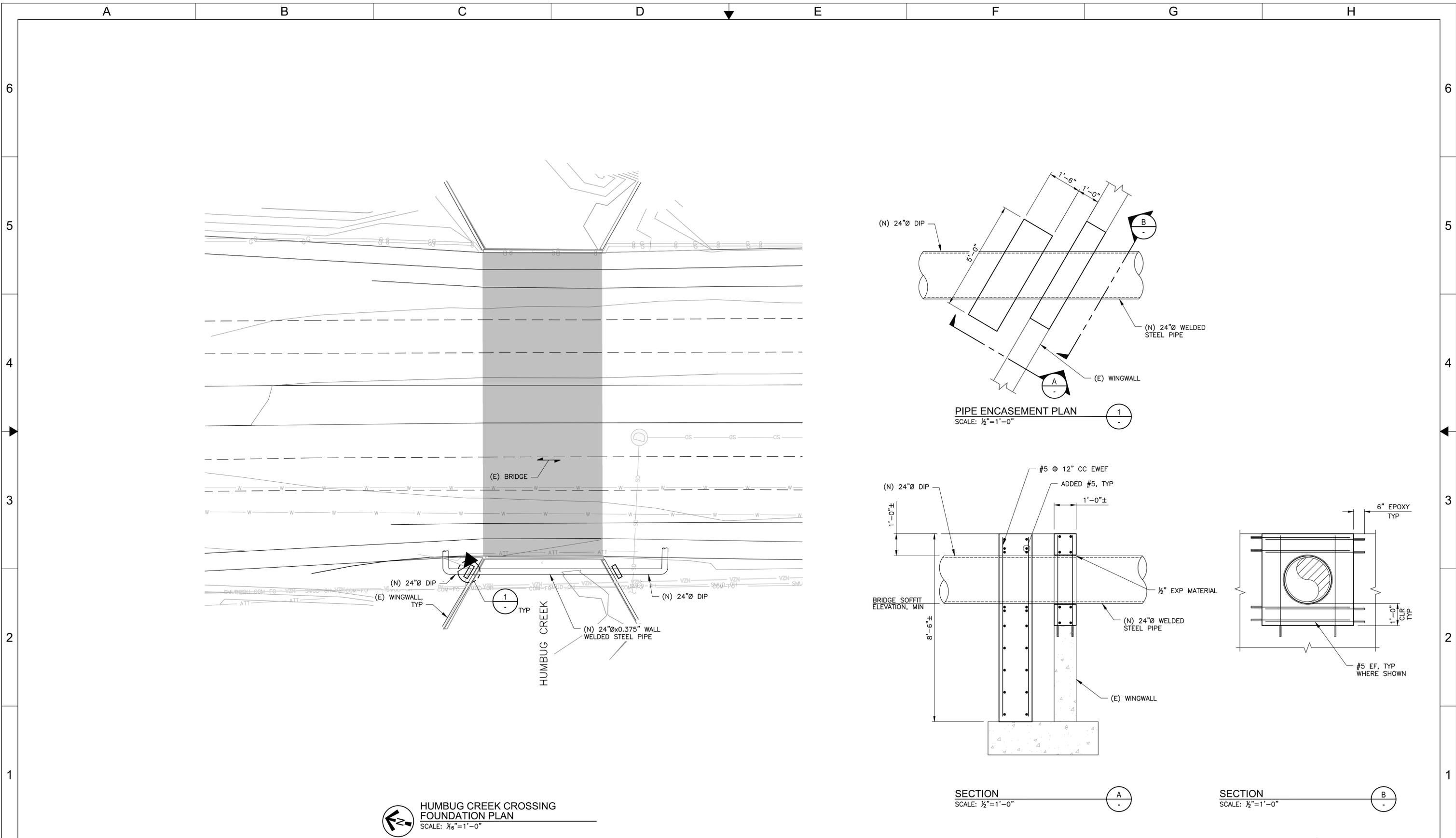
FOLSOM SOUTH AREA GROUP  
TRANSMISSION PIPELINE AND  
PUMP STATION PROJECT

RETAINING WALL  
DETAILS



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S200 SHEET 84 OF 86  
DRAWING NUMBER



**HUMBUG CREEK CROSSING FOUNDATION PLAN**  
SCALE: 1/8"=1'-0"

**PIPE ENCASEMENT PLAN**  
SCALE: 1/2"=1'-0"

**SECTION A-A**  
SCALE: 1/2"=1'-0"

**SECTION B-B**  
SCALE: 1/2"=1'-0"



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REV	DESCRIPTION	DATE

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DISTINCTIVE BY NATURE

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4370 TOWN CENTER BLVD., STE. 100  
EL DORADO HILLS, CA 95762

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DESIGN BY: BAF PCE: S2780 DATE: 6/3/24  
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FOLSOM SOUTH AREA GROUP  
TRANSMISSION PIPELINE AND  
PUMP STATION PROJECT

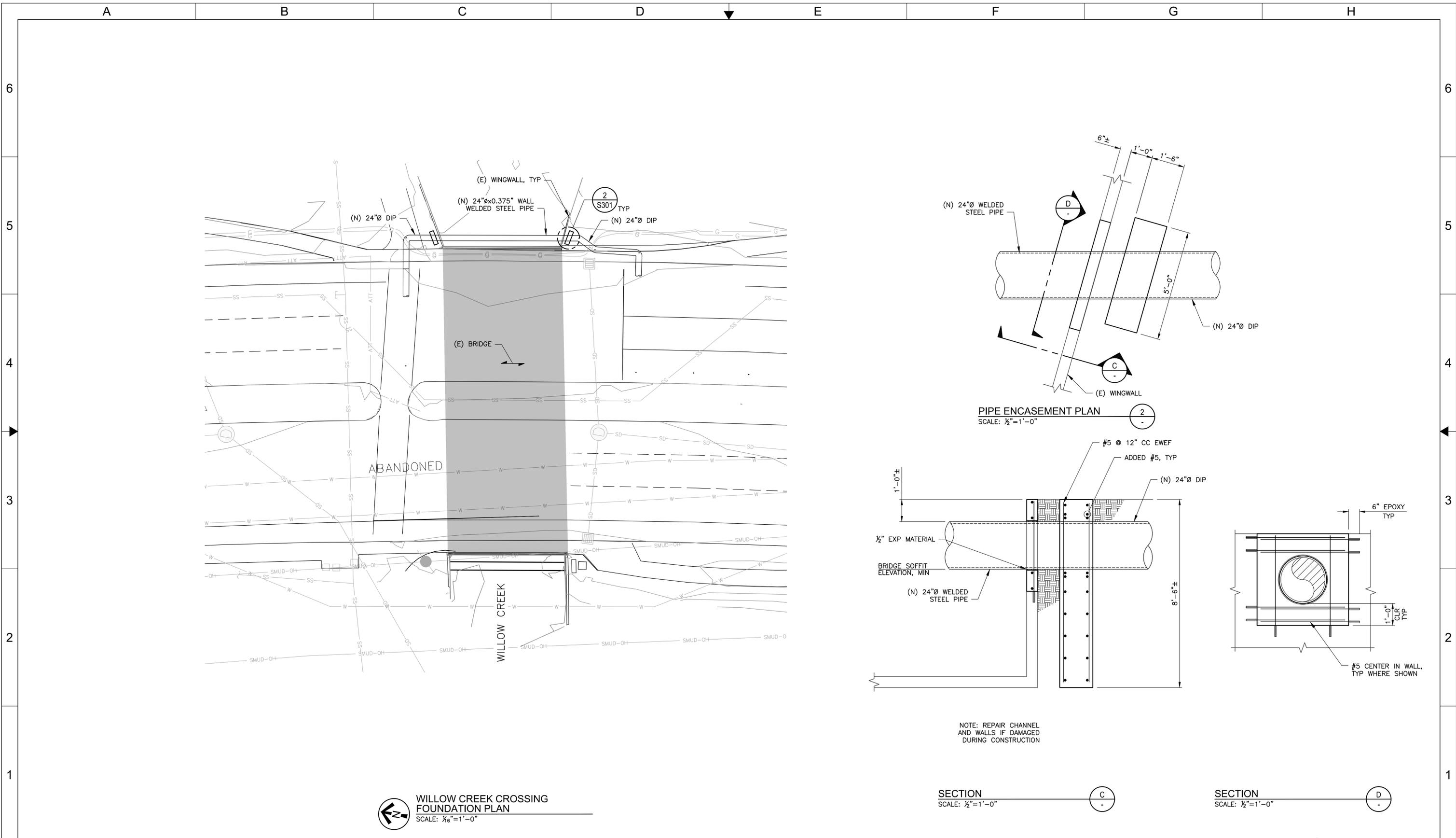
HUMBUG CREEK  
PIPE CROSSING



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**S300**  
DRAWING NUMBER

SHEET  
85 OF 86



**WILLOW CREEK CROSSING FOUNDATION PLAN**  
SCALE: 1/8"=1'-0"

**PIPE ENCASEMENT PLAN**  
SCALE: 1/2"=1'-0"

**SECTION**  
SCALE: 1/2"=1'-0"

**SECTION**  
SCALE: 1/2"=1'-0"

NOTE: REPAIR CHANNEL AND WALLS IF DAMAGED DURING CONSTRUCTION

**HydroScience**  
741 ALLSTON WAY  
BERKELEY, CA 94710  
510.540.7100 HYDROSCIENCE.COM

REV	DESCRIPTION	DATE

**CITY OF FOLSOM**  
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FOLSOM SOUTH AREA GROUP  
TRANSMISSION PIPELINE AND  
PUMP STATION PROJECT

WILLOW CREEK  
PIPE CROSSING



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**S301**  
DRAWING NUMBER

SHEET  
86 OF 86

**Attachment C – Draft Technical Specifications**

# TECHNICAL SPECIFICATIONS

## Folsom South Area Group Transmission Pipeline Project

100% Documents

January 2024

Prepared for:

**FIG Cost Sharing, LLC**

4370 Town Center Blvd, Suite 100

El Dorado Hills, CA 95762



Prepared By:

**HydroScience** 

HydroScience Engineers  
741 Allston Way  
Berkeley, CA 94710

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**\*\*END OF SECTION\*\***

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**SECTION 01010**  
**SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.01 Summary**

A. The work to be done consists of furnishing all labor, materials, equipment, and services for the **Folsom South Area Group (FSAG) Transmission Pipeline Project**, including all water transmission,; all trenching and backfilling; all piping; all paving, retaining walls and at-grade improvements; all structural facilities, all geotechnical work, all site work and grading; all electrical; and all miscellaneous work as shown on the Contract Drawings, specified or required for a complete, operational installation.

**1.02 Project Site Conditions**

<u>Item</u>	<u>Description</u>
Location	City of Folsom, California
Site Address	Water Treatment Plant Road
Elevations	520 feet to 600 feet
Average Ambient Temperatures	Monthly Average Low: 38° F Monthly Average High: 94° F
Exterior Temperature Range	30° F to 115° F
Humidity Range	10% to 100%

**1.03 Contractor Scope of Services:**

A. The work to be performed under this contract comprises furnishing all labor, materials, and equipment (unless otherwise excluded under "Owner Pre-purchases") required to, but not limited to, perform the following items:

1. Install approximately 18,800 linear feet of new 24-inch transmission ductile iron or welded steel pipeline from Water Treatment Plant Road to the Iron Point Road crossing of E. Bidwell Street, including all of the following:

a. Pipe, angles, couplings, and other appurtenances

- b. Butterfly valves and appurtenances
  - c. Blowoffs and/or fire hydrants
  - d. Combination Air/vacuum release valves
  - e. Pipe bedding and backfill
  - f. Hydroseeding
2. Provide traffic control and site security.
  3. Lower existing utilities as noted on Plans to ensure adequate separation with the new pipeline. Contractor is responsible for notifying the utility owner with enough lead time for garner their support and/or participation in the lowering process.
  4. Provide localized grading at locations noted on Plans and in accordance with referenced sections in order to remove low and high points and provide improved drainage.
  5. Perform hydroseeding on eroded hillside TCE locations as noted on Plans to reduce future erosion of hillsides.
  6. Construct two Grouted Cobble stormdrain spillways as noted on Plans to replace eroded and damaged cobble drainage spillways.

#### **1.04 Owner Scope of Services**

- A. The Owner will not furnish labor, materials, equipment or services necessary for the FSAG Transmission Pipeline and Pump Station Project. All required services to construct the proposed potable water pumping and conveyance facilities shall be included in the Contractor's scope of services and directly reflected in the Contractor's final bid.

#### **1.05 Owner Pre-purchased Equipment**

- A. No pre-purchased materials or equipment will be provided by the Owner.

#### **1.06 Work Included**

- A. The Contractor shall furnish all labor, superintendence, materials, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services, and other means of construction necessary or proper for performing and completing the work.
- B. The Contractor shall obtain and pay for all required permits.

- C. Contractor shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property, to the satisfaction of the Owner's Representative and in strict accordance with the Contract Documents.
- D. The Contractor shall clean up the work site and maintain it during and after construction, until accepted, and shall do all of the work and pay all costs incidental thereto.
- E. The Contractor shall repair all structures, pavement, and property, in kind, that may be damaged or disturbed during performance of the work.
- F. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his equipment.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

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## **SECTION 01150 DEFINITION OF BID ITEMS**

### **PART 1 - GENERAL**

#### **1.01 General**

Payment for the various items of the Bid Schedule, as further specified herein, shall include full compensation to be received by the Contractor for furnishing all labor, materials, equipment and services, and do all work for the construction, maintenance, dewatering, testing, and placing in trouble-free operation all items of work being described, including all appurtenances thereto and including the costs of all permits and the cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefor shall be included in the prices named in the Bid Schedule for the various items of work.

#### **1.02 Bid Schedule**

##### **BID ITEM NO. 1: TRANSMISSION PIPELINE MOBILIZATION/DEMobilIZATION**

The contract lump sum price paid for Mobilization/Demobilization shall include full compensation for furnishing all transportation, labor, materials, equipment, and incidentals necessary to prepare the site in accordance with the project plans, the technical specifications, and as directed by the Engineer. Work shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; obtaining bonds and insurance; preparation, submission, and re-submission of submittals; schedule preparation, public notification, cleaning and site maintenance; survey layout; all construction facilities and temporary controls described in Section 01500, and fees and permits. The bid price for mobilization and demobilization shall not exceed five percent (5%) of the total bid amount.

##### **BID ITEM NO. 2: STORM WATER POLLUTION PREVENTION PLAN**

The contract lump sum price paid for Storm Water Pollution Prevention Plan shall include full compensation for preparation, submission, and re-submission of a Storm Water Pollution Prevention Plan (SWPPP) for approval by the Engineer prior to commencing any field work. The SWPPP shall be prepared in accordance with any requirements set forth in Section 01500. The lump sum price shall also include full compensation for furnishing of all transportation, labor, materials, tools, equipment, and all incidental work for implementing the SWPPP for the project.

##### **BID ITEM NO. 3: TRAFFIC CONTROL**

The contract lump sum price paid for Traffic Control during construction shall include full compensation for furnishing all materials, equipment, labor, permits, and incidentals required to prepare traffic control plans and provide traffic control for worker and public safety as specified in Section 02800 and as shown on the Drawings. Payment for traffic control during construction shall only be made for work where excavations are to be made in traffic areas, as identified on the Drawings. Traffic control that is necessary to protect the work or the public at sites where excavation is not required in traffic areas shall be considered a part of the rest of the work at those sites, and no additional compensation shall be made therefor.

#### **BID ITEM NO. 4: SHEETING, SHORING AND BRACING**

The lump sum price paid for Sheeting, Shoring and Bracing shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to provide sheeting, shoring, bracing and other measures, complete, and as described in Section 02350.

#### **BID ITEM NO. 5: SURVEY MONUMENT PERPETUATION & REPLACEMENT**

The contract unit price paid per each for Survey Monument Perpetuation & Replacement shall include full compensation for furnishing of all materials, equipment, labor to replace all disturbed Monuments as part of this work per City requirements, as described in Section 02895.

#### **BID ITEM NO. 6: PEDESTRIAN BRIDGE REMOVAL AND 36 INCH STORM DRAIN IMPROVEMENTS**

The lump sum price paid for Pedestrian Bridge Removal and 36 inch Storm Drain Improvements shall include full compensation for furnishing of all materials, equipment, labor and incidentals to remove and dispose of the existing pedestrian bridge and construct 36 inch storm drain improvements as part of this work per City requirements, as described in Section 02630 and includes locating utilities, potholing prior to construction, excavation, new pipe, testing, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations

#### **BID ITEM NO. 7: GROUTED COBBLE EROSION CONTROL DITCH**

The contract unit price paid per Cubic Yard for Grouted Cobble Erosion Control Ditch shall include full compensation for furnishing of all materials, equipment, labor to grouted cobble ditch improvements as part of this work per City requirements, as described in Section 02630.

### **TRANSMISSION PIPELINE**

#### **BID ITEM NO. 8: TREE PROTECTION/TREE REMOVAL**

The lump sum price paid for Tree Protection/Tree Removal shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install and maintain tree protection fencing, tree removal, root pruning, limb pruning, backfill, transport and disposal of materials in accordance with applicable State and Federal regulations.

#### **BID ITEM NO. 9: REPLACE/NEW TRAIL PAVEMENT & AGGREGATE BASE**

The contract unit price paid square yard for Replace/New Trail Pavement and Aggregate Base shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install trail pavement and aggregate base as shown and as specified, including excavation, grading, compaction, testing, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations, and striping.

#### **BID ITEM NO. 10: ITERIS RADIO/VIDEO DETECTION SYSTEM**

The contract unit price paid per each for Traffic Signal Detector Loops shall include full compensation to locate and replace all traffic signal detector loops disturbed as part of this work per City requirements, including coordination with City traffic representatives, and materials and labor necessary to provide complete working traffic loops.

**BID ITEM NO. 11: REPLACE STREET PAVEMENT & AGGREGATE BASE**

The contract unit price paid square yard for Replace Street Pavement and Aggregate Base shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install trail pavement and aggregate base as shown and as specified, including excavation, grading, compaction, testing, surface restoration, traffic control, transport and disposal of materials in accordance with applicable State and Federal regulations, and striping.

**BID ITEM NO. 12: PAVEMENT STRIPING AND MARKING**

The contract lump sum price paid for Pavement Striping and Marking shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to replace existing pavement markings and striping disturbed as part of this work per City requirements, including coordination with City traffic representatives.

**BID ITEM NO. 13: SITE GRADING, EXCAVATION AND HAULING**

The contract lump sum price paid for Site Grading, Excavation and Hauling shall include full compensation for furnishing all material, equipment, and labor to provide finish grading elevations as shown in the drawings and as specified herein, including protection of items not intended for removal, dust and noise control, material disposal, fees, and all incidentals.

**BID ITEM NO. 14: ROCK EXCAVATION**

The contract unit price paid per cubic yard for Rock Excavation shall include full compensation for furnishing all materials, equipment, labor and incidentals required to excavate rock as specified, including excavation, grading, compaction, testing, surface restoration, traffic control, transport and disposal of materials in accordance with applicable State and Federal regulations.

**BID ITEM NO. 15: 24 INCH TIE-IN TO EXISTING 24 INCH WATER TREATMENT PLANT**

The contract unit price paid per 24" Tie-In to Existing 24" water treatment plant shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install new pipeline as shown and as specified, including locating utilities, potholing prior to construction, excavation, new pipe, fittings, restraint, testing, corrosion protection, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations, and striping.

**BID ITEM NO. 16: 24 INCH TIE-IN TO EXISTING 30 INCH TRANSMISSION MAIN (Iron Point Rd)**

The contract unit price paid per 24" Tie-In to Existing 30" Transmission Main shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install new pipeline as shown and as specified, including locating utilities, potholing prior to construction, excavation, new pipe, fittings, restraint, testing, corrosion protection, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations, and striping.

**BID ITEM NO. 17: 24 INCH TRANSMISSION MAIN (CLMC WELDED STEEL PIPE OR DUCTILE IRON PIPE, CL 250, FULLY RESTRAINED)**

The contract unit price paid per linear foot for 24" Transmission Main – Open Trench shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install new pipeline as shown and as specified, including locating utilities, potholing prior to construction, excavation, new pipe, relocating existing pipes, fittings, restraint, testing, corrosion protection, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations, and striping.

**BID ITEM NO. 18: 24 INCH PIPE FITTINGS AND ELBOWS**

The contract unit price paid per each for 24 inch Pipe Fittings and Appurtenances shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install new pipeline fittings as shown and as specified, including locating utilities, potholing prior to construction, excavation, new pipe, restraint, testing, corrosion protection, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations, and striping.

**BID ITEM NO. 19: 24 INCH BUTTERFLY VALVE**

The contract unit price paid per each for 24 inch Butterfly Valve shall include full compensation for furnishing all materials, equipment, labor, and incidentals required to install a new valve on the potable water main as shown in the drawings and as specified, including excavation, valve, fittings, restraints, cathodic protection system, riser and valve box, connection to new pipeline, testing, backfill, surface restoration, and striping.

**BID ITEM NO. 20: 24 BLOWOFFS AND HYDRANT ASSEMBLIES**

The contract lump sum price paid for blowoffs and hydrant assemblies shall include full compensation for furnishing all materials, equipment, labor, and incidentals required to install a new fire hydrant of blowoff assembly on the potable water main as shown in the drawings and as specified, including excavation, valve, fittings, restraints, cathodic protection system, riser and valve box, connection to new pipeline, testing, backfill, surface restoration, and striping.

**BID ITEM NO. 21: 6 INCH COMBINATION AIR/VACUUM RELEASE VALVES**

The contract unit price paid per each for Air Release Valves shall include full compensation for furnishing, installing and testing air release valves as shown on the Drawings and per the Specifications, including supplying and installing the service saddle, corporation stop, lateral piping, traffic rated valve box, air release valve, cathodic protection, and all other fittings and bends for a complete working air valve assembly, including testing of assembly. Additionally, compensation shall include the cost for trenching; hauling; disposal; pipe materials; pipe bedding; intermediate backfill and associated compaction and compaction testing; restoration of roadway subgrade material (AB); concrete curbs, gutters and surfaces; associated compaction and compaction testing; AC pavement replacement, transport and disposal of materials in accordance with applicable State and Federal regulations; striping; and other items as required to facilitate the construction work.

**BID ITEM NO. 22: AERIAL PIPE INSTALLATION AT CREEK CROSSINGS**

The contract unit price paid per each for Aerial Pipe Installation at Creek Crossings shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install new pipeline as shown and as specified, including locating utilities, potholing prior to construction, excavation, new pipe, restraint, testing, corrosion protection, bedding, backfill, surface restoration, pipe supports, air valves, concrete curbs, gutters and surfaces, associated compaction and compaction testing; AC pavement replacement, transport and disposal of materials in accordance with applicable State and Federal regulations.

#### **BID ITEM NO. 23: CATHODIC PROTECTION TESTING SITE**

The contract unit price paid per each for Cathodic Protection Testing Site shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install new pipeline as shown and as specified, including locating utilities, potholing prior to construction, excavation, new pipe, anodes, testing, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations, and striping.

#### **BID ITEM NO. 24: FIBER OPTIC CONDUIT WITH PULL BOXES AND SPLICE VAULTS**

The contract lump sum price paid for Fiber Optic Conduit with Pull Boxes and Splice Vaults shall include full compensation for furnishing all material, equipment, and labor to install fiber optic conduit, pull boxes, and splice vaults as shown in the drawings and specified herein, including locating utilities, potholing prior to construction, excavation, new pipe, anodes, testing, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations.

### **WATER TREATMENT PLANT**

#### **BID ITEM NO. 26: WATER TREATMENT PLANT MOBILIZATION/DEMobilIZATION**

The contract lump sum price paid for Mobilization/Demobilization shall include full compensation for furnishing all transportation, labor, materials, equipment, and incidentals necessary to prepare the site in accordance with the project plans, the technical specifications, and as directed by the Engineer. Work shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; obtaining bonds and insurance; preparation, submission, and re-submission of submittals; schedule preparation, public notification, cleaning and site maintenance; survey layout; all construction facilities and temporary controls described in Section 01500, and fees and permits. The bid price for mobilization and demobilization shall not exceed five percent (5%) of the total bid amount.

#### **BID ITEM NO. 26: CLEARING AND GRUBBING**

The contract lump sum price paid for Site Clearing and Grubbing shall include full compensation for furnishing all material, equipment, and labor to clear and grub vegetation as shown in the drawings and as specified herein, including protection of items not intended for removal, dust and noise control, material disposal, fees, and all incidentals.

#### **BID ITEM NO. 27: SITE WORK**

The contract lump sum price paid for Site Work shall include full compensation for furnishing all material, equipment, and labor to install aggregate base, curbs, gutters, storm drain drop inlets, fencing, guardrails, and swales.

BID ITEM NO. 28: CMU RETAINING WALL

The contract lump sum price paid for CMU Retaining Wall shall include full compensation for furnishing all material, equipment, and labor to install new retaining walls, including concrete masonry units, foundations, drain rock, piping sleeves and filter fabric.

BID ITEM NO. 29: YARD PIPING

This contract lump sum price paid for Yard Piping shall include full compensation for furnishing of all materials, equipment, labor and incidentals required to install new yard piping as shown and as specified, including locating utilities, potholing prior to construction, excavation, relocation of existing welded steel pipe, new piping, fittings, valves, fire hydrant, flow meter, restraint, testing, corrosion protection, bedding, backfill, surface restoration, transport and disposal of materials in accordance with applicable State and Federal regulations.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**\*\*END OF SECTION\*\***

## **SECTION 01300 SUBMITTALS**

### **PART 1 - GENERAL**

#### **1.01 Summary**

A. Section Includes:

1. Description of general requirements for project Submittals.

#### **1.02 Submittals**

A. Where required by the Specifications, the Contractor shall submit descriptive information which will enable the Engineer to advise the Owner whether the Contractor's proposed materials, equipment or methods of work are in general conformance with the design concept and are in compliance with the drawings and specifications. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results and other such information, all as specifically required in the Specifications.

B. The Contractor shall submit the following items:

1. Schedule of Submittals and Shop Drawings
2. List of Submittals, Shop Drawings, Product Data and Materials
3. Contractor's Safety Program
4. Designated Safety Supervisor
5. Designated "Competent Person(s)"
6. Schedule of Values
7. Construction Schedule
8. Substitutions List
9. Shop Drawings
10. Product Data
11. Samples
12. Material Safety Data Sheets
13. Operation and Maintenance Manuals
14. Project Closeout Information
15. Warranty Data
16. Others as Specified in the Technical Specifications
17. Manufacturer's Instructions
18. Manufacturer's Certifications and Test Reports

C. Quantity of Submittals:

1. Submit one (1) digital PDF format of all submittals.
  - a. PDF submittal shall be clear and readable.
  - b. Provide searchable PDF file.

- c. Annotate or mark submittal to clearly show the item or model being submitted.
  - d. Organization and Binding of Submittals: The initial and subsequent submittals of drawings and data for review shall be organized and bound with a Table of Contents so that eventually they may be used as guides for preparing the required maintenance manuals. PDF files shall have active links in the Table of Contents, or they shall have bookmarks per the Table of Contents.
2. If paper copies are submitted:
- a. Provide three (3) copies to the Owner's Representative and a scanned electronic copy where feasible. The Contractor shall state the number of copies the Contractor wants to be returned where necessary.
- D. Where the Contractor is required by these Specifications to submit samples of products, the Contractor shall provide a sufficient number of physical samples to allow three (3) to be retained by the Owner's Representative of all structural and architectural products involving color, finish, texture, or the like.
- E. List of Submittals:
- 1. Within thirty-five (35) days after the Notice to Proceed, the Contractor shall submit a List of Submittals to the Owner's Representative for review.
  - 2. The List shall include all items of equipment and materials for necessary project disciplines (Civil, Electrical, Mechanical etc) and the names of manufacturers with whom purchase orders have been or will be placed.
  - 3. The List shall be arranged in the same order as the Specifications and shall contain sufficient data to identify all items of material and equipment the Contractor proposes to furnish. The List shall include Specification and/or Drawing references.
  - 4. After the submission is favorably reviewed and returned to the Contractor by the Owner's Representative, it shall become the basis for the submission of detailed manufacturer's drawings, catalog cuts, curves, diagrams, schematics, data, and information on each separate item for review as set forth in the Specifications.
- F. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall ensure that the material, equipment or method of work shall be as described in the submittal.
- 1. Submittals shall contain all required information, including satisfactory identification of items, units and assemblies in relation to the contract drawings and specifications.
  - 2. The Contractor shall verify that the material and equipment described in each submittal conforms to the requirements of the specifications and drawings.
  - 3. Unless otherwise approved by the Engineer, submittals shall be made only by the Contractor, who shall indicate by a signed stamp on the submittals that the Contractor has checked the submittals and that the work shown conforms to contract requirements and has been checked for dimensions and relationship with work of all other trades involved.
  - 4. If the information shows deviations from the specifications or drawings, the Contractor, by statement in writing accompanying the information, shall identify the deviations and state the reason(s) therefore.
  - 5. The Contractor shall ensure that there is no conflict with other submittals and shall notify the Engineer in each case where the Contractor's submittal may affect the work of another contractor or the Owner.

6. The Contractor shall ensure coordination of submittals among the related crafts and subcontractors.

### **1.03 Submittal Transmittal Procedure**

- A. General: Submittals regarding material and equipment shall be accompanied by a transmittal form from the Contractor. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete specification sections for which a submittal is required. However, submittals for various items shall be made with a single form only when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.
- B. Submittal Identification: Each set of submittals or samples shall be attached to the submittal transmittal form.
  1. The submittal number shall be made up of two parts: XXX-ZZ. The XXX shall be sequential number 001 for the first item submitted, 002 for the second, etc. The ZZ shall be the sequential number of a specific submittal or resubmittal (01 for the first submittal, 02 for the first resubmittal, etc.).
  2. All submittals shall show the contract title, shall indicate the name of the vendor, and shall indicate when the equipment and/or material will be required by the construction schedule.
  3. The submittal must be adequate to permit a comprehensive review without further reference to the Contractor. The documents submitted must be separately identifiable on the Contractor's submittal transmittal form.
- C. Deviation from Contract: If the Contractor proposes to provide material or equipment which does not conform to the specifications and drawings, this shall be indicated under "deviations" on the submittal transmittal form accompanying the submittal copies.
  1. If the Owner accepts such deviation, the Owner shall issue an appropriate Contract Change Order, except that, if the deviation is minor, or does not involve a change in price or in time of performance, a Change Order need not be issued.
  2. If any deviations from the Contract requirements are not noted on the submittal, the review of the shop drawing shall not constitute acceptance of such deviations.
- D. Submittal Completeness: Submittals which do not have all the information required to be submitted, including deviations, shall be considered as not complying with the intent of the contract and are not acceptable and will be returned without review.
  1. A complete submittal shall contain sufficient data to demonstrate that the items comply with the Specifications, shall meet the minimum requirements for submissions cited in the technical specifications, shall include materials and equipment data and seismic anchorage certifications where required, and shall include any necessary revisions required for equipment other than first named.
- E. Review of Subsequent Resubmittals: It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Owner's Representative at least by the second submission of data. At the discretion of the Engineer costs associated with the review of any subsequent resubmittals may be borne by the Contractor. The Contractor will be billed for these costs by the Owner. Costs due may be deducted from progress payments due the Contractor by the Owner.

#### 1.04 Submittal Review

- A. The Contractor shall provide all submittals to the Owner's representative at the earliest feasible time possible to facilitate a comprehensive review that does not impact construction related progress.
- B. Within 14 calendar days after receipt of the submittal by the Engineer, the submittal will be reviewed by the Engineer and the Engineer will return the marked-up submittal. On complex drawings and equipment, the Engineer shall acknowledge receipt within 30 days and advise the Contractor when the submittal will be returned. The returned submittal shall indicate one of the following actions.
1. If the review indicates that the material, equipment or work method is in general conformance with the design concept and complies with the drawings and specifications, submittal copies will be marked "NO EXCEPTIONS TAKEN". In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.
  2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED". The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in operation and maintenance data, a corrected copy shall be provided. Otherwise, no resubmittal will be required.
  3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT". The Contractor shall not undertake work covered by this submittal until the submittal has been revised, resubmitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
  4. If the review indicates that the material, equipment or work method is not in general conformance with the design concept or in compliance with the drawings and specifications, copies of the submittal will be marked "REJECTED - SEE REMARKS". Submittal with deviations which have not been identified clearly may be rejected. The Contractor shall not undertake work covered by such submittal until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
- C. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide shall not relieve the Contractor of responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer, the Owner's Representative or the Owner, or by any officer, employee or subcontractor thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure of the method of work, material, or equipment so reviewed.
1. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the Owner has no objection to the Contractor, upon its own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.
  2. Favorable review of submittals does not constitute a change order to the Contract requirements.
  3. The favorable review of all submittals by the Engineer shall apply in general design only and shall in no way relieve the Contractor from responsibility for errors or omissions contained therein.
  4. Favorable review by the Engineer shall not relieve the Contractor of its obligation to meet safety requirements and all other requirements of laws, nor constitute a Contract Change Order.

5. Favorable review by the Engineer will not constitute acceptance by the Engineer of any responsibility for the accuracy, coordination, and completeness of the submittals or the items of equipment represented on the submittals.
6. The favorable review of shop drawings shall be obtained prior to the fabrication, delivery and construction of items requiring shop drawing submittal.

**\*\*END OF SECTION\*\***

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## **SECTION 01311 SCHEDULE AND REPORTING**

### **PART 1 - GENERAL**

#### **1.01 General**

- A. The scheduling of the work under the Contract shall be performed in accordance with the requirements of this Section.
- B. The development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) or bar chart scheduling.

#### **1.02 Definitions and Requirements**

- A. Critical Path Method (CPM): CPM, as required by this Section, shall be interpreted to be generally as outlined in the Association of General Contractors (AGC) publication, "The Use of CPM in Construction." except that either "i-j" arrow diagrams or precedence diagramming format may be utilized. In the case of conflicts between this specification and the AGC Document, this specification shall govern.
- B. Construction Schedules: Construction schedules shall include a graphic network diagram and computerized construction schedule reports.
- C. Networks: The CPM network shall be in a form of a time scaled "i-j" activity-on-arrow or precedence type diagram and may be divided into a number of separate sheets with suitable match lines relating the interface points among the sheets.
  - 1. Individual sheets shall not exceed 36-inch by 60-inch.
- D. All construction activities and procurement shall be indicated in a time-scaled format and a calendar timeline shall be shown along the entire sheet length.
  - 1. Each activity arrow or node shall be plotted so that the beginning and completion dates of each activity are accurately represented along the calendar timeline.
  - 2. All activities shall be shown using the symbols that clearly distinguish between critical path activities, non-critical activities and free float for each non-critical activity.
  - 3. All activity items shall be identified by their respective Activity Number, Responsibility Code, Work Duration, and their Dollar Value.
  - 4. All non-critical path activities shall show their total float time in scale form by utilizing a dotted line or some other graphical means.
- E. Duration Estimates: The duration estimate indicated for each activity shall be computed in calendar days and shall represent the single best estimate considering the scope of the activity work and resources planned for the activity. Except for certain non-labor activities, such as curing of concrete or delivery of materials, activity duration shall not exceed 10 calendar days nor be less than one calendar day unless otherwise accepted by the Owner's Representative.
- F. Float Time: Float time shall be as follows:
  - 1. Definition: Unless otherwise provided herein, float as referenced in these documents, is total float. Total float is the period of time measured by the number of calendar days each non-critical path activity may be delayed before it and its succeeding activities become part of the critical path. If a non-critical path activity is delayed beyond its float period, that activity then

becomes part of the critical path and controls the end date of the project. Thus, the delay of the non-critical path activity beyond its float period will cause delay to the project itself.

2. Float Ownership: Neither the Owner nor the Contractor owns the float time. The project owns the float time. As such, liability for delay of the project completion date rests with the party actually causing delay to the project completion date. For example, if Party A uses some, but not all of the float time and Party B later uses the remainder of the float time as well as additional time beyond the float time, Party B shall be liable for the costs associated with the time that represents a delay to the project's completion date. Party A would not be responsible for any costs since it did not consume all of the float time and additional float time remained, therefore, the project's completion date was unaffected.

### **1.03 Submittals**

- A. Submit schedules per requirements of Specification Section 01300.
- B. Preliminary Schedule
  1. The Contractor shall submit a preliminary schedule document at the Preconstruction Conference, to identify the manner in which the Contractor intends to complete all work within the Contract Time.
- C. Original Schedule
  1. The Contractor shall submit an original schedule document within 21 days following the Preconstruction Conference.
- D. Revised or Updated Schedules
  1. Submit when required to reflect changes to original schedule.

### **1.04 Construction Schedule**

- A. The schedule shall indicate the major components of the project work and the sequence relations between major components and subdivisions of major components.
- B. The schedule shall be cost loaded based on the schedule of values as approved by the Owner's Representative.
- C. Sufficient detail shall be included for the identification of subdivisions of major components into such activities as:
  1. All work tasks requiring a partial of existing facilities and roadways.
  2. Trenching and backfilling.
  3. Piping
  4. Manhole construction.
  5. Finished pavement.
  6. Site work.
  7. Other important work within the overall project scope.
- D. Planned durations and start dates shall be indicated for each work item subdivision. Each major component and subdivision component shall be accurately plotted on time scale sheets not to exceed 36-inch by 60-inch in size. Not more than one sheet shall be employed to represent this information.

### **1.05 Schedule Review**

- A. The Owner's Representative and the Contractor shall meet to review and discuss the preliminary schedule within 14 days after it has been submitted to the Owner's Representative.
  - 1. The Owner's Representative's review and comment on the schedules shall be limited to Contract conformance with the sequencing and milestone requirements as stated in other sections of the specifications.
  - 2. The Contractor shall make corrections to the schedules necessary to comply with the Contract requirements and shall adjust the schedules to incorporate any missing information requested by the Owner's Representative.

### **1.06 Acceptance**

- A. The acceptance of the Contractor's schedule by the Owner's Representative and Owner will be based solely upon the schedule's compliance with the Contract requirements.
- B. By way of the Contractor assigning activity durations and proposing the sequence of the Work, the Contractor agrees to utilize sufficient and necessary management and other resources to perform the work in accordance with the schedule.
- C. Upon submittal of a schedule update, the updated schedule shall be considered the "current" project schedule.
- D. Submission of the Contractor's progress schedule to the Owner or Owner's Representative shall not relieve the Contractor of the Contractor's total responsibility for scheduling, sequencing, and pursuing the Work to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed work.

### **1.07 Monthly Updates and Periodic Schedule Submittals**

- A. Following the acceptance of the Contractor's Original Construction Schedule, the Contractor shall monitor the progress of the Work and adjust the schedule each month to reflect actual progress and any changes in planned future activities.
  - 1. Each schedule update submitted must be complete including all information requested in the original schedule submittal.
  - 2. Each update shall continue to show all work activities including those already completed.
  - 3. These completed activities shall accurately reflect the "as built" information by indicating when the work was actually started and completed.
- B. Neither the submission nor the updating of the Contractor's original schedule submittal nor the submission, updating, change or revision of any other report, curve, schedule or narrative submitted to the Owner's Representative by the Contractor under this Contract, nor the Owner's Representative's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying, in any way, the Contract completion date or milestone dates or of modifying or limiting, in any way, the Contractor's obligations under this Contract. Only a signed, fully executed change order can modify these contractual obligations.
- C. The monthly schedule update submittal will be reviewed with the Contractor during a construction progress meeting held on a month end date to be determined. The goal of these meetings is to enable the Contractor and the Owner's Representative to initiate appropriate remedial action to minimize any known or foreseen delay in completion of the Work and to determine the amount of Work completed since the last month's schedule update.
  - 1. The status of the Work will be determined by the percent complete of each activity shown in the Network Diagram.

2. These meetings are considered a critical component of the overall monthly schedule update submittal and the Contractor shall have appropriate personnel attend.
  3. As a minimum, these meetings shall be attended by the Contractor's Project Manager and General Superintendent.
  4. Within seven (7) calendar days after the progress meeting, the Contractor shall submit the revised schedule.
  5. Within five (5) calendar days of receipt of the above noted revised submittals, the Owner's Representative will either accept or reject the monthly schedule update submittal.
  6. If accepted, the percent complete shown in the monthly update will be the basis for the Application for Payment to be submitted by the Contractor.
  7. If rejected, the update shall be corrected and resubmitted by the Contractor before the Application for Payment for the update period can be processed.
- D. Schedule Revisions: The Contractor shall highlight or otherwise identify all changes from the previous schedule. The Contractor shall modify any portions of the schedule that become infeasible because of activities behind-schedule or for any other valid reason.

### **1.08 Change Orders**

- A. Upon approval of a change order, or upon receipt by the Contractor of authorization to proceed with additional work, the change shall be reflected in the next submittal of the schedule by the Contractor.
- B. The Contractor shall utilize a sub-network in the schedule depicting the changed work and its effect on other activities.
- C. This sub-network shall be tied to the main network with the appropriate logic so that a true analysis of the Critical Path can be made.

### **1.09 Project Status Reporting**

- A. In addition to the submittal requirements for the scheduling identified in this Section, the Contractor shall provide monthly project status reports.
- B. The Contractor shall prepare monthly written narrative reports of the status of the project for submission to the Owner's Representative. Written status reports shall include:
  1. The status of major project components (Percent Complete, amount of time ahead or behind schedule) and an explanation of how the project will be brought back on schedule if delays have occurred.
  2. The progress made on critical activities indicated on the schedule.
  3. Explanations for any lack of work on critical path activities planned to be performed during the last month.
  4. Explanations for any schedule changes, including changes to the logic or to activity durations.
  5. A list of the critical activities scheduled to be performed in the next two-month period.
  6. The status of major material and equipment procurement.
  7. The value of materials and equipment properly stored at the site, but not yet incorporated into the work-in-place.
  8. Any delays encountered during the reporting period.
  9. An assessment of inclement weather delays and impacts to the progress of the Work.

C. The Contractor may include any other information pertinent to the status of the project. The Contractor shall include additional status information requested by the Owner's Representative.

**1.10 Inclement Weather Provisions of the Schedule**

A. The Contractor's construction schedule shall include lost days on the CPM schedule's critical path due to inclement weather typical for the area of construction based on the average rain days for the past five (5) years.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

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## SECTION 01360 OPERATING AND MAINTENANCE INFORMATION

### PART 1 - GENERAL

#### 1.01 Summary

- A. Contractor shall supply Operations and Maintenance (O&M) Manuals for equipment as specified in other parts of the Project Documents.

#### 1.02 Description

- A. The Contractor shall provide four (4) sets of operating and maintenance instructions for all equipment and devices furnished under this contract and one (1) pdf set. The operating and maintenance material supplied shall be original printed copies of manufacturer's brochures and/or manuals. Photocopied material will not be acceptable. Operating and maintenance instructions for each item of equipment and each equipment assembly shall consist of:
1. Names and addresses of manufacturer, nearest representative of manufacturer, and nearest supplier of manufacturer's equipment and parts
  2. For equipment requiring lubrication, the manufacturer's recommended lubricants and lubrication schedule.
  3. For equipment containing integral electrical controls, diagrams showing internal and connection wiring.
  4. Specified operating and maintenance information. This information shall include, but not necessarily be limited to, the following items:
    - a. Equipment data: The Contractor shall provide a good quality photocopy of the Equipment Maintenance Summary sheets for review and shall make corrections to the originals as noted in the submittal review comments. Sufficient copies of the blank forms will be furnished by the Owner.
    - b. Start-up procedures: These instructions shall include equipment manufacturer's recommendations regarding installation, adjustment, calibration and trouble-shooting.
    - c. Operating procedures: These instructions shall include the equipment manufacturer's recommended step-by-step procedures for starting, operating and stopping the equipment under all modes of operation.
    - d. Preventive maintenance procedures: These instructions shall include the equipment manufacturer's recommendations regarding the steps and schedules to be followed in maintaining the equipment.
    - e. Parts list: This list shall include generic title and identification number of each component part of the equipment.
    - f. Exploded views: These shall be provided where appropriate.
    - g. Spare parts list: This list shall include the manufacturer's recommendations of number of parts that should be stored by the Owner.
    - h. Overhaul instructions: These instructions shall consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment.

### 1.03 Submittal Procedure

- A. Operating and maintenance (O&M) instructions shall be submitted to the Owner's Representative accompanied by the submittal transmittal form described in Section 01300 - Submittals.
- B. Required submittals:
1. Initial Submittal: One (1) copy of O & M Manual shall be submitted for approval. Initial O&M submittal may be hard copy or PDF format.
  2. Intermediate Submittal: One (1) copy of revised O & M Manual shall be submitted for approval. Intermediate O&M may be hard copy or PDF format.
  3. Final Submittal: Once approved, submit four (4) paper copies and one (1) PDF.
  4. The submitted O&M Manuals shall have a separate submittal numbering system from the general equipment and material submittals required to confirm conformance with the design specifications.
- C. PDF Format shall be manufacturer's data converted directly to PDF. Scanned PDF information is not acceptable unless approved by the Owner's Representative.
1. PDF documents shall be bookmarked, indexed and in searchable format.
- D. For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the equipment name, equipment number and specification number, as it appears in the contract documents.
- E. The information shall be organized in binders in numerical order by the specification section numbers assigned in the contract documents. The binders shall be provided with a table of contents and tab sheets to permit easy location of desired information. Each numerical section shall contain a complete itemized data list with equipment name and equipment number for the information contained in that section. Binders shall be three-ring with clear vinyl pockets on the front and spine. The binder title shall be clearly visible on the spine and the front cover.
- F. The following procedures shall be used:
1. Contractor shall include in each O&M submittal a good quality photocopy of associated Equipment Maintenance Summary sheets, for each specification section for review.
  2. Submittals will be returned with a review sheet and comments.
  3. Contractor shall resubmit, if requested by the Owner's Representative, and retain all copies of approved submittals until all sections have been approved.
  4. When all sections have been approved, Contractor shall organize and bind the manuals for all the sections of the contract specifications according to the above instructions and submit one complete set of O&M Manuals for final review. Contractor shall submit separately and unbound the completed original Equipment Maintenance Summary sheets.
  5. Final review will be for the organization and binding of a complete set of manuals as specified and will not include review of previously approved material.
  6. When the complete set is approved, the Contractor shall submit four (4) complete sets to the Owner's Representative as approved and specified.
- G. If the manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project.
1. Clearly mark or annotate the actual model supplied for the project.
  2. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.

#### **1.04 Field Changes**

- A. Following the acceptable installation and operation of an equipment item, the item's operating and maintenance instructions, including drawings, shall be modified and supplemented by the Contractor to reflect any as-built conditions, field changes or information required by field conditions.

#### **1.05 Payment**

- A. Acceptable operating and maintenance information must be delivered to the Owner's Representative before the Contractor can be paid for more than 80 percent of the purchase value of that equipment and prior to installation of the equipment. Purchase value shall be the net price for the equipment as given on the paid invoice. Acceptable operating and maintenance information for the project must be delivered to the Owner's Representative prior to the project being 75 percent complete. Progress payments for work in excess of 75 percent completion will not be made until the specific acceptable operating and maintenance information has been delivered to the Owner's Representative.

#### **PART 2 - MATERIALS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

**\*\*END OF SECTION\*\***

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**SECTION 01500**  
**CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

**PART 1 - GENERAL**

**1.01 Summary**

- A. The Contractor shall provide all temporary facilities and utilities required for execution of the work, protection of employees and the public, protection of the work from damage by fire, weather or vandalism, and such other facilities as may be specified or required by any legally applicable law, ordinance, rule, or regulation.
- B. Temporary facilities utilized on the project shall be in complete accordance with requirements set forth in the Caltrans Standard Specifications.
- C. The Contractor shall keep the work site clean and free from rubbish and debris. Materials and equipment shall be removed from the site when they are no longer necessary on a daily basis as directed by the Owner's Representative. All cables, slings and other materials used to set the pipe and equipment shall be removed from the project site. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance.

**1.02 Temporary Facilities**

A. Electrical Service

- 1. The Contractor shall arrange, at its own cost, with the local utility to provide adequate temporary electrical service at a mutually agreeable location.
- 2. The Contractor shall then provide adequate jobsite distribution facilities conforming to applicable codes and safety regulations.
- 3. The Contractor shall provide, at its own cost, all electric power required for construction, testing, general and security lighting, and all other purposes whether supplied through temporary or permanent facilities.

B. Water

- 1. The Contractor shall pay for and shall construct all facilities necessary to furnish water for its use during construction.
- 2. Water used for human consumption shall be kept free from contamination and shall conform to the requirements of the State and local authorities for potable water.
- 3. The Contractor shall pay for all water used for the Contractor's operations prior to final acceptance.

C. Sanitary Conveniences

- 1. The Contractor shall provide suitable and adequate sanitary conveniences for the use of all persons at the site of the Work.
- 2. Such conveniences shall include chemical toilets or water closets and shall be located at appropriate locations at the site of the Work.
- 3. All sanitary conveniences shall conform to the regulations of the public authority having jurisdiction over such matters.
- 4. At the completion of the Work, all such sanitary conveniences shall be removed, and the site left in a sanitary condition.

#### D. Telephone/Internet

1. The Contractor shall arrange, at its own cost, with the local utility to provide adequate temporary telephone or internet services for its use during construction.
2. Contractor shall pay for all required services required for its own use as necessary.

### **1.03 Construction Facilities**

A. Construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities shall be of ample size and capacity to adequately support and move the loads to which they will be subjected. Railings, enclosures, safety devices, and controls required by law or for adequate protection of life and property shall be provided.

#### B. Staging and Falsework

1. Temporary supports shall be designed by a professional registered engineer with an adequate safety factor to assure adequate load bearing capability. If requested by the Owner's Representative, the Contractor shall submit design calculations for staging and shoring prior to application of loads.
2. Excavation support shall be in accordance with applicable codes and regulations.

#### C. Temporary Enclosures

1. When sandblasting, spray painting, spraying of insulation, or other activities inconveniencing or dangerous to property or the health of employees or the public are in progress, the area of activity shall be enclosed adequately to contain the dust, over-spray, or other hazard.
2. In the event there are no permanent enclosures of the area, or such enclosures are incomplete or inadequate, the Contractor shall provide suitable temporary enclosures.

#### D. Warning Devices and Barricades

1. The Contractor shall adequately identify and guard all hazardous areas and conditions by visual warning devices and, where necessary, physical barriers.
2. Such devices shall, as a minimum, conform to the requirements of Cal/OSHA.

#### E. Culvert Bypassing and Protection

1. The Contractor shall provide bypass and pumping facilities for any flowing culverts that encroach upon project trenching activities.
  - a. Bypassing facilities will only be required in high risk situations to prevent flooding the trench. Culvert bypassing risk shall be at the sole discretion of the Contractor.
2. Culvert bypassing systems shall be submitted to the Engineer for review prior to construction activities. Culvert bypassing plans shall provide, but not be limited to, the following information:
  - a. Means of protecting culverts during trench construction activities.
  - b. Construction means and methods describing culvert plugging, bypassing, and relocation of flowing water.
  - c. List all equipment necessary to perform bypassing and culvert protection undertakings.
  - d. Detail the bypass system's receiving stream crossing or drainage channel and the existing condition of the structure.
3. Culvert crossings damaged during construction activities identified by the project Inspector shall be restored in kind by the Contractor at no additional cost to the Owner unless otherwise negotiated.

#### **1.04 Protection and Restoration of Existing Improvements**

- A. The Contractor shall be responsible for the protection of public and private property at and adjacent to the Work and shall exercise due caution to avoid damage to such property.
- B. The Contractor shall repair or replace all existing improvements which are not designated for removal (e.g., curbs, sidewalks, survey points, fences, walls, signs, utility installations, pavements, structures, etc.) and are damaged or removed as a result of its operations. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.
- C. Trees, lawns, and shrubbery that are not to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original conditions and location as is reasonably possible. Lawns shall be re-seeded and covered with suitable mulch.
- D. The Contractor shall give reasonable notice to occupants or owners of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers, and other improvements within the right-of-way which are designated for removal or would be destroyed because of the Work.

#### **1.05 Access Roads**

- A. Access roads shall be maintained to all storage areas and other areas to which frequent access is required. Similar roads shall be maintained to all existing facilities on the site of the Work to provide access for delivery of material and for maintenance and operation. Where such temporary roads cross buried utilities that might be injured by the loads likely to be imposed, such utilities shall be adequately protected by steel plates or wood planking, or bridges shall be provided so that no loads shall discharge on such buried utilities.

#### **1.06 Air Pollution and Dust Control**

- A. The Contractor at its expense shall take whatever steps, procedures, or means as are required to prevent abnormal dust conditions being caused by its operations in connection with the execution of the Work; and on any unpaved road which the Contractor or any of its subcontractors are using, excavation or fill areas, demolition operations, or other activities.
  - 1. Control shall be by sprinkling, use of dust palliatives, modification of operations, or any other means acceptable to agencies having jurisdiction.
  - 2. Haul routes shall be kept visibly wet during excavation and hauling operations.
  - 3. Exposed stockpiles of soil and other backfill material shall be enclosed, have silt fencing, be covered, be watered regularly or have soil binders added to minimize erosion.
  - 4. Dust-producing activities shall be suspended when high winds create construction-induced visible dust plumes moving beyond the project site, in spite of dust control measures.
- B. Unless the construction dictates otherwise, and unless otherwise approved by the Owner's Representative, the Contractor shall furnish and operate a self-loading motor sweeper with spray nozzle at least once each working day to keep paved areas acceptably clean whenever construction, including restoration, is incomplete.
  - 1. If visible soil material is carried onto adjacent public streets, such streets shall be swept with water sweepers.

#### **1.07 Noise Abatement**

- A. Operations at the Worksite shall be performed so as to minimize unnecessary noise.
- B. Special measures shall be taken to suppress noise during night hours.

- C. Noise levels due to construction activity shall not exceed the levels specified by local ordinance.
- D. Internal combustion engines used on the Work shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated without said muffler.

### **1.08 Working Hours**

- A. Construction shall be allowed only between the hours of 7:00 a.m. and 3:00 p.m. on weekdays unless otherwise approved in writing by the Owner's Representative. With the exception of Iron Point Road which shall be allowed only between the hours of 8:00 p.m and 6:00 a.m.
- B. The Contractor shall be responsible for any inspection and additional administration costs incurred by the Owner, or its agents and representatives, for work by the Contractor outside the hours defined above on weekdays, or any work on weekends or holidays recognized by the Owner. Such costs shall be withheld from the succeeding monthly progress payment. Any work specifically required to be performed outside the normal working hours is excluded from the provisions of this paragraph.
- C. The Contractor shall notify the Owner's Representative at least one working day prior to any work outside the normal working hours defined above, on weekends or holidays.

### **1.09 Drainage Control**

- 1. In all construction operations, care shall be taken not to disturb the existing drainage pattern whenever possible.
- 2. Particular care shall be taken not to direct drainage water onto private property. Drainage water shall not be diverted to streets or drainage ways inadequate for the increased flow.
- 3. Drainage means shall be provided to protect the Work and adjacent facilities from damage due to water from the site or due to altered drainage patterns from construction operations.
- 4. Temporary provisions shall be made by the Contractor to insure the proper functioning of gutters, storm drain inlets, drainage ditches, culverts, irrigation ditches, and natural water courses.

### **1.10 Stormwater Pollution Prevention**

- A. The Contractor shall prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the State Water Resources Control Board.
  - 1. One (1) copy of the SWPPP submitted to the Regional Board will also be submitted to the Owner's Representative.
  - 2. The Contractor shall file a Notice of Intent (NOI) with the State Water Resources Control Board (SWRCB) to comply with the terms of the Construction General Permit.
- B. Erosion & Dust Control
  - 1. To reduce potential water-borne erosion impacts, the Contractor shall incorporate the following best management practices into the project:
    - a. Erosion control measures to reduce post-construction erosion, such as re-vegetation with local native plant species and installation of appropriate slope protection.
    - b. Provide and maintain all necessary erosion and sediment control measures throughout the construction period as required to minimize stormwater pollution control from the Contractor's work area. Erosion and sediment control measures may include, but are not limited to, straw bale dikes, sand bag dikes, silt fences, drainage swales, pipe drains, sediment traps, protective sheets, jute matting, hydro-seeding, and appropriate surface

contouring. The Contractor shall notify the Owner's Representative if erosion and sediment control measures do not operate properly and shall take all necessary protective action.

- c. The Contractor shall secure erosion control devices at the end of each work shift during the period from November 1 to April 30, or when rain is forecast prior to the next workday.
  - d. Grading activities shall be prohibited during the period when rain is falling, and runoff is observed at the site. The Contractor shall immediately secure the site for erosion control and storm water runoff.
  - e. Prepare drainage ways that handle concentrated or increased runoff from disturbed areas by using riprap or other lining materials to control erosion.
  - f. Reduce erosion by limiting the area and time of exposure, and by the provision of diversion channels.
  - g. Use temporary plant cover, mulching, and/or structures to control runoff and protect areas subject to erosion during construction.
  - h. Minimize soil exposure during the rainy season by proper timing of grading and construction and be prepared to shut down all earthwork if heavy precipitation occurs.
  - i. Have erosion control equipment and materials on site if needed in an emergency to quickly construct temporary collectors, diversion channels, intercept drains, berms, dikes or filters.
2. Grading and permits and the appropriate environmental clearances shall be obtained by the Contractor prior to any export of materials off site.

### **1.11 Construction Cleaning**

- A. The Contractor shall, at all times, keep property on which work is in progress and the adjacent property free from accumulations of waste material or rubbish caused by employees or by the Work. All surplus material shall be removed from the site immediately after completion of the work causing the surplus materials. Upon completion of the construction, the Contractor shall remove all temporary structures, rubbish, and waste materials resulting from its operations.

### **1.12 Disposal of Material**

- A. The Contractor shall make arrangements for disposing of materials outside the Site and the Contractor shall pay all costs involved.
1. The Contractor shall first obtain permission from the property owner on whose property the disposal is to be made and absolve the Owner from any and all responsibility in connection with the disposal of material on said property.
  2. When material is disposed of as above provided, the Contractor shall conform to all required codes pertaining to grading, hauling, and filling of earth.

### **1.13 Parking and Storage Areas**

- A. All stockpiled materials and parked equipment at the job site shall be located to avoid interference with private property and to prevent hazards to the public.
- B. Locations of stockpiles, parking areas, and equipment storage must be approved by the Owner's Representative.

### **1.14 Biological Resources Protection**

- A. The Contractor shall comply with one of the following biological resources protection measures to protect migratory and/or special status birds:

1. Perform all construction activities before and/or after nesting season of March 15 – July 15 annually.
2. If construction is planned to occur during nesting season of March 15 – July 15, the Contractor shall hire a qualified biologist or ornithologist to conduct preconstruction field surveys in and adjacent to the project area for nesting raptors and migratory birds, prior to the removal of any tree on the site or prior to any construction on the project site, if such construction will take place during nesting season. Surveys shall be conducted during the season immediately preceding grading operations when birds are building and defending nests or when young birds are still in nests and dependent on the parents. If no raptor or special status bird nests are found during the surveys, construction may proceed unconstrained by conflicts with raptors and/or migratory birds. If nests are found, construction activities within 300 feet shall be postponed until after the nesting season. The time of the bird's departure must be determined by a qualified wildlife biologist.

**1.15 Cultural Resources Protection**

- A. If historical, archeological or paleontological artifacts are discovered, all work must stop in the immediate vicinity. The Contractor shall protect the discovered items, notify the Owner's Representative, and comply with applicable law.
- B. If human remains are discovered, all work must stop in the immediate vicinity of the find, and the County Coroner must be notified, according to Section 5097.98 of the State Public Resources Code and Section 7050.5 of California's Health and Safety Code.
- C. If the remains are determined to be Native American, the coroner will notify the Native American Heritage Commission, and the procedures outlined in CEQA Section 15064.5(d) and (e) shall be followed.

**1.16 Project Sign**

- A. The Contractor shall provide, install and maintain for the duration of the project a project sign as designated below. The sign shall be installed within seven (14) days of Notice to Proceed and shall be installed where directed by the Owner's Representative.
  1. 8'x4' exterior grade plywood, minimum 3/4" thick
  2. Two coats exterior quality paint for background, one coat exterior quality paint for lettering.
  3. Erect supports and framing on secure foundation, rigidly braced and framed to resist loadings. Install sign surface plumb and lev
  4. el; anchor securely.
  5. Colors of sign shall be as designated by the Owner's Representative.
  6. Remove sign at the end of the project.
- B. Contents of Project ID Sign
  - Project Name: FOLSOM SOUTH AREA GROUP TRANSMISSION PIPELINE AND PUMP STATION PROJECT
  - Utility Owner: CITY OF FOLSOM
  - Engineer: HydroScience Engineers, Inc.
  - Owner's Representative: Westland Capital Partners
  - Construction Cost: \$\$\$\$\$\$
  - Start Date: xx/xx/20xx
  - Estimated End Date: xx/20xx

### **1.17 Project Office**

- A. The Contractor shall maintain on the project site a suitable office or other protected area in which shall be kept project copies of the Contract Documents, project progress records, project schedule, shop drawings, and other relevant documents which shall be accessible to the Owner and Owner's Representative during normal working hours.

### **1.18 Owner's Representative's Office**

- A. The Contractor shall provide and furnish at its own expense, a temporary Owner's Representative's office. The Contractor shall relocate, install and make operational the Owner's Representative office the first day that the Contractor starts work at the project site, in a location as directed by the Owner's Representative. Unless the Contractor is directed by the Owner's Representative to remove the office at an earlier date, the office shall be disconnected from the utilities between twenty and thirty-five days after the Notice of Completion is recorded. The Contractor shall be responsible for removal of the trailer from the site.
- B. Trailer shall be of standard frame mobile construction with interior and equipment to include:
  - 1. Trailer size shall be approximately 10'x44' or manufacturer's next standard size, it shall include two locking exterior solid metal clad doors with keys, two offices, conference room and a bathroom.
  - 2. Steel or timber steps to match the entrances of the office shall be constructed.
  - 3. Interior Lighting: double fluorescent fixtures complete with tubes and diffusers (1 fixture per every 100sqft).
  - 4. Outside Lighting: single night light mounted over each entry door.
  - 5. HVAC equipment: Air conditioning and heating unit capable of maintaining a comfortable working environment at all times.
  - 6. Electrical service: 200-ampere, 120/240 volt.
  - 7. Washroom: Lavatory, water closet with paper towel and toilet tissue holders.
    - a. Provide and furnish potable water connection for washroom.
- C. Contractor shall maintain 30'x10' by 6" thick aggregate base parking area in front of the Owner's Representative's trailer
- D. Two fire extinguishers shall be provided for trailer, UL approved Class B & C min. 2 lb size.
- E. The Contractor shall provide, at its cost, electrical service to the office, including an adequate disconnect switch.
- F. The Contractor shall arrange, at its cost, with the local utility to provide temporary telephone service at a mutually agreeable location in the Owner's Representative's trailer. The telephone shall provide for four (4) separate lines, (1) DSL line and one (1) fax line.
- G. The Contractor shall provide bottled water service with hot and cold-water dispenser to the Owner's Representative trailer for the duration of the project.
- H. A holding tank or similar device shall be installed and connected for sanitary sewage. The Contractor shall pump the holding tank as necessary during the duration of the job.
- I. The Owner's Representative shall be responsible for paying for the monthly power and telephone service.
- J. Contractor shall be responsible for all maintenance and repair of the structural facilities including access stairs, trailers, trailer supports and skirting, plumbing, electrical, ventilating systems and all

other appurtenances. Contractor shall arrange for prompt service for the maintenance and repair with either his own forces or with service contract agreements for the trailer leasing company.

- K. At the end of construction, the trailer and all its furnishings, connections and appurtenances shall be removed and become property of the contractor.

**\*\* END OF SECTION \*\***

## **SECTION 01600 MATERIAL AND EQUIPMENT SUBSTITUTION**

### **PART 1 - GENERAL**

#### **1.01 Section Includes**

- A. Procedures for substitution of material and equipment from named products specified elsewhere in these specifications.

#### **1.02 Submittals**

- A. Submit information described in Part 2 of this specification.
- B. All Material and Equipment Substitutions submittals shall be in compliance with requirements listed under Section 01300 – Submittals.

### **PART 2 - PRODUCTS**

#### **2.01 Material and Equipment Substitutions**

- A. In preparing these Specifications, the Engineer has named those products which to its knowledge meet the Specifications and are equivalent in construction, functional efficiency, and durability.
- B. Wherever catalog numbers and specific brands or trade names preceded by "similar and equal" or followed by the designation "or equal" are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Specifications, they are used to establish the standards of quality and utility required.
- C. The first-named manufacturer is the basis for the project design and the use of alternative-named or unnamed manufacturer's products proposed by the Contractor may require modifications in the project design and construction. Where only one product has been named by brand, it is the only brand, trade name, or manufactured product known to the Engineer that meets these Specifications.
- D. Wherever catalog numbers and specific brands or trade names not preceded by designation "similar and equal" nor followed by the designation "or equal", are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Specifications, to ensure compatibility with existing facilities, no substitutions will be favorably reviewed.

#### **2.02 Substitutions**

- A. Substitutions which are equal in quality and utility to those specified will be permitted, subject to the following provisions.
  - 1. For this purpose, the Contractor shall submit to the Owner's Representative, no later than thirty five (35) days after the Notice of Award, a typewritten list containing a description of each proposed substitute item or material.
  - 2. Sufficient data, drawings, samples, literature, calculations, or other detailed information as will demonstrate to the Engineer that the proposed substitute is equal in quality and utility to the material specified in the project documents. All substitutions shall be clearly identified in project submittals and appended to this list.
  - 3. The Engineer will favorably review in writing such proposed substitutions as are, in its opinion, equal in quality to the items or materials specified.

- B. Failure of the Contractor to submit proposed substitutions for review in the manner described above and within the time prescribed shall be sufficient cause for rejection by the Owner's Representative of any substitutions otherwise proposed.

### **2.03 Modifications and Costs**

- A. If alternative named or substitutions are proposed by the Contractor and favorably reviewed by the Engineer, the Contractor is responsible for providing, at no additional cost to the Owner, any electrical, mechanical, structural, or other related changes or testing that may be required to accommodate or provide the particular material or equipment the Contractor desires to use.
- B. Any deviation from the Specifications or the Drawings resulting from the type of material or equipment to be used shall not be the basis for any "extra charges" above and in excess of the original bid price of the work.
- C. In addition the Contractor is responsible for all additional costs to the Owner, and its agents and representatives, for evaluation of data submitted by the Contractor for alternative named or substitutions and any redesign necessary. The Owner shall deduct said costs from the Contract monies due the Contractor.

### **PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

**SECTION 01615  
WIND DESIGN CRITERIA**

**PART 1 - GENERAL**

**1.01 Section Includes**

A. Wind design criteria.

**1.02 REFERENCES**

A. International Code Council (ICC):

1. 2019 California Building Code (CBC).
2. ASCE/SEI 7-16 Minimum Design Loads for Buildings and Other Structures

**1.03 DESIGN CRITERIA**

A. Design in accordance with the requirements of the following:

1. Risk Category: IV
2. Basic Wind Speed:  $V = 105$  mph.
3. Wind Exposure Category: C

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

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## **SECTION 01710 FINAL CLEAN-UP**

### **PART 1 - GENERAL**

#### **1.01 Requirements**

- A. As a condition precedent to final acceptance or release of a structure, space or process unit for use by the Owner, the Contractor shall thoroughly clean all roads, shoulders, and construction areas prior to final Acceptance.
- B. All existing culverts, drainage sumps, and existing stormwater facilities shall be cleared of silt, sand, debris and construction materials. Should any existing structures, culverts, or drainage channels be compromised by construction related activities, the Contractor shall restore to the fullest extent of the pre-existing conditions as required by the Owner's Representative or Inspector.
- C. At the completion of the project, the Contractor shall perform the following:
  - 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. Contractor shall restore the pavement to the fullest extent required by the Engineer.
  - 3. Remove spatter, grease, stains, fingerprints, debris, 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 roadway signs, striping, guard railing, or other materials to match the pre-existing condition.
  - 5. Contractor shall refinish trenching activities to match existing surface conditions to the fullest extent feasible and to the satisfaction of the Inspector.
- D. As the Contractor executes construction related procedures along the identified alignments shown in the contract drawings, preliminary cleaning shall be conducted such that downstream facilities can be reopened in the public right of way.
  - 1. All significant clean up items such as sign or guard railing replacement shall be conducted at the earliest possible moment during the project to protect the public from dangerous situations.
  - 2. Insignificant cleanup items may be included in the project punch list and completed prior to Acceptance.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

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# SECTION 01720 RECORD DRAWINGS

## PART 1 - GENERAL

### 1.01 General

A. The Contractor shall provide the Owner's Representative neatly and legibly marked contract drawings showing the final horizontal and vertical location of all piping, manholes, and culverts. Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. These drawings shall be available to the Owner's Representative throughout the construction period. Final payment shall not be made until the marked up record drawings are delivered to and approved by the Owner's Representative.

### 1.02 Maintenance of Documents

A. The following shall be maintained in the Contractor's field office in clean, dry, legible condition: Contract Drawings, Specifications, Addenda, approved Shop Drawings, Samples, photographs, Change Orders, other Modifications of Contract, test records, survey data, Field Orders, and all other documents pertinent to Contractor's Work.

B. Two full-sized sets of the Contract Drawings will be furnished to the Contractor by the Owner. These Drawings shall be updated with record information and one copy of the updated record drawings shall be submitted for review to the Owner's Representative every month. The Record Drawing shall be up-to-date and its completeness shall be a precondition of the next month's partial payment request approval.

1. Mark and record field changes and detailed information contained in submittals and change orders.
2. Record actual depths, horizontal and vertical location of underground pipes and other buried utilities. Reference dimensions to permanent surface features.
3. Identify specific details of pipe connections, location of existing buried features located during excavation, and the final locations of piping, manholes, and culverts.
4. Provide schedules, lists, and layout drawings.
5. Make annotations with erasable colored pencil conforming to the following color code:

Annotations	Color
Additions	Red
Deletions	Green
Comments	Blue
Dimensions	Graphite

C. Documents shall be available at all times for inspection by the Owner's Representative.

D. Record documents shall not be used for any other purpose and shall not be removed from the office without approval of the Owner's Representative.

E. The Contractor may submit additional size D sheets detailing record work as approved by the Owner's Representative.

F. The Contractor shall not conceal any work until the required record drawing information has been recorded.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

## **SECTION 01900 SEISMIC CRITERIA**

### **PART 1 - GENERAL**

#### **1.01 Summary**

- A. This section establishes the minimum seismic anchorage and bracing requirements for mechanical, and electrical components, as well as non-building structures. All components and non-building structures shall be permanently attached to supporting structures with sufficient strength and ductility to resist the forces described in this Section. Gravity supports and anchorages are specified on the drawings and specifications.

#### **1.02 Contractor Responsibilities**

- A. Design, provide and install all supports, restraints, and anchorages as required herein.
- B. Engineering design is not required where such supports are specifically detailed on the drawings or specified. Engineering design is not required where tabularized system selection guides are specified using listed References.
- C. Ensure that all manufacturers, material suppliers, and subcontractors understand and conform to requirements of this Section.
- D. Coordinate and verify the location of anchor bolts prior to the placing of concrete. See paragraph 3.01 in this Specification
- E. Component testing and certifications described in IBC 1707.7.2 and 1707.7.3 are not required except for anchors, structural connectors, proprietary structural components or systems or as indicated on the Drawings.

#### **1.03 Seismic Design Requirements**

- A. The Owner has investigated the site and developed foundation criteria. Specific questions relative to the foundation requirements, seismic design criteria requirements, acceptable loads and soil types should be directed to the geotechnical report for this project.

##### Geotechnical Report

Folsom South Area Group  
Transmission Pipeline and Pump Station Project,  
Folsom CA, March 2021  
Blackburn Consulting  
2491 Boatman Avenue,  
West Sacramento, CA 95691  
File No. 3279

B. Project-Specific Seismic Parameters

Reference	Seismic Parameter	Recommended Value
Table 20.3-1	Site Class	C
Figure 1613.3.1(1)	Short-Period MCE at 0.2s, $S_s$	0.41g
Figure 1613.3.1(2)	1.0s Period MCE, $S_1$	0.21g
Equation 16-39	Design Spectral Acceleration Parameters, $S_{DS} = 2/3 S_{MS}$	0.34g
Equation 16-40	Design Spectral Acceleration Parameters, $S_{D1} = 2/3 S_{M1}$	0.21g
Figure 1613.3.5(1)	Seismic Design Category (Short Period), Occupancy I to III	D
Figure 1613.3.5(1)	Seismic Design Category (Short Period), Occupancy IV	D
Figure 1613.3.5(2)	Seismic Design Category (1-Second Period), Occupancy I to IV	D

1.04 References

- A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly.
- B. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- C. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization, or if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

<u>Reference</u>	<u>Title</u>
IBC	2006 International Building Code, locally amended
ASCE 7-16	Minimum Design Loads for Buildings and Other Structures
ASTM C 635	Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
ASTM C 636	Standard Practice for Installation for Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
ASME B 31	Code for Pressure Piping
ASME	Boiler and Pressure Vessel Code

### 1.05 Submittals

- A. Submittals shall be provided for each piece of equipment, system, or anchorage, in accordance with Section 01300 and shall include the following information:
1. A copy of this specification section, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
    - a. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.
    - b. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
  2. Certificate of Compliance for each Contractor Designed bracing system, signed and sealed by a Professional Engineer registered in the state of the project. Certification shall state that the component's support and anchorage systems are designed to withstand the required seismic forces and displacements in accordance with this Section.
  3. Installation drawings for each component of sufficient detail to represent the installed conditions. Provide component information including weight, location, bracing and anchor types, material, size, embedment, number and locations. If Contractor designed, comply with Submittal Item #2.
  4. Structural calculations certified by a Professional Engineer currently registered as such by the State of California to comply with the above requirements.

## PART 2 - PRODUCTS

- A. Materials and products associated with the requirements of this Section are specified in their respective Sections or noted on the drawings.

## PART 3 - EXECUTION

### 3.01 General Requirements

- A. Design and construct component bracing and anchorage to resist the seismic forces specified above. These forces shall be considered acting at the center of gravity of the piece under consideration. No equipment shall be anchored to vertical structural elements without written approval of the Construction Manager.
- B. All anchorage of equipment is specified to be made by cast-in anchor bolts in concrete elements unless specifically noted otherwise on the drawings or other specification Sections.

- C. Contractor shall be responsible for any remedial work or strengthening of concrete elements because of superimposed seismic loading if anchor bolts are improperly installed or omitted due to lack of submittal review or improper placement for any reason, at no additional cost to the Owner.
- D. The exceptions to bracing and anchorage requirements in Section 9.6.1 of ASCE-7 do not apply to process equipment and associated piping, power supply, instrumentation and control features required for the normal or emergency operation of the facility.
- E. Mechanical components include but are not necessarily limited to HVAC ducts and mechanical units in total, plumbing to include non-buried pipes and all fixtures, and mechanical equipment units and piping.
- F. Vibration isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4-inch.
- G. Piping with flexible connections and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system.
- H. Ducts and pipes shall be braced according to SMACNA for the Seismic Hazard Level (SHL) in the facility at the point of anchorage. Associated equipment units whose weight falls within the SMACNA tables may also be braced using this method. Larger units shall be braced with Contractor Designed systems.

### **3.02 Electrical Components**

- A. Electrical components include but are not necessarily limited to power distribution systems and associated equipment, control and instrumentation systems and associated equipment, and lighting systems.
- B. Conduits shall be braced according to SMACNA for the Seismic Hazard Level (SHL) in the facility at the point of anchorage. Cable trays and grouped duct runs whose weight falls within the SMACNA tables may also be braced using this method. Heavier components shall be braced with Contractor Designed systems.

**\*\* END OF SECTION \*\***

## **SECTION 02055 DEMOLITION AND SITE PREPARATION**

### **PART 1 - GENERAL**

#### **1.01 Summary**

A. Demolition and site preparation includes all clearing, grubbing and demolition Work.

#### **1.02 Job Conditions**

A. The Contractor shall determine the actual condition of the site as it affects the Work.

#### **1.03 Quality Assurance**

A. General: All work shall be performed in accordance with the local building codes, State Industrial Safety Orders and requirements of the Occupational Safety and Health Act requirements.

B. Schedule: Demolition must be scheduled to allow all existing roadways and utilities to remain in continuous operation. No interruption in operation will be permitted without previous authorization from the Owner's Representative.

C. Protection

1. Demolition shall be performed in such a manner as to not harm adjacent structures, equipment, existing landscaping or natural vegetation.

a. The Contractor shall assume full responsibility for such disturbance.

b. All costs of any such repair, rehabilitation, or modifications shall be borne by the Contractor.

2. The Contractor shall provide such protection as may be required to transfer material to the ground.

a. Throwing, dropping or permitting the free fall of material and debris from heights which would cause damage to other work, existing structures, or equipment; undue noise or nuisance; or excessive dust will be expressly prohibited.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### **3.01 General**

A. The Contractor shall adhere to all demolition and site preparation requirements set forth in the City of Folsom Standard Construction Specifications.

B. The Contractor shall notify the Owner's Representative when demolition of existing is completed and dispose of refuse materials in an appropriate manner.

#### **3.02 Performance**

A. Clearing and Grubbing

1. The site of all open-cut excavations and areas to be cleared as indicated on the Plans shall be cleared and grubbed prior to excavation.

B. Equipment and Piping Removal

1. All equipment and piping to be removed shall be properly disconnected from structures, piping, electrical, and instrumentation systems.
2. The Contractor shall do all resurfacing and other work as necessary to comply with the above requirements.
3. Removal of any existing and operational culverts shall be restored in kind at the Contractor's expense unless proven that the culverts condition was previously compromised by age, corrosion or other cause unrelated to construction activities. The Owner's Representative or Inspector shall be present during excavation and trenching or all culvert crossings.

#### C. Pavement Removal

1. All pavements and concrete pads shall be saw-cut on a neat line at right angles to the curb or concrete face.

#### D. Utility Interference

1. Where existing utilities interfere with the prosecution of the work, the Contractor shall temporarily relocate the utilities out of the construction project's right of way and restore in kind prior to final backfilling efforts.

### **3.03 Salvage**

- A. The Owner has the right to salvage any items identified within the project vicinity.
- B. The Contractor shall notify the Owner's Representative five days prior to any salvage or demolition work.
  1. The Owner's Representative will mark items to be salvaged.
  2. The Contractor shall be responsible for properly disconnecting, removal from their foundations, cleaning and storing salvaged items. Salvaged items shall be delivered by the Contractor to a storage location designated by the Owner.
  3. All drop offs must be coordinated with the City.

### **3.04 Removed Material and Debris**

- A. Where Contractor is directed on the Drawings to "Demolish" or "Remove" material or facilities it is understood that the material will be removed and disposed of offsite unless specifically stated otherwise or directed by the Owner's Representative.
- B. All removed material not designated for salvage and all debris shall become the property of the Contractor and shall be removed from the site.
- C. Materials and debris generated by demolition activities shall not be allowed to accumulate. Debris shall be removed daily and disposed of in a manner allowed by law.

### **3.05 Backfill**

- A. Holes or depressions in the ground remaining after demolition of structures, pipelines, or equipment shall be filled with compacted backfill materials as specified in Section 02200 - Earthwork.

### **3.06 Restoration**

- A. Restore adjacent structures and facilities damaged during demolition or other construction to original or better condition.

**\*\* END OF SECTION \*\***

**SECTION 02115  
CLEARING & GRUBBING**

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. Clearing and grubbing consists of furnishing transportation, labor, materials, and equipment to:
1. Remove and dispose of all rubbish, debris, and other objectionable material from within the limits of the project as specified.
  2. Strip the entire area within the limits of work of trees, shrubs, weeds, and other vegetative growth of any nature, unless otherwise shown as Protect In Place, and disposal of same.
  3. Grub the entire area within the limits of work of all roots and vegetative material to the full depth of the root system, and disposal of same.
  4. Remove existing pavement markers, pavement markings, traffic lines, pavement legends and weeds along cracks, joints, and gutter lip.
  5. Provide dust alleviation and control during the course of the work.
  6. Comply with any required abandonment of system facilities, including cutting, capping and slurry filling of abandoned pipelines.
  7. Provision of all materials, equipment and apparatus not specifically mentioned herein or noted on the plans, but which are obviously necessary to complete the work specified.
  8. Comply with any required salvage of existing facilities.
- B. Implementing measures to prevent air pollution during clearing, grubbing and during construction activities in accordance with Federal, State, and local regulations.

1.02 REFERENCES

- A. State of California Department of Transportation Standard Specifications (SS):
- B. California Air Resources Board, CARB 2003a. California Ambient Air Quality Standards

**PART 2 - PRODUCTS**

- A. Water shall be available to the Contractor for dust control as specified herein. Dust suppressants other than water shall not be utilized.
- B. Temporary fencing shall be heavy-duty, four foot (4') high orange plastic safety fencing as produced by Uline, Model No. S22226, or approved equal.

## PART 3 - EXECUTION

### 3.01 PERFORMANCE

- A. Clearing and grubbing shall be in accordance with all applicable state and local requirements.
- B. Clearing
  1. Remove and dispose of shrubs, brush, limbs, and other vegetative growth. Remove all evidence of their presence from the surface, including sticks and branches greater than 2 inches in diameter or thickness. Remove and dispose of trash piles, rubbish, and fencing.
  2. Protect trees, shrubs, vegetative growth, and fencing not designated for removal.
- C. Grubbing
  1. Remove and dispose of wood or root matter below the ground surface remaining after clearing, including stumps, trunks, roots, or root systems greater than 2 inches in diameter or thickness, to a depth of 12 inches. Weed removal shall be accomplished by method(s) that result in complete removal of the weed. Method used must be approved by the Engineer. Surface and crack cleaning shall be accomplished by sweeping, and not by air blowers.
- D. Stripping
  1. Remove and dispose of all organic sod, topsoil, ash, grass and grass roots, and other structurally unsound material remaining after clearing and grubbing from the areas designated to be stripped. The site shall be stripped to such greater depth, as the Engineer or the project geotechnical engineer may consider necessary to remove materials that, in their opinion, are unsatisfactory. The stripped material shall either be removed from the site or stockpiled for reuse later as topsoil where approved by the Engineer, but none of the stripped material may be used for engineered fill.
  2. Remove and dispose of all asphalt, aggregate, concrete and other inorganic materials within the limits of construction. Remove all evidence of their presence from the project site.
- E. Trees and Shrubbery
  1. Preserve all trees to the maximum extent possible except those that are specifically designated for removal on the Plans.
  2. It is possible that existing trees, shrubbery, and other vegetative material are not shown on the Plans. Inspect the site to determine the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein. Coordinate with City Arborist to determine the necessary plan for protection or removal for all trees not shown on the Plans.
  3. The Contractor shall be responsible for the placing, maintaining, and removal of any orange, temporary construction fencing as shown on the Plans or that may be

necessary along the line of work or around all trees to preserve and protect all trees to the maximum extent possible and delineate the construction area.

4. If work will be continued within one foot (1') of any tree dripline, Contractor must contact City Arborist and continue work under their supervision which may include conducting only hand tool work within their driplines.
  5. Contractor shall trim overhanging limbs that may be in conflict with trenching and other construction activities. Tree, roots, and bush pruning shall be performed by a certified arborist and in accordance with "Pruning Standards," published by the Western Chapter of the International Society of Arboriculture. The certified arborist shall be approved in advance by the Engineer, and all pruning shall be done as directed by and in the presence of the City Arborist and Engineer. Tree limbs damaged by Contractor activities shall be trimmed by certified arborist as described above.
  6. Where trees are removed, the soils loosened by the roots shall be over-excavated at least to the bottom of the disturbed zone and to the width of the equipment.
- F. Spoil resulting from clearing, grubbing, and stripping operations shall be removed from the entire limits of work and properly disposed of by the Contractor. Materials resulting from clearing, grubbing, and stripping operations shall become the property of the Contractor, to be properly removed from the work site and disposed of from the project site in a lawful manner, at no additional expense to the contract.
- G. Furnish, install, maintain, and operate necessary control measures and other equipment necessary to prevent dust. Temporary measures shall be to Contractor's own design and Contractor shall be solely responsible for risks related to the management of dust control during construction.

**\*\*END OF SECTION\*\***

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## **SECTION 02140 DEWATERING**

### **PART 1 - GENERAL**

#### **1.01 Summary**

- A. Scope: The work of this Section includes dewatering necessary to lower and control groundwater levels and hydrostatic pressures to permit excavation and construction to be performed properly under dry conditions.
- B. Contractors Responsibility: Dewatering operations shall be adequate to assure the integrity of the finished project. The responsibility for conducting the dewatering operation in a manner that will protect adjacent structures and facilities rests solely with the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor. Contractor shall secure all necessary permits to complete the requirements of this Section of the Specifications.

#### **1.02 References**

- A. Work shall be performed in accordance with the City of Folsom Standard Construction Specifications Section 6.5.

#### **1.03 Submittals**

- A. The following shall be submitted in compliance with Section 01300 – Submittals:
  - 1. Prior to commencement of excavation, a detailed plan and schedule for dewatering activities of excavations.
  - 2. Demonstration of proposed dewatering system and verification that adequate personnel, materials and equipment are readily available for all dewatering activities.
  - 3. Copy of any permit or discharge requirements.
  - 4. Compliance with SWPPP requirements.

#### **1.04 Control and Observation**

- A. Adequate control shall be maintained to ensure that the stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled and that flooding of excavation or damage to structures do not occur.
- B. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.
- C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement that may develop.
- D. A daily report shall be maintained. The following shall be recorded:
  - 1. Elevation of ground water and piezometric water levels in observation wells (if any).
  - 2. Change in elevation of reference points established.

## **PART 2 - PRODUCTS**

### **2.01 Equipment**

- A. Dewatering system shall include well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means including standby pumping equipment maintained on the job site continuously.

## **PART 3 - EXECUTION**

### **3.01 General Requirements**

- A. An adequate dewatering system shall be maintained to lower and control the groundwater to permit excavation, construction of structures, placement of piping, and placement of fill materials to be performed under dry conditions.
- B. Sufficient dewatering equipment shall be installed to predrain the water-bearing strata below the bottom of foundations, drains, sewers, pipelines and other excavations.
- C. The Contractor shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.
- D. The hydrostatic head in water-bearing strata below foundations, drains, sewers, pipelines and other excavations shall be reduced to ensure that the water level and piezometric water levels are below the excavation surface at all times.
  - 1. The piezometric water level shall be maintained a minimum of 3-feet below the excavation surface all times.
- E. The dewatering system shall be placed into operation prior to excavation below ground water level to lower the ground water level and shall be operated continuously 24 hours a day, 7 days a week until drains, sewers, pipelines and structures have been constructed and leak tested and fill materials have been placed and dewatering is no longer required.
- F. The site shall be graded to facilitate drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity away from the excavation.
- G. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- H. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock at no additional cost to the Owner.
- I. Flotation shall be prevented by the Contractor by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.
- J. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means shall be used to prevent pumping of fine sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.
- K. Water and debris shall be disposed of in a suitable manner in compliance with local and State regulations and without damage to adjacent property. No water shall be drained into the installed or under construction facilities. Water shall be filtered to remove sand and fine-sized soil particles and further treated if required by regulatory agencies before disposal into any drainage system

- L. Necessary permits for disposal of water, if applicable, shall be obtained by the Contractor from the appropriate regulatory agencies.
- M. The release of groundwater to its original level shall be performed in such manner to prevent disturbance of natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.
- N. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the Work and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering.
- O. Contractor shall comply with all discharge permit and SWPPP requirements.

**\*\* END OF SECTION \*\***

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# SECTION 02200 EARTHWORK

## PART 1 - GENERAL

### 1.01 Summary

- A. This section specifies all operations necessary to the excavation, loosening, filling, grading, hauling, compacting, removal, and control of earth, rock or other unspecified material for the construction of project facilities. This section also includes the quality assurance and placement requirements for all related backfill materials and their respective standards.
- B. Earthwork shall also include the following operations:
1. Backfill placement for site grading, structures, and piping.
  2. Compaction under and around structures.
  3. Pavement subgrade preparation.

### 1.02 References

- A. The following documents are a part of this section insofar as they are specified and modified herein. In case of conflict between the requirements of this Section, and the following documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
California Test Method 217	Method of Test for Sand Equivalent
ASTM C136	Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D420	Standard Recommended Practice for Investigating and Sampling Soil and Rock for Construction Purposes
ASTM D1556	Method of Test for Density of Soil in Place by the Sand-Cone Method
ASTM D1557	Method of Test for Moisture-Density Relations of Soils, Using 10 lb. (4.5 kg) Hammer and 18 in. (457 mm) Drop
ASTM D2049	Standard Test Method for Relative Density of Cohesionless Soils
ASTM D2922	Standard Test Method for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3017	Method of Test for Moisture Content of Soil and Soil Aggregates in Place by Nuclear Methods (Shallow Depth)
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
Caltrans	2018 Standard Specifications

- B. The Contractor shall also utilize the City of Folsom Standard Construction Specifications for construction requirements not listed herein.

### **1.03 Definitions**

- A. Compaction: The degree of compaction is specified as percent of relative compaction. The relative compactions refer to the maximum relative densities of dry soil obtainable at optimum moisture content.
- B. Excavation Slope: Excavation slope shall be defined as an inclined surface formed by removing material from below existing grade.
- C. Embankment Slope: Embankment slope shall be defined as an inclined surface formed by placement of material above existing grade.

### **1.04 System Description**

- A. Soils Report
  - 1. Refer to Section 01900, Seismic Criteria, for reference to the project Geotechnical Report.

### **1.05 Performance Requirements**

- A. Where mud or other soft or unstable material is encountered, remove such material, and refill space with stabilization material approved for use by the Engineer.
- B. The Contractor shall obtain acceptable import material from other sources if surplus or borrow materials obtained within project easements do not conform to specified requirements or are not sufficient in quantity.
- C. No extra compensation will be made for hauling or fill materials nor for water required for sufficient compaction.

### **1.06 Submittals**

- A. Submit current technical data for each type of material specified to prove compliance with the specifications in accordance with the requirements of Specification Section 01300 - Submittals.
- B. Contractor shall submit an excavation and backfill plan detailing hauling truck staging and routes, expected traffic impacts, proposed equipment and machinery, anticipated construction durations per section, temporary excavation stockpiling areas, and backfilling process. Excavation and backfilling plan shall be separate but consistent with statements provided in the Contractor's shoring plan.
- C. Mix Designs for all fill materials indicating referenced testing standards, gradations, Atterberg limits, specific gravity, sand equivalent, R-value, durability, moisture content.
- D. Submit documentation related to Contractor's proposed testing laboratory, capabilities, and equipment.
- E. Submit certified test reports of all specified tests performed by the Contractor.
  - 1. Test reports shall be signed and sealed by a registered Geotechnical Engineer who practices geotechnical engineering in the State of California.

### **1.07 Quality Assurance**

- A. All soils testing will be done by a testing laboratory of the Owner's choice and expense except as otherwise noted.
- B. The Owner's Representative will take samples and perform tests for compliance with the specifications including Atterberg limits, specific gravity, sand equivalent, R-value, durability, moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications.

- C. The Contractor shall remove surface material at locations designated by the Owner's Representative and provide such assistance as necessary for sampling and testing.
- D. The Owner's Representative may direct the Contractor to construct inspection trenches in compacted or consolidated backfill to determine that the Contractor has complied with these specifications.
- E. The Owner will bear the costs for sampling and testing specified in this Paragraph. The Contractor shall pay costs associated with retesting due to the Contractor's failure to comply with the specifications.
- F. Sequencing and Scheduling
  - 1. If necessary, stockpile excavated material in order to utilize it in separate locations. The Contractor shall not stockpile excavation spoils in an active roadway at any time during the project.
  - 2. Perform excavation and backfilling in a manner that encourages drainage at all times.

## **PART 2 - PRODUCTS**

### **2.01 Fill Materials**

- A. Water for earthwork compaction and dust control shall be imported. No water supply facilities are available throughout the project right of way. Contractor may establish a standing reservoir within the limits of the identified construction lay down yard. The cost of water facilities shall be borne by the Contractor.
- B. Unless noted herein, fill materials shall be utilized in accordance with requirements shown on the project drawings and detailed in the City of Folsom Standard Construction Specifications. Minimum trenching dimensions and elevations are reflected in the contract documents.
- C. The Contractor shall not repurpose excavation spoils at any time during the utility trench backfilling process unless otherwise approved by the Engineer of record and designated as a select fill.
- D. Classification of Excavated Materials:
  - 1. Rock:
    - a. Earth encountered during the course of excavation which is sufficiently hard to cause refusal to equipment specified below shall be deemed inexcavatable and therefore classified as 'rock'. Earth deemed inexcavatable shall be removed by substantial means such as reciprocating hydraulic hammers and shall conform to this specification.
    - b. Refusal to be considered as the inability of the following equipment to excavate material as caused by the hardness of the earth: Tractor mounted excavator, with minimum operating weight of 85,000 lbs and using a single ripper tooth. Refusal shall be demonstrated to Engineer prior to earth being deemed inexcavatable and therefore defined as rock subject to this rock clause and unit price compensation.
    - c. All rock excavation shall be under one classification. This classification shall include solid ledge rock in its natural location that requires systematic quarrying or drilling, and also boulders that exceed 0.25 CY in volume.
    - d. When rock is encountered, strip free of earth. After verification by a representative of the Owner and/or Engineer that the material encountered is rock (as defined above), employ an independent surveyor to determine rock quantities before removal operation begins. In computing the volumetric content of rock excavation for payment, the pay lines shall be taken as follows:

- 1) For structures (including foundations, manholes wet well, emergency storage vaults, etc.): 24 Inches outside the exterior limits of foundations and from rock surface to 12 Inches below bottom of foundations or unless otherwise noted in the project Geotechnical Report.
  - 2) For piping and utilities: A width 24 Inches wider than the outside diameter of the pipe or conduit and from rock surface to 12 Inches below bottom exterior surface of the pipe or conduit.
  - 3) Rock removed for benching, sloping excavations and other activities that are subject to the Contractor's means and methods shall not be included in the pay quantity.
- e. Hydraulic Hammer: Hydraulic hammering or alternative means approved by the Engineer shall be employed where refusal has been demonstrated and normal excavation procedures are not feasible.
- f. Remove and handle excavated materials regardless of its type, character, composition, condition, or depth.
- g. Blasting shall only be allowed under specified circumstances and performed in a method that limits the amount of public impacts. All blasting activities shall be under the discretion of the Engineer, Owner and City representatives. The contractor shall bear the responsibility for obtaining all required permits and notifications associated with any blasting activities.

E. Trench Bedding and Initial Backfill for Utilities:

1. Trench Bedding and Initial Backfill shall be in accordance with City of Folsom Standard Construction Specifications Section 6.7 and Standard Detail WR-15 unless otherwise Approved by the Engineer. The bedding and initial backfill section for utilities and pipelines shall be defined as indicated on the plans.
2. For all piping, trench bedding and initial backfill shall be 3/4" Class II aggregate base material in conformance with these specifications and Section 26 of the State Specifications. Backfill shall be mechanically consolidated to 95% relative compaction and shovel sliced under the haunches of the pipe.
3. Any trench soil or moisture condition that prevents the bedding and haunching material from forming a firm and stable base requires the use of granular fill material for bedding and haunching and foundation as approved by the Engineer. Granular fill material shall consist of 3/4-inch gravel or crushed rock of which 100% shall pass the 3/4" sieve and with no material passing the No. 4 sieve.

F. Intermediate Fill for Utilities:

1. Native material compacted to 95% relative compaction may be used for intermediate fill. Maximum particle size for native material shall not exceed 3 inches in the greatest dimension and shall be free of leaves, grass, roots, stumps, and other vegetable matter.

G. Imported Select Fill:

1. Imported Select Fill material shall be pea gravel or crushed rock. All applications of select fill materials shall be Approved and Inspected by the Engineer prior to installation.
2. General requirements for select fills are described as:
  - a. The material shall be free from peat, wood, roots, bark, debris, garbage, rubbish or other extraneous material.
  - b. 100% of material shall pass the 3/4-inch sieve.
  - c. Not more than 10% material shall pass the No. 8 sieve.

- d. The material shall have a minimum sand equivalent of 50 per Test Method No. Calif. 217.
- e. The amount of fines passing a No. 200 sieve shall not exceed 20 percent.

H. Drain Rock:

- 1. Drain Rock material shall be clean crushed stone or gravel material. Contractor may propose one of the following:
  - a. Granular Fill in accordance with City of Folsom Standard Construction Specifications Section 6.7E. Gradation shall be 3/4-inch minus with no material passing the No. 4 sieve.
  - b. Class 1, Type A Permeable Material in accordance with Caltrans Standard Specification Section 68-2.02F(2).

I. Sand:

- 1. All sand utilized for the project shall conform to the flowing gradation:

<u>U.S. Standard Sieve Size</u>	<u>Percent by Weight Passing</u>
3/8 inch	100
No. 4	90 - 100
No. 50	0 - 100
No. 100	0 - 8
No. 200	0 - 4

J. Class 2 Aggregate Base:

- 1. Class 2 Aggregate Base shall be 3/4-inch maximum size free from organic or other deleterious substances, in conformance with the City of Folsom Standard Construction Specifications and CALTRANS Standard Specifications Section 26.

<u>U.S. Standard Sieve Size</u>	<u>Percent by Weight Passing</u>
1 inch	100
3/4 inch	90 - 100
No. 4	35 - 60
No. 30	10 - 30
No. 200	2 - 9

<u>Test</u>	<u>Minimum Value</u>
Resistance (R Value)	78
Sand Equivalent	22
Durability Index	35

K. Controlled Low-Strength Material (CLSM)

- 1. As a proposed alternative, the Contractor may elect to utilize a controlled density fill in lieu of the pipe bedding, initial and intermediate backfills specified herein. The Controlled density fill shall be hand tool excavatable controlled low-strength material (CLSM).

2. Controlled density fill mix design shall be produced and delivered by a concrete manufacturing batch plant and submitted to the Engineer for Approval prior to application. Periodic compressive strength testing shall be conducted by a third party, materials testing and engineering firm licensed to conduct compressive strength testing and results shall be submitted to the Engineer for review.
3. Compressive strength requirements:
  - a. Mix designs used for Pipe Bedding and Trench Backfill shall generate a 100-150 psi 28-day compressive strength in accordance with ASTM D4832.
  - b. Mix Designs used for Backfill of Excavations shall generate a 150-300 psi 28-day compressive strength in accordance with ASTM C4832.
4. Mix design requirements:
  - a. Water-cement ration shall not exceed 3.5.
  - b. Minimum cement content shall be 50 pounds per cubic yard.
  - c. Fly ash content shall not exceed 300 pounds per cubic yard.
  - d. Unit weight shall be between 100 and 130 pounds per cubic foot in the as-placed condition as determined by ASTM D6023.
  - e. Slump shall be between 6 and 8 inches when tested in accordance with ASTM C143.

#### L. Rock Slope Protection

1. The Contractor shall furnish and install rock slope protection (rip-rap) where shown on the Drawings or to facilitate slope stabilization during construction activities.
2. Rip-rap slope protection shall be done with quarry stone or crushed rock, well graded coarse to fine, hard and durable with a percentage of wear less than 60 percent when tested for resistance to abrasion in conformance with ASTM C535. The rip-rap material shall be free of roots and organic material. The stones shall be angular, contain a minimum of three fractured faces and the least dimension of any piece shall not be less than  $\frac{1}{4}$  of its greatest dimension. Rip-rap as placed in any portion of the completed layer shall meet requirements of Caltrans Standard Specifications Section 72-2.02, Rock Slope Protection
3. Rock gradation shall meet the Nominal RSP Class and Median Particle Diameter as indicated on the Plans per location. Use the class of rock and the method for placement as provided in the rock gradation table in Caltrans Standard Specifications Section 72-2.02.
4. If slope is steeper than 2:1, do not use rounded boulders and cobbles. Angular shaped rock may be used on any planned slope. Flat or needle-shaped rock must not be used unless the individual rock thickness is greater than 0.33 times the length.

#### M. Geotextiles

1. Filter Fabric
  - a. Where specified or shown on the Drawings, filter fabric for subsurface drainage or gradation separation shall be a Class "A" non-woven polypropylene geotextile fabric and per Caltrans Section 96-1.02B.
2. Geotextile Reinforcement
  - a. Where specified or shown on the Drawings, fabric for soil stabilization or reinforcement shall be woven geotextiles, Mirafi Geolon HP370, or equal.
3. Erosion Control Mat

- a. Where specified or shown on the Drawings, erosion control mat shall be Contech CFB2 Temporary Degradable Erosion Blanket, or equal.
- b. Anchor and install erosion control blanket per manufacturer's requirements.

## **PART 3 - EXECUTION**

### **3.01 General**

#### **A. Overexcavation**

1. At the direction of the Owner's Representative: Where the undisturbed condition of natural soils is inadequate for support of planned construction, the Owner's Representative will direct the Contractor to overexcavate to adequate supporting soils. The excavated space shall be backfilled and compacted to the specified elevation with 3/4-inch Class II or 3/4-inch crushed rock. Filter fabric shall be provided around all 3/4-inch crushed rock.
2. Due to Contractor's Operations: Should the excavation be carried below the lines and grades specified on the drawings or should the bottom of the excavation be disturbed because of the Contractor's operations and require overexcavation and backfill, the Contractor shall backfill such excavated space with a compacted material in accordance with fill requirements of this Section. Backfill and compaction shall be at Contractor's expense.
3. As an alternative to overexcavation, the Owner's Representative may direct the Contractor to reinforce the soil with woven geotextiles equivalent to Mirafi Geolon HP370.

#### **B. Removal of Obstructions**

1. The Contractor shall remove all brush, trees, logs, stumps, roots, heavy sods, heavy growth of grass, all decayed vegetative matter, fences, and all structures where the proper construction and completion of the Work require their removal. The Contractor shall also remove all rocks, stones, broken concrete and pavement, debris and all obstructions of whatsoever kind or character, whether natural or artificial, encountered in the Work.
2. Material that is removed as hereinbefore specified, and is not to be incorporated in the Work, shall be properly disposed of off the site.

#### **C. Surplus Material**

1. Unless otherwise specified, surplus excavated material shall be disposed of in accordance with applicable ordinances and environmental requirements.
2. No excavated material shall be deposited on private property unless written permission from the Owner thereof is secured by the Contractor. Before the Owner will accept the work as being completed, the Contractor shall file a written release signed by all property owners with whom the Contractor has entered into agreements for disposal of excess excavated material absolving the Owner from any liability connected therewith.
3. The Contractor shall satisfy himself that there is sufficient material available for the completion of the required earthwork before disposing of any material inside or outside the site. The Contractor shall replace shortage of material, caused by premature disposal of any material by the Contractor.
4. Material shall not be stockpiled to a depth greater than 5 feet above finished grade within 25 feet of any excavation or structure except for those areas designated to be preconsolidated. For these areas, the depth of stockpiled material shall be as specified. The Contractor shall maintain stability of the soil adjacent to any excavation.

#### **D. Borrow Material**

1. If the quantity of acceptable material from excavation is not sufficient to construct the embankments required by the work, the quantity of material needed to complete the embankments shall consist of imported borrow conforming to specified requirements.

#### E. Hauling

1. When hauling is done over highways and/or private streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. The loads shall be watered after trimming to eliminate dust.

#### F. Haul Roads

1. If required, Contractor shall construct haul roads required to transport materials on the Work site. Alignment of haul roads shall be selected to avoid interference with concurrent construction operations and facility operations. Haul roads shall be removed after completion of embankment construction.

#### G. Finish Grading

1. Finish surfaces shall be smooth, compacted and free from irregularities. The degree of finish shall be that normally obtainable with a blade-grader.
2. Finished grade will be as specified by the contours, plus or minus 0.10 foot, except where a local change in elevation is required to match sidewalks, curbs, manholes and catch basins, or to ensure proper drainage. Allowance for topsoil and grass cover, and subbase and pavement thickness shall be made so that the specified thickness of topsoil can be applied to attain the finished grade.
3. When the Work is at an intermediate stage of completion, the lines and grades shall be as specified plus or minus 0.5 foot to provide adequate drainage.
4. If the soil is to be cultivated or straw is to be incorporated into the surface, rocks larger than 2-1/2 inches in maximum dimension, roots and other debris on the surface of the slope shall be removed and disposed of prior to cultivation or placement of straw.

#### H. Control of Erosion

1. The Contractor shall maintain earthwork surface true and smooth and protected from erosion. Where erosion occurs, the Contractor shall provide fill or shall excavate as necessary to return earthwork surfaces to the grade and finish specified.

### **3.02 Earthwork for Structures**

A. Earthwork for structures shall be in conformance with specification requirements stated herein, and per the City of Folsom Standard Construction Specifications.

#### B. Structure Excavation

1. The bottom shall not be more than 0.15 foot above or below the lines and grades specified on the contract drawings. If the elevation or structure excavation is not specified, the excavation shall be not more than 0.15 foot above or below the elevation specified for fill material below the structure. Slopes shall vary no more than 0.5 foot from specified grade unless the excavation is in rock where the maximum variation shall be 2 feet.
2. Unless otherwise specified, excavations shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is specified to be placed directly against excavated surfaces.

#### C. Foundation Treatment

1. The foundation of the new structures shall be excavated, backfilled and compacted as specified herein, on the contract drawings or as provided in the City of Folsom Standard

Construction Specifications The Contractor shall make the necessary provisions to protect the foundations of existing structures adjacent to the new structures against disturbance during the new foundation installation activities.

2. At the completion of the excavation, the Owner's Representative shall inspect the bottom of the excavation. No further earthwork shall be performed prior to this inspection. Where unsuitable material is found, the Contractor shall overexcavate as directed by the Owner's Representative.
3. Upon the Owner's Representative's approval, the bottom of the excavation shall be scarified to a depth of 8 inches, then moisture conditioned to within two percentage points of optimum moisture content, and then shall be re-compacted to a minimum of 90 percent of maximum relative compaction.

#### D. Structure Fill and Backfill

1. Structural Fill and Backfill shall conform to the requirements of this Section or as shown on the Drawings. In the case of a conflict the more restrictive requirement shall govern.
2. After completion of construction below the elevation of the final grade, and prior to backfilling, forms shall be removed and the excavation shall be cleaned of debris.
3. Structure backfill shall not be placed until the subgrade portions of the structure have been inspected. No backfill material shall be deposited against concrete structures until the concrete has developed a compressive strength of not less than the specified 28 day concrete strength is reached.
4. Structural Backfill material shall be placed in uniform layers with uncompacted thickness of not more than 8 inches and shall be brought up uniformly on all sides of the structure. Each layer of backfill shall be compacted to a relative compaction of not less than 90 percent. The top 12 inches shall be compacted to at least 95 percent relative compaction. Where the backfill is under roadway or traffic area, the material within 8 inches below the roadbase shall be compacted to a relative compaction of not less than 95 percent. Compaction by means of water jetting or water ponding shall not be permitted.
5. Unless otherwise specified, backfill around and above pipelines within the excavation line of any structure shall be the same as that specified for structures.
6. Controlled Density Fill may be used for structural backfill where Approved by the Engineer.

#### E. Drain Rock

1. Drain rock below and around structures shall be completely encased in filter fabric.
  - a. Seams shall be overlapped a minimum of 3 feet and fastened per manufacturer's recommendations.
  - b. Repair all tears and cuts in fabric prior to backfill.
  - c. Take precautions to not damage fabric during backfill.
2. Drain rock to be placed under structures shall be compacted with 2 to 4 passes of a vibrating compactor into an even surface to minimize migration of finer material that may be placed on top of the rocks.

### **3.03 Excavation and Backfill for Pipelines and Conduits**

#### A. Trench Excavation

1. General Requirements:

- a. Unless otherwise specified or indicated, excavation for pipelines and conduits shall be open cut. Trenching machines may be used except where their use will result in damage to existing facilities.
- b. Where, in the opinion of the Owner's Representative, the undisturbed condition of the natural soils below the excavation grades indicated or specified is inadequate for the support of the planned pipeline, the Owner's Representative will direct the Contractor to overexcavate to adequate supporting soils and backfill the excavated space to the proper elevation. The bottom of the trench excavation shall be firm and dry.
- c. Unless otherwise shown, trenches shall be excavated at least 12 inches below the final elevation of the barrel of the pipe.
- d. The trench may be excavated by machinery to the grade indicated on the Drawings provided that the soil material remaining in the bottom of the trench is no more than slightly disturbed.
- e. Open Trench:
  - 1) Trench Excavation shall proceed in advance of pipe installation only so far as can be backfilled the same day.
  - 2) Trench Stability: (AWWA 605-05 4.1.1.3)
    - a) Where necessary to prevent caving, trench excavations in unstable soils shall be adequately supported with steel sheeting or trench boxes. Before sheeting is withdrawn, or trench boxes moved forward, they shall be raised, in place, just above the pipe crown to safely allow the constructor to completely fill any voids left in the pipe zone.

#### B. Trench Width

1. The width of trench shall be a minimum 24 inches wider than the pipe outside diameter, with a minimum of 12 inches clear on each side as shown on Standard Detail WR-15. The maximum width shall be inclusive of all sheeting, lagging and bracing.
2. Wherever the maximum allowable trench width is exceeded for any reason, the Contractor shall provide improved bedding and/or extra strength pipe, as directed by the Owner's Representative.
3. All pipelines shall have a minimum of 12 inches bedding material below the barrel of the pipe. Bedding shall be placed and compacted as specified for initial trench backfill and shall be placed to provide uniform support for the pipe.
4. Where, in the opinion of the Owner's Representative, stabilization of the undisturbed foundation below the overexcavated depth as shown is required because of the soft, spongy or unstable condition, backfill selected by the Owner's Representative shall be placed in the trench bottom.

#### C. Grading of Pipe Trench Bedding:

1. Bedding grading material shall be as specified in Section 2.01 E of this Specification.
2. For all water main piping:
  - a. Place 12 inches of Bedding material below bottom of pipe.
  - b. Place Bedding material at uniform density, with minimum possible compaction.
3. Bell or coupling holes:
  - a. Dig holes after trench bottom has been graded.

- b. Provide holes of sufficient width to provide ample room for grouting, banding, or welding of Welded Steel Piping.
  - c. Excavate holes only as necessary for making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.
4. Depressions for joints, other than bell-and-spigot:
- a. Make in accordance with recommendations of joint manufacturer for particular joint used.

#### D. Initial Backfill & Bedding

1. After the pipe has been properly installed on the consolidated bedding and inspected, initial backfill shall be placed around the pipe to a depth over the pipe as shown in the Drawings. The backfill material shall be placed in horizontal layers and compacted by power-operated tampers, rollers, or vibratory equipment to the relative compaction in accordance with Fill Requirements. Jetting of bedding or initial backfill is not allowed.
2. After the pipe is laid, place bedding and backfill material in lifts:
  - a. First Lift: Place and compact the bedding material in a single lift, even with the spring line of the pipe. Compact to 95% of maximum density.
  - b. Second and Subsequent Lifts: Place and compact bedding material in lifts of approximately 8 inches in uncompacted depth and compact to 95 percent of maximum density.
  - c. Per City Standard Detail WR-15, the Contractor shall shovel slice the bedding material uniformly in the "Haunch Zone" to the pipe spring line. During shovel slicing activities, the Contractor shall monitor the pipelines slope to avoid incremental lifting of the utility pipeline.
  - d. Each layer shall be compacted to the specified relative compaction prior to placing subsequent layers. The thickness of the loose layer may be increased when in-place compaction tests satisfactory to the Owner's Representative show that the specified relative compaction can be obtained. No further backfilling will be permitted until the Owner's Representative has accepted the initial backfill.

#### E. Subsequent Backfill

1. Above the level of initial bedding and backfill, the trench shall be filled with material as specified unless otherwise indicated on the Drawings. The backfill material shall be placed in horizontal layers and shall have a moisture content such that the required degree of compaction may be obtained. Each layer shall be compacted by power-operated tampers, rollers or other suitable equipment to the relative compaction as indicated in same table. Each layer shall be compacted to the specified relative compaction prior to placing subsequent layers.
2. Under structures:
  - a. Backfill trench up to underside of structure with aggregate base course material compacted to 95 percent of maximum density.
3. Under roadways, paved areas or storage areas:
  - a. Backfill trench up to within 2 feet of finish grade as indicated on the Drawings with native material compacted to 90 percent of maximum density.
  - b. Then backfill from 2 feet below finish grade to underside of pavement as indicated on the Drawings with aggregate base course material compacted to 95 percent of maximum density.
  - c. In areas outside the improved section of roadways or in open country:

- 1) Backfill to finish grade as indicated on the Drawings with native material compacted to 90 percent of maximum density.
4. Through earth slopes adjacent to, or supporting structures:
  - a. Backfill to finish grade with aggregate base course material or select material compacted to 95 percent of maximum density.
5. Under existing intersecting pipes or conduits larger than 3 inches in diameter:
  - a. Backfill from bottom of new pipe trench to spring line of intersecting pipe or conduit with aggregate base course material compacted to 90 percent of maximum density.
  - b. Extend aggregate base course material two feet on either side of intersecting pipe or conduit to ensure that material remains in place while other backfill is being placed.
  - c. Backfill remainder of trench as specified in "Trench backfill above pipe bedding and for conduits and ductbanks" above.
6. Compaction:
  - a. In-place density of compacted trench backfill, and bedding determined in accordance with ASTM D 1556, or with ASTM D 2922 and ASTM D 3017.
  - b. Maximum density obtained in laboratory when tested in accordance with ASTM D 1557.
  - c. Consolidation:
    - 1) Do not use water-settling methods such as flooding, poling, or jetting.

### **3.04 Paving Subgrade Preparation**

- A. The prepared subgrade shall be scarified to a depth of at least 8 inches, moisture conditioned as necessary, and recompacted to at least 95 percent of the maximum relative compaction based on the ASTM D1557 test method.
- B. Any localized zones of soft or pumping soils observed within the excavation base should either be scarified and recompacted as discussed above or be overexcavated and replaced with suitable material.
- C. Aggregate base course shall be compacted to at least 95 percent of the maximum relative compaction based on the ASTM D1557 test method.

### **3.05 Site Fill**

- A. Unless otherwise specified general site fill material shall be Select Fill or Engineered Fill compacted to a relative compaction of at least 90 percent. If the existing slope in an area to be filled is steeper than 5:1, the Contractor shall bench the area prior to filling.

### **3.06 Field Quality Control**

- A. Confirmation tests:
  1. Contractor's responsibilities:
    - a. Accomplish specified compaction of trench backfill.
    - b. Control operations by confirmation tests to verify and confirm that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.
    - c. Cost of confirmation tests are Paid by the Owner:

- d. Qualifications of Contractor's testing laboratory: Acceptable to Engineer. Provide lab certification.
  - e. Copies of confirmation test reports: Submit promptly to the Engineer.
  - 2. Frequency of confirmation testing:
    - a. Perform testing not less than as follows:
      - 1) For trenches: At each test location include tests for each type or class of backfill from bedding to finish grade.
      - 2) In open fields: 2 every 1,000 linear feet.
      - 3) Along dirt or gravel road or off traveled right-of-way: 2 every 500 linear feet.
      - 4) Crossing paved roads: 2 locations along each crossing.
      - 5) Under pavement cuts or within 2 feet of pavement edges: 1 location every 400 linear feet.
- B. Compliance tests:
- 1. Frequency of testing: Periodic compliance tests will be made by the Engineer to verify that compaction is meeting requirements previously specified.
  - 2. If compaction fails to meet specified requirements: Perform remedial work by one of the following methods:
    - a. Remove and replace backfill at proper density.
    - b. Bring density up to specified level by other means acceptable to the Engineer.
- C. Retesting:
- 1. Costs of retesting: Contractor is responsible for the costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements.
  - 2. Contractor's confirmation tests during performance of remedial work:
    - a. Performance: Perform tests in manner acceptable to the Engineer.
    - b. Frequency: Double amount specified for initial confirmation tests.

**\*\* END OF SECTION \*\***

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**SECTION 02350  
SHEETING, SHORING AND BRACING**

**PART 1 - GENERAL**

**1.01 Scope**

A. This Section provides specifications for sheeting, shoring, bracing, or other excavation supports.

**1.02 References**

A. This section references the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the most stringent requirement shall prevail.

<u>Reference</u>	<u>Title</u>
ASCE	Guidelines of Engineering Practice and Tied Back Excavations
Caltrans	Caltrans California Trenching and Shoring Manual
OSHA	Occupation Safety and Health Act, US Department of Health
CAL OSHA	State of California Construction Safety Orders – California State Labor Code
CCR	California Code of Regulations – Title 8
CLC	California Labor Code – Sections 6705 to 6707
NAVFAC	Department of the Navy Naval Facilities Engineering Command
USS	United States Steel Corp – Steel Sheet Piling Design Manual

**1.03 Definitions**

- A. Shoring: A temporary structural system designed to support vertical faces, or nearly vertical faces, of soil or rock for purposes of excavation. Shoring includes cantilevered sheet piling, internally braced sheet piling, slurry walls, soldier piles and lagging, trench plates and vertical shoring, slide rail, and other similar shoring systems. Sloping (Benching) of the soil is not considered shoring as described herein however, sloping (benching) is considered an appropriate means of constructing a safe trench and may be considered for the use of project excavation.
- B. Shielding: A temporary structural system designed to protect workers from trench failure. A shield is not considered to be a temporary structural system designed to support vertical trench faces, or nearly vertical faces, of soil or rock for purposes of excavation and maintain trench wall consolidation. A shield may be used in conjunction with an active shoring system but shall not be substituted as an or equal.
- C. For the purpose of bidding, the Contractor shall reference the project geotechnical report referenced in Section 01900, Seismic Criteria to identify the appropriate soil conditions per the OSHA Soil Classification System.

**1.04 Quality Assurance**

A. Protection and Trench Safety

1. Pursuant to Section 6705 of the State Labor Code, all open excavations greater than 5 feet in depth shall be constructed with bracing, sheeting, shoring, or other equivalent method designed for the protection of life and limb.

2. The trench excavation and support system shall comply in all respects with the requirements of Article 6 of the Construction Safety Orders of the Division of Industrial Safety.
3. The Contractor's attention is directed to the provisions of Subarticle 1540 (4), Article 6 of the California Construction Safety Orders for alternative shoring and sloping system. It shall be the Contractor's responsibility to provide the additional strength required to support the sides of the excavation against loads which may exceed those employed to derive the criteria set forth in the Industrial Safety Orders.
4. The Contractor shall submit to the Owner's Representative a detailed plan showing the design of sheeting, shoring, bracing, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. The plan shall be prepared and stamped by a California registered Civil Engineer.
5. It shall be understood that the above-stipulated requirements are the minimum to be provided. The Contractor shall be solely responsible for all liabilities that may arise from the Contractor's failure to provide adequate shoring, bracing or sheeting as necessary to support the excavation under any or all of the conditions of loading which may exist, or which may arise during the construction of the project.

#### B. Excavation for structures

1. All excavations shall be properly shored, sheeted and braced to prevent shifting of material, to prevent damage to structures or other work, and to avoid delay to the Work, all in accordance with applicable safety and health regulations.
2. Before starting excavation for structures, the Contractor shall submit, for record purposes, complete design calculations and working drawings of proposed sheeting and bracing arrangements which have been prepared, signed and sealed by a California registered Civil Engineer. Shoring system means and methods are the sole responsibility of the Contractor however, the proposed shoring system shall be applicable to working excavation conditions, existing soils, groundwater tables, and required constructability. The shoring system should be consistent with recommendations provided by the Geotechnical Engineer. If the Inspector or Owner's representative determines that the Contractor's shoring system means and methods are producing an unsafe environment or do not adequately account for the existing work environment, the Inspector may shut down construction until the shoring system is deemed safe by a licensed Civil Engineer.
3. Bracing shall be arranged so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength. If the Owner's Representative is of the opinion that, at any point, the sheeting or supports are inadequate or unsuited for the purpose, the Owner's Representative may order the Contractor to resubmit design calculations and working drawings for that point, taking into consideration the observed field conditions.
4. If the new calculations show the need for additional sheeting and bracing, the Contractor shall immediately install facilities necessary to meet or exceed identified requirements.
5. The sole responsibility for the design, methods of installation, and adequacy of the sheeting and supports shall be and shall remain that of the Contractor.
6. The working drawings for shoring, sheeting and bracing will not be checked by the Owner's Representative.

#### C. Submittals

1. The following shall be submitted in compliance with Specification Section 01300 - Submittals.
2. Trench Support Shop Drawings and Calculations:

- a. In accordance with the requirements of Section 6705 of the Labor Code of the State of California, the Contractor shall submit detailed drawings and supporting calculations to the Owner's Representative before excavation, showing the design of sheeting, shoring, bracing, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches 5 feet or more in depth.
  - 1) Where such drawings vary from excavation support standards set forth in California Code of Regulations Title 8 - Construction Safety Orders, submit design calculations pursuant to general engineering design practice.
  - 2) Provide means for safe and stable excavations that are not less effective than required in CCR Title 8 - Construction Safety Orders.
  - 3) For excavations other than trenches, submit, in advance of excavation work, design calculations as performed pursuant to general engineering design practice, as specified in this Section, and detail drawing showing means for safe and stable excavations. In design calculations and detail drawing, cover, as a minimum:
    - a) Excavations adjacent to structures and other improvements, and
    - b) Excavations 5 feet or more in depth, or less than 5 feet in depth when there is potential for cave-in, at other locations.
- b. The Contractor's Sheeting, Shoring and Bracing design submittal shall include the following items:
  - 1) Provide calculations for the different load, support, and other conditions that occur during the sequence of installation of shoring, construction of facilities protected by the shoring, and sequence of removal of shoring. Provide design calculations that clearly disclose assumptions made, criteria followed, and stress values used for the materials being used.
  - 2) Provide sketches showing the condition at various stages of installation and removal of shoring.
  - 3) Show structures, pipelines, and other improvements located near the shoring, and the shoring on a plan.
  - 4) When utilities penetrate the shoring, submit an elevation of all sides of the shoring showing the locations of the penetrations. Submit details on ground support and sealing around utility penetrations.
- c. The design shall be signed and stamped by a California registered Professional Civil Engineer. The drawings and calculations will be for record purposes only and will not be checked by the Owner's Representative. Responsible charge of the submitted sheeting, shoring and bracing drawings and calculations will remain under the sole responsibility of the California registered Professional Civil Engineer of record whom signed and stamped the sheeting, shoring, and bracing design.
- d. The sheeting, shoring and bracing design shall take the geotechnical data, soil characteristics, and sheeting, shoring, and bracing recommendations into consideration reported in the project specific geotechnical report. Please note discrepancies between the submitted design and recommendations listed in the geotechnical report.
- e. In accordance with the requirements of CalTrans Standard Specifications, protective plans not requiring a signature shall be submitted at least 5 days before the Contractor intends to begin excavation. If the protective plan requires a signature, the plan shall be submitted at least 20 days before the Contractor intends to begin excavation.
- f. Detailed Sequence of Installation and Removal of Shoring:

- 1) Consider effects of ground settlement in the sequence of installation and removal of shoring.
  - 2) Provide individual drawings/details illustrating the conditions at various stages in the sequence of installation and removal of shoring.
3. Certification
- a. The minimum required protection will be that described in the Cal/OSHA Construction Safety Orders of the California Division of Industrial Safety.
  - b. If the Contractor presents excavation plans that vary from the shoring system standards established by the Construction Safety Orders, the Plans shall be prepared, stamped, and signed by a California registered Civil Engineer.

### **1.05 Scheduling and Sequencing**

- A. Do not begin work on excavations, trenches, and means for providing stability of excavation and trenches until submittals have been accepted by Engineer and until materials necessary for installation are on site.
- B. Submit submittals a minimum of 20 days prior to the scheduled date to begin excavation work.
- C. The Contractor shall sequence the installation and removal of the shoring system in strict accordance with the signed and stamped Sheeting, Shoring, and Bracing design. In soils deemed unstable, the Contractor shall only construct trenching that can be open and closed in (1) business day. The Contractor shall coordinate closely with the geotechnical engineer to determine the quality of existing soils and the potential for allowing open cut trenches to remain un-backfilled for multiple days.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 General**

- A. The design, planning, installation and removal of all lagging, sheeting, shoring, sheet piling, and bracing shall be accomplished in such a manner as to maintain the undisturbed state of the soils adjacent to the trench and at and below the excavation bottom.
- B. The use of horizontal strutting below the barrel of a pipe or the use of a pipe as a support will not be permitted.
- C. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loadings that might overload the pipe.
- D. Where measurements and observations indicate possibility of failure or excessive movement of excavation support, determined in accordance with general engineering design practice, take appropriate action immediately.
- E. In the event of an unknown utility line or obstruction is encountered during trenching activities, the contractor shall discontinue construction progress and notify the Engineer. The Contractor will coordinate with the Civil Engineer of record responsible for the Sheeting, Shoring, and Bracing design and adjust the shoring system design as necessary to accommodate the avoidance of the existing
- F. Installation and Removal

1. The Contractor shall select a shoring system and method of removal which will minimize soil that sticks to shoring from creating large voids and causing settlement. To prevent settlement caused by pulling shoring, the Contractor shall fill voids with sand, pea gravel, pressure inject grout or an approved controlled density fill.

### **3.02 Performance Requirements:**

#### **A. General:**

1. Support faces of excavations and protect structures and improvements in vicinity of excavations from damage and loss of function due to settlement or movement of soils, alterations in ground water level caused by such excavations, and related operations.

#### **2. Herein Specified Provisions:**

- a. Complement, but do not substitute or diminish, obligations of Contractor for the furnishing of a safe place of work pursuant to provisions of the Occupational Safety and Health Act of 1970 and its subsequent amendments and regulations and for protection of the Work, structures, and other improvements.
- b. Represent minimum requirement for:
  - 1) Number and types of means needed to maintain soil stability.
  - 2) Strength of such required means.
  - 3) Methods and frequency of maintenance and observation of means used for maintaining soil stability.

- #### **B. Provide safe and stable excavations by means of sheeting, shoring, bracing, sloping, and other means and procedures, such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils and rock.**

- #### **C. Provide support for trench excavations for protection of workers from hazard of caving ground.**

#### **D. Provide Shoring:**

1. Where, as result of excavation work and analysis performed pursuant to general engineering design practice, as defined in this Section:
  - a. Excavated face or surrounding soil mass may be subject to slides, caving, or other types of failures.
  - b. Stability and integrity of structures and other improvements may be compromised by settlement or movement of soils, or changes in soil load on structures and other improvements.
2. For trenches 5 feet and deeper.
3. For trenches less than 5 feet in depth, when there is a potential for cave-in.
4. Where indicated on the Drawings.
5. For safe and stable excavations, use appropriate design and procedures for construction and maintenance to minimize settlement of supported ground and to prevent damage to structures and other improvements, including:
  - a. Using stiff support systems.
  - b. Following appropriate construction sequence.
  - c. Preventing Soil Loss Through or Under Support System:
    - 1) Provide support system that is tight enough to prevent loss of soil and extend deep enough to prevent heave or flow of soils from supported soil mass into the excavation.

- d. Providing surface runoff routing and discharge away from excavations.
- e. Where dewatering is necessary, recharge groundwater as necessary to prevent settlement in area surrounding excavation.
- f. Where sheet piling is used, use interlocking type sheets. The sheet piles shall be continuous and driven in interlock. If the bottom of the excavation is located below the water table, use "thumb and finger" type interlock.
- g. Not applying shoring loads to existing structures and other improvements.
- h. Not changing existing soil loading on existing structures and other improvements.
- i. Provide welded steel packing between soil retaining members such as sheet piles and wales and similar members when the gap exceeds 1/2 inch before the wales are loaded.

### **3.03 Design**

#### **A. General**

1. Design means for safe and stable excavations in accordance with general engineering design practice.
2. Design steel members in accordance with CBC (most recent edition) and the AISC Manual of Steel Design.
3. Design shoring involving materials other than steel in accordance with CBC (most recent edition).
4. Perform design in accordance with soil characteristics and design recommendations contained in the project geotechnical report referenced in Section 01900, Seismic Criteria and provided in Appendix A.
5. When electing to design with material stresses for temporary construction higher than allowable stresses prescribed in the Manual of Steel Construction and the applicable building codes, increase in such stresses shall not exceed 10 percent of value of prescribed stresses.
6. Minimum safety factor used for design shall not be less than 1.5.
7. The calculated minimum depth of penetration of shoring below the bottom of the excavation shall be increased not less than 30 percent if the full value of passive pressure is used in the design.
8. The maximum height of cantilever shoring above the bottom of excavation shall not exceed 15 feet. Use braced shoring when the height of shoring above the bottom of excavation exceeds 15 feet.
9. The location of the point of fixity for shoring shall not be less than half the calculated minimum embedment depth below the bottom of the excavation.
10. Generally acceptable references for the design of shoring and excavations are as follows:
  - a. Caltrans California Trenching and Shoring Manual.
  - b. NAVFAC Design Manual 7.2 - Foundations and Earth Design.
  - c. NAVFAC Design Manual 7.3 - Soil Dynamics Deep Stabilization and Special Geotechnical Construction.
  - d. USS Steel Sheet Piling Design Manual.
  - e. Guidelines of Engineering Practice for Braced and Tied-Back Excavations published by American Society of Civil Engineers.

- B. Shoring design shall be performed by a Shoring Design Engineer meeting the following qualifications:
1. Shall be registered as a civil or structural engineer in the State of California.
  2. Shall have not less than 5 years experience in the design of shoring.
  3. The shoring design firm shall obtain errors and omissions insurance for the Project for an amount of not less than \$500,000.
- C. Soldier Piles and Lagging:
1. Provide lagging over the full face of the excavation. Joints between pieces of lagging shall be tight to prevent loss of soil.
  2. Provide full face lagging all around penetrations through the lagging.
  3. If the soldier piles are installed in predrilled holes, the predrilled holes shall be filled with controlled density backfill after the soldier piles are installed.
  4. The effective width of driven soldier piles for passive soil resistance shall not exceed 2 times the width of the pile. The effective width of concrete encased soldier piles for passive soil resistance shall not exceed 2 times the width of the concrete encasement.
  5. Fill voids behind lagging with gravel or other material acceptable to the Engineer.
  6. Apply loads from tie back soil, rock, or deadman anchors concentrically to soldier piles or wales spanning between soldier piles. Wales shall be back-to-back double channels or other members acceptable to the Engineer. Eccentrically loaded with section soldier piles or wales are not acceptable.
  7. Design soldier piles for downward loads including vertical loads from tie back anchors.
- D. Soil Anchors, Rock Anchors, and Deadmen Anchors:
1. Design tie back anchors for a safety factor of not less than 2 times the calculated load from the shoring.
  2. Proof load all production anchors to not less than 125 percent of the calculated load from the shoring. Lock off anchors at the calculated anchor load.
  3. The length of soil anchors used to calculate resistance to load from the shoring, shall not include any length within the potential active pressure soil failure zone behind the face of shoring.
  4. Design tie rods for anchors for 130 percent of the calculated load from the shoring.
  5. Design tie rods for anchors for 150 percent of the calculated load from the shoring when tie rod couplers are used and for other conditions where stress concentrations can develop.
- E. Steel Plating and Vertical Shoring
1. Steel plating shall be required for all excavations greater than 5-feet in depth.
  2. Steel plates utilized for the design shall be nonskid finishes.
    - a. If excavations are to be left open for 5 days or less, steel plates may be placed over the excavation.
    - b. In existing AC Pavement, the Contractor shall place cold mix Asphalt "Cutback" around the perimeter of the plates for a smooth transition. If the excavation will be left open longer than 5 days, the Contractor shall saw cut/grind a key into edges of the pavement around the perimeter of the excavation to support the plates.

- 1) These keys shall be cut/ground to a depth equal to the thickness of the plates used to span the excavation.
3. Hydraulic Vertical shores may be Aluminum and shall be sized in accordance with the horizontal loading calculated in the Sheeting, Shoring and Bracing system design.
4. When excavating in less stable soils requiring close or intermittent sheeting, the Contractor may utilize an Aluminum Waler & Hydraulic Shore System for trench wall support.

### **3.04 Sequencing**

- A. The Contractor shall not start excavation until the trench support drawings have been returned to the Contractor.
- B. When the construction sequence of structures requires the transfer of bracing to the completed portions of any structure, the Contractor shall secure the written acceptance of the Owner's Representative prior to the installation of such bracing.

**\*\* END OF SECTION \*\***

## **SECTION 02500 ASPHALT CONCRETE PAVING**

### **PART 1 - GENERAL**

#### **1.01 Summary**

- A. This section provides specifications for asphalt concrete pavement for prepared subgrade or aggregate base course and for asphalt concrete overlay.

#### **1.02 References**

- A. Paving shall be in conformance with the requirements of Caltrans Standard Specification, 2018, City of Folsom Standard Construction Specifications, and the requirements set forth herein.
- B. State of California Department of Transportation Standard Specifications, latest edition (Caltrans Standard Specifications):
1. Section 37 – Bituminous Seals.
  2. Section 39 – Asphalt Concrete.
  3. Section 92 – Asphalt Binders.
  4. Section 94 – Asphaltic Emulsions.
  5. Section 96 – Geosynthetics.
- C. Caltrans Standard Test Methods:
1. Calif Test 202 - Sieve Analysis of Fine and Coarse Aggregates.
  2. Calif Test 304 - Preparation of Bituminous Mixtures for Testing.
  3. Calif Test 362 - Determining Asphalt Content in Bituminous Mixtures by Vacuum Extraction.
  4. Calif Test 375 - Determining the In-Place Density and Relative Compaction of AC Pavement.
  5. Calif Test 379 - Determining Asphalt Content in Bituminous Mixtures (Troxler Nuclear Gauge Model 3241).
- D. ASTM International (ASTM):
1. D 1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft. lbf/ft<sup>3</sup>)(2,700 kN-m/m<sup>3</sup>).
  2. D 1561 - Standard Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor.

#### **1.03 Submittals**

- A. Contractor shall submit product data showing that all paving materials conform to the requirements of this section, Caltrans Standard Specifications and applicable requirements set forth in the City of Folsom Standard Construction Specifications.
- B. Submittals shall be in accordance with Specification Section 01300 - Submittals.
- C. Contractor shall submit the following information for review and approval by the Engineer:
1. Mix Design;
  2. Shop Drawings;
  3. Product Data of proposed Materials:

- a. Asphalt
  - b. Asphalt Aggregate
  - c. Pavement Reinforcing Fabric
4. Contractor shall submit copies of Quality Control testing laboratory reports verifying that the aggregate material conforms to the specified gradations or characteristics.
  5. Certificates of Compliance and Competence by the Contractor performing the work.

D. Delivery & Storage

1. Asphalt pavement delivery:
  - a. Transport the mixture from the mixing plant to the point of use in vehicles having tight bodies previously cleaned of all foreign materials.
  - b. Treat bodies as necessary to prevent material from sticking to the bodies.
  - c. Cover each load with canvas or other suitable material of sufficient size and thickness to protect the asphalt mixture from the weather.

E. Project Conditions

1. Environmental requirements:
  - a. Asphalt concrete:
    - 1) Place asphalt concrete only when surface is dry, when atmospheric temperature in the shade is 40 degrees Fahrenheit and rising, or above 50 degrees Fahrenheit if falling.
    - 2) Do not place asphalt concrete when weather is foggy or rainy nor when base on which material is to be placed is in wet or frozen conditions or when, in the opinion of the Engineer, weather conditions will prevent proper handling, finishing, compaction of the mixtures.

**PART 2 - PRODUCTS**

**2.01 Asphalt Concrete**

A. All materials shall be in conformance with the following requirements of the latest Caltrans Standard Specification:

<u>Material</u>	<u>Requirements</u>
Crushed aggregate base	Section 26, Class II, 3/4" Max.
Asphalt concrete	Section 39, Type B, 3/4" Max.
Asphalt Binder	Section 92, PG 64-10
Tack coat	Section 39, Section 94, CSS1h,
Slurry: Emulsion and aggregate	Section 37, QS1h emulsion and Type I aggregate
Pavement Reinforcing Fabric	Section 96

B. Asphalt concrete pavement shall consist of a subgrade as shown. The finish course shall consist of Type B, PG 64-10 asphalt concrete, of at least 3 inches thickness or as shown on the Drawings, whichever is thicker.

- C. Asphalt concrete shall be provided with an emulsion-aggregate slurry seal applied on the completed finish course of the asphalt pavement.
- D. A minimum of 6 inches of aggregate base or as shown on the Drawings, whichever is thicker, will be placed below all new asphalt paving.

## **2.02 Equipment**

### **A. Spreading and compacting equipment:**

- 1. Spreading equipment shall conform to Section 39-5.01 and all applicable referenced sections, of the Caltrans Standard Specifications:
  - a. Only in areas inaccessible to the machine, by approval of the Engineer, will hand spreading be permitted.
- 2. Compaction equipment shall conform to Section 39-5.02 and all applicable referenced sections, of the Caltrans Standard Specifications.

## **PART 3 - EXECUTION**

### **3.01 Examination**

- A. Verification of conditions: Verify surfaces and site conditions are ready to receive work. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning application means acceptance of existing conditions.

### **3.02 Preparation**

#### **A. Protection**

- 1. Protect concrete pavements and walks, curbs and bases, and other improvements adjacent to the operations with suitable materials.
- 2. Building and other surfaces shall be covered with paper or other protection, when required.
- 3. Contractor shall be responsible for any damage caused by Contractor's employees. All damage caused by the Contractor's operations shall be repaired to the satisfaction of the Engineer at no additional cost to Owner.

#### **B. Asphalt Concrete Removal**

- 1. All asphalt concrete pavement surface that has been removed, broken or damaged shall be completely re-paved in accordance with the requirements stated herein unless otherwise noted in the Contract Documents.
- 2. Existing pavement shall be saw cut and removed clean in accordance with City of Folsom Standard Construction Specifications and Caltrans Standard Specifications. The Contractor shall coordinate with the Engineer to determine the full extent of pavement restoration/removal.
- 3. All asphalt paving shall be cut to a neat, straight line and the exposed edge shall be tacked with emulsion prior to paving. The exposed base material shall be graded, recompact, and resealed prior to paving. Reference the Contract Drawings or City of Folsom Standard Construction Specifications for compaction requirements.
- 4. Removed asphalt shall be disposed from the work site at the Contractor's expense. Removed asphalt shall not be used as backfill material on-site.

5. Reclaimed asphalt material may be used on the Work site only with written approval from the Construction Manager/Engineer. Reclaimed asphalt is asphalt that has been removed with a “grinding machine” and mixed with aggregate material to meet pre-approved requirements.

#### C. Compaction of Asphalt Concrete Paving

1. Compact until roller marks are eliminated and a density of 92% minimum to 98% maximum has been attained per ASTM D2041.
2. Compacting equipment shall conform to the provisions of Caltrans Standard Specification Section 39.

#### D. Preparation of Subgrade

1. Subgrade shall be prepared in accordance with Section 02200 – Earthwork, and in accordance to City of Folsom Standard Construction Specifications.
2. Shape subgrade to line, grade, and cross section shown in the drawings.
3. Scarify subgrade to 6 inches depth below the finished subgrade elevation. Compact to 95 percent relative compaction.
4. Immediately prior to applying tack coat, or immediately prior to placing the asphalt pavement when tack coat is not required, the subgrade to receive asphalt pavement shall conform to the compaction requirement and elevation tolerances specified for the material involved and shall be cleaned to remove any loose or extraneous material.
5. If the asphalt pavement is placed on an existing base or pavement which was not constructed as part of the contract, the Contractor shall clean the surface by sweeping, flushing, or other means to remove all loose particles of paving, all dirt and all other extraneous material immediately before applying the tack coat.
6. The finished subgrade shall be within a tolerance of 0.05 of a foot of the grade and cross section shown and shall be smooth and free from irregularities and at the specified relative compaction.

#### E. Placement of Aggregate Base Course

1. Place aggregate base course to a minimum thickness as required. Compact to 95% relative compaction and install in accordance with Caltrans Standard Specification Section 26.

### **3.03 Tack Coat Application**

- A. A tack coat of asphaltic emulsion shall be applied to all vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, or as otherwise specified in this Section.
- B. Tack coat shall be applied in one application at a rate of 0.1 gallons per square yard of surface covered.
- C. Apply tack coat on surfaces to receive finish pavement per Caltrans Standard Specifications 39. Apply tack to metal or concrete surfaces that will be in contact with the asphalt concrete paving.

### **3.04 Seal Coat Application (If required and if indicated on the drawings)**

- A. Apply slurry seal at end of project after all paving and major construction is complete.
- B. Apply slurry seal to new overlay and existing asphalt as indicated on the Drawings.
- C. Apply slurry seal coat at the rate of 8 to 12 pounds of dry aggregate per square yard.
- D. Apply slurry seal per Caltrans Standard Specification Section 37.

**3.05 Asphalt Concrete Overlay (if required and if indicated on the drawings)**

- A. Provide asphalt concrete overlay in areas indicated on the Drawings.
- B. Repair or replace existing asphalt concrete pavement surfaces damaged or removed by construction activities prior to overlay.
- C. Milling of the existing asphalt pavement is required to provide a smooth transition where overlay meets existing pavement surfaces.
- D. Contractor shall be responsible for raising all manholes, valve boxes or any at grade structure to remain to match new final grade of asphalt overlay.
- E. Install pavement reinforcing fabric on existing pavement to receive overlay. Installation of fabric, binder/tack coat and overlay shall be per Caltrans Standard Specification Section 39.
- F. Asphalt concrete overlay thickness shall be a minimum of 2 inches or as shown on the Drawings.

**3.06 Asphalt Pavement Installation**

- A. Placing materials in a windrow, then picking it up and placing it in the asphalt paver with loading equipment will be permitted provided that:
  - 1. The asphalt paver is of such design that the material will fall into a hopper which has a movable bottom conveyor to feed and screed.
  - 2. The loader is constructed and operated so that substantially all of the material deposited into windrows is picked up and deposited into the paving machine.
  - 3. The windrow is deposited only so far in advance of the paver to provide for continuous operation of the paver and not so far as to allow the temperature of the asphalt pavement in the windrow to fall below 260 degrees Fahrenheit.
- B. Unless lower temperatures are directed by the Engineer, asphalt concrete shall be spread, and the first coverage of initial or breakdown compaction shall be performed when the temperature of the mixture is not less than 250 degrees Fahrenheit, and all breakdown compaction shall be completed before the temperature of the mixture drops below 205 degrees Fahrenheit.
- C. Asphalt pavement shall be spread and compacted in the number of layers and of the thicknesses indicated in the following table:
  - 1. A thickness tolerance of within 0.1 inches is allowed for asphalt concrete.
  - 2. A total thickness tolerance of within 0.2 inches is allowed for asphalt concrete base.

Total Thickness Indicated on Drawings <sup>a</sup>	Number of Lifts	Top Layer Thickness		Next Layer Thickness		All other Layer Thicknesses	
		Min	Max	Min	Max	Min	Max
<2-3/4"	1	-	-	-	-	-	-
3"	2	1-1/4"	1-1/2"	1-1/4"	1-1/2"	-	-
3-1/4" - 4-3/4"	2	1-3/4"	2-1/4"	1-3/4"	2"	-	-
>5"	<sup>b</sup>	1-3/4"	2-1/4"	1-3/4"	2"	1-3/4"	4-3/4"

- 3. When pavement reinforcing fabric is shown to be placed between layers of asphalt pavement, the thickness of asphalt pavement above the pavement reinforcing fabric shall be considered to be the "Total Thickness Indicated on the Drawings" for the purpose of spreading and compacting the asphalt pavement above the pavement reinforcing fabric.

4. At least 2 layers shall be placed if the total thickness is less than 5 inches. At least 3 layers shall be placed if the total thickness is more than 5 inches, and less than 10-1/2 inches. At least 4 layers shall be placed if the total thickness is greater than 10-1/2 inches.
- D. A layer shall not be placed over another layer which exceeds 3 inches in compacted thickness until the temperature of the layer which exceeds 3 inches in compacted thickness is less than 160 degrees Fahrenheit at mid depth:
1. If the temperature of any layer drops below 140 degrees Fahrenheit, or if directed by the Engineer, apply tack coat before placing next layer.
- E. Unless otherwise indicated on the Drawings, asphalt mixtures shall not be handled, spread, or windrowed in a manner that will stain the finished surface of any pavement or other improvements.
- F. The completed mixture shall be deposited on the prepared subgrade at a uniform quantity per linear foot, as necessary to provide the required compacted thickness without resorting to spotting, picking-up or otherwise shifting the mixture.
- G. Spreading:
1. All layers of asphalt pavement shall be spread with an asphalt paver and shall conform to Section 39-6.02 and all applicable referenced sections of the Caltrans Standard Specifications.
  2. At locations where the asphalt pavement is placed over areas inaccessible to spreading and rolling equipment, all layers of asphalt pavement shall be distributed directly out of the back of the dump truck and spread by hand:
    - a. Asphalt pavement spread by hand shall be compacted thoroughly to the required lines, grades, and cross-sections by means of pneumatic tampers, or by other methods that will produce the same degree of compaction as pneumatic tampers.
- H. Compaction:
1. Compaction of asphalt pavement shall conform to Section 39-6.03 and all applicable referenced sections of the Caltrans Standard Specifications.
  2. Minimum required density for each layer of asphalt pavement shall be 95 percent of that obtained in the laboratory in accordance with ASTM Test Method D 1561.
- I. Segregation shall be avoided and the surfacing shall be free of pockets of coarse or fine material. Asphalt pavement containing hardened lumps shall not be used:
1. In areas inaccessible to paving and compacting equipment where spreading is done by hand, minimize the amount of segregation.
- J. Location of longitudinal joints in the top layer will be determined by the Engineer and shall not adversely affect the quality of the finished product.
- K. At all locations, or as directed by the Engineer, the asphalt concrete shall be square and at least 1 inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.

### **3.07 Surface Tolerance**

- A. Finished grade shall not deviate more than 0.02 foot in elevation from the grade indicated in the drawings. Slopes shall not vary more than ¼ inch in 10 feet from the slopes shown in the drawings.

### **3.08 Traffic and Parking Lot Striping and Marking Paint Application (if required and if indicated on the drawings)**

- A. Apply in accordance with Caltrans Standard Specification Section 84.

### **3.09 Field Quality Control**

- A. The Contractor shall control the quality of Work and shall provide adequate testing to assure compliance with these Specifications:
  - 1. The type and size of the samples shall be suitable to determine conformance with stability, density, thickness and other specified requirements. Use an approved power saw or core drill for cutting samples. Furnish all tools, labor, and materials for cutting samples, testing, and replacing the pavement where samples were removed. Take a minimum of 1 sample for every 4,000 square feet of asphalt pavement placed.
- B. Contractor shall perform in-place density and compaction tests of the completed pavement in accordance with California Test Method Number 375, to determine compliance with the specified requirements. Submit test results to Engineer for approval.
- C. Cracks, settling of surface, improper drainage, improper compaction, and sloppy connection to previously laid surfaces will be construed as improper workmanship and will not be accepted.

**\*\* END OF SECTION \*\***

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## **SECTION 02630 STORM DRAINAGE**

### **PART 1 - GENERAL**

#### **1.01 Summary**

- A. This section provides specifications for the requirements of storm drainage facilities including, but not limited to, pipe, inlets, grouted cobble erosion control ditches and concrete collars.

#### **1.02 References**

- A. Storm Drainage Facilities shall conform with City of Folsom Standard Construction Specifications, Standard Detail Drawings and Design Standards.

#### **1.03 Submittals**

- A. Contractor shall submit product data showing that all paving materials conform to the requirements of this section, Caltrans Standard Specifications and applicable requirements set forth in the City of Folsom Standard Construction Specifications.
- B. Submittals shall be in accordance with Specification Section 01300 - Submittals.
- C. Contractor shall submit the following information for review and approval by the Engineer:
1. Mix Design;
  2. Shop Drawings;
  3. Product Data of proposed Materials:
    - a. Reinforced Concrete Pipe
    - b. Trash Rack and Hardware
    - c. Cobble
  4. Contractor shall submit copies of Quality Control testing laboratory reports verifying that the aggregate material conforms to the specified gradations or characteristics.
  5. Certificates of Compliance and Competence by the Contractor performing the work.

### **PART 2 - MATERIALS**

#### **2.01 Pipe**

- A. Reinforced concrete pipe for storm drain shall be designed and fabricated in accordance with the City of Folsom Standard Specifications, Section 7 Storm Water Drainage.

#### **2.02 Structures**

- A. Structures, including but not limited to, concrete collars and pipe inlets with trash racks for storm drain shall be designed and fabricated in accordance with the City of Folsom Standard Specifications, Section 7 Storm Water Drainage.

### **2.03 Cobble Lined Erosion Control Ditch**

- A. Cobble Lined Ditch for erosion control shall be designed and constructed in accordance with the City of Folsom Standard Specifications, Section 7 Storm Water Drainage.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. Construction of storm drainage facilities shall be in accordance with the City of Folsom Standard Specifications, Section 7 Storm Water Drainage.

### **3.02 Flow Control**

- A. Contractor shall be responsible for bypassing storm water around the work without causing storm drains to surcharge. If rain is imminent, Contractor shall discontinue work, and shall provide temporary piping to assure continuous flow of storm water through the project site.

### **3.03 Testing**

- A. All storm drain pipes shall be television inspected in accordance with Section 01660

## **SECTION 02800 TRAFFIC CONTROL**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION**

- A. The Contractor shall furnish all labor, materials, equipment, tools, and services necessary to provide access to the motoring and pedestrian public; and adequately safeguard the workers and public from construction hazards with a minimum of inconvenience.
- B. Work includes but is not limited to the following:
1. Work described in the City of Folsom Standard Construction Specifications Sections.
  2. Preparation of Traffic Control Plans and obtaining approval of Traffic Control Plans from the County of Sacramento.
  3. Masking and restoring permanent signs and striping.
  4. Erections and removal of temporary construction signs.
  5. Installation and removal of temporary traffic control devices, including barriers, barricades, changeable message boards.
  6. Coordinating work with all agencies having jurisdiction.
- C. Nothing in these specifications shall be construed as relieving the Contractor from its responsibility as provided in General Provisions Section 10.06, PUBLIC SAFETY AND TRAFFIC CONTROL and Section 2.9, STREET CLOSURES, of the current version of the City of Folsom Standard Construction Specifications and Section 7-1.03, PUBLIC CONVENIENCE, and Section 7-1.04, PUBLIC SAFETY, of the State Standard Specifications.

#### **1.02 REFERENCE STANDARDS**

- A. The Contractor shall comply with guidelines excluding payment sections of the latest editions of the following reference standards:
1. Sacramento County Standard Construction Specifications, Section 12-3, Public Safety and Traffic Control, Section 12-4, Traffic Control Plans, and Section 6, Legal Relations and Responsibilities, Public convenience and Safety.
  2. California Manual of Uniform Traffic Control Devices.
  3. Caltrans Standard Specifications, May 2018.
  4. Caltrans Standard Plans, May 2018.
  5. CAL/OSHA, State of California Construction Safety Orders.
    - a. Section 1599, Traffic Control for Public Streets and Highways.
    - b. Section 1599, Flaggers
  6. OSHA, Code of Federal Regulations.
    - a. Title 19, Part 1926, Construction Safety Health Regulations
    - b. Title 29, Part 1910, Occupational Safety and Health Standards
- B. In case of conflict between the above reference standards and the specifications contained herein, these specifications shall take precedence and be used in lieu of such conflicting portions.

### **1.03 SUBMITTALS**

- A. The Contractor shall provide submittals in accordance with Section 01300, SUBMITTALS.
- B. The Contractor shall at minimum submit the following:
  - 1. Traffic Control Plans shall conform to Standard Specification Section 12-4.02, TRAFFIC CONTROL PLANS (TCP), and Section 6-10, PERMITS, AND LICENSES, AND CERTIFICATIONS, and be submitted for review and approval at least twenty-one (21) calendar days prior to work.
  - 2. Traffic Control Plans shall contain, but not be limited to, location, placement, duration, monitoring schedule and movement of all traffic control devices and bypass piping including, but not limited to, signs, signals, pedestrian and vehicle ramps, barricades, k-rails, and lighting.
- C. The Contractor shall submit traffic control plans for each phase of work within a City right-of-way or easements along with an Encroachment Permit. The Contractor will allow for a 15-day review period.

### **1.04 QUALITY ASSURANCE**

- A. Traffic Control Plans shall be prepared by a California licensed Civil or Traffic Engineer. The Traffic Engineer who prepared the Traffic Control Plans shall be available at any time during the life of the contract to modify the Traffic Control Plans if and as required by the agency having jurisdiction.
- B. No changes or deviations from the approved Traffic Control Plans shall be made, except temporary changes in emergency situations, with prior approval of the Traffic Engineer, the Resident Engineer, and all agencies having jurisdiction.
- C. Immediately notify the Traffic Engineer, the Resident Engineer, and the agencies having jurisdiction of occurrences that necessitate modification of the approved Traffic Control Plans.

### **1.05 TRAFFIC CONTROL**

- A. Nothing herein shall be construed to entitle the Contractor to the exclusive use of any public street, alleyway, or parking area during the performance of the work hereunder, and the Contractor shall conduct its operations so as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas.
- B. No streets or lane closures of any duration (temporary or permanent) shall occur without first obtaining permission of the Engineer and agency (or agencies) having jurisdiction.
- C. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise provided or shown. Toe boards shall be provided to retain excavated material if required by the Engineer or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the work shall be kept accessible to firefighting equipment at all times. Temporary provisions shall be made by the Contractor to assure the use of sidewalks and the proper functioning of all gutters, storm sewer inlets and other drainage facilities.
- D. For the protection of traffic in public or private streets and ways, the Contractor shall provide, place and maintain all necessary barricades, traffic cones, warning signs, lights and other safety devices in accordance with requirements of the agency having jurisdiction or the California Manual of Uniform Traffic Control Devices whichever is more strict.
- E. Contractor shall take all necessary precautions for the protection of the work and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be turned on

from sunset until sunrise. The Contractor shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdiction.

- F. No work will be allowed in public right-of-way until the Contractor obtains written approval of the proposed Traffic Control Plans from agencies having jurisdiction.

#### **1.06 STREET CLOSURE REQUIRED NOTIFICATION**

- A. When street closure is required or permitted for the construction of facilities on or under the street, the Contractor shall notify in writing, the occupants of all homes and businesses with access to that street of the proposed closure at least ten (10) Working Days prior to road closures and at least three (3) Working Days prior to disruption of ingress and egress.
- B. The notice provided to the residences or businesses shall include, at a minimum, schedule of closures and/or parking restrictions with estimated closure and/or parking restriction times, clure and/or parking restriction location, alternate route or detour, and name and twenty-four (24) hour phone number of a contact person employed by the Contractor.
- C. The Contractor shall be prepared to make access available at any time during the day to emergency type vehicles or pre-arrange alternative locations for non-emergency vehicles and operations. At a minimum the following agencies must be notified.
  - 1. Fire Department
  - 2. Police Department
  - 3. Sheriff Department
  - 4. County of Sacramento Department of Transportation
  - 5. Sacramento Regional Transit
  - 6. Emergency ambulance companies
  - 7. Folsom Cordova Unified School District
  - 8. Waste Management and Recycling
- D. These requirements are in addition to those of the City of Folsom General Provisions, Article 10.
- E. Unless otherwise specifically approved by the Engineer all street closures and/or parking restrictions shall be adequately restored to allow all marked lanes of traffic to be open on all major streets in each direction during the peak traffic hours of 7:00 a.m. to 8:00 a.m. and 3:30 p.m. to 6:00 p.m.
- F. During the first Friday after Thanksgiving and the last twenty-four (24) Calendar Days of December, the Contractor shall not close any traffic lanes on a major street except for an emergency and when the Contractor submits a written request two (2) Working Days in advance, and the Contractor receives written permission from the Engineer.
- G. If, for an emergency, the Contractor is required to close a lane on a major street during peak traffic hours or during the last twenty-four (24) of December, the Contractor shall immediately notify the City Construction Inspection office.

## **PART 2 - PRODUCTS**

### **2.01 TRAFFIC CONTROL DEVICES**

- A. All traffic control devices shall conform to the provisions in the California Manual of Traffic Control Devices and the agency having jurisdiction.
- B. Included, but not limited to, are flag units, construction signs, channelizing devices, barricades, delineators, and lighting devices.
- C. A high level warning device is required for use on major streets at the direction of the Engineering, when a lane is closed or work encroaches in a lane of traffic or when barricades are placed in a moving lane of traffic. A single barricade shall not be placed alone in the traveled way.
- D. Use of flashing arrow signs is required on major (four or more lanes) streets for lane closures during hours of darkness and for all lane closures lasting more than two (2) hours.
- E. All signs which are to convey their messages during darkness shall be reflectorized or illuminated.
- F. No signs or supports shall bear any commercial advertising.

## **PART 3 - EXECUTION**

### **3.01 ACCESS TO ADJACENT PROPERTIES**

- A. Provide and maintain access to adjacent properties at all times. The Contractor shall notify homeowners/occupants along the proposed construction route.

### **3.02 STREET OR PERMANENT LANE CLOSURE**

- A. If closure of any street is required during construction, a formal application for a street closure shall be made to the authority having jurisdiction at least thirty (30) calendar days prior to the required street or permanent lane closure for approval and to determine necessary sign and detour requirements.

### **3.03 TRAFFIC COORDINATION WITH OTHER CONTRACTORS**

- A. The Contractor shall coordinate the traffic routing work with that of other forces working in the same or adjacent areas.

### **3.04 CONSTRUCTION PARKING CONTROL**

- A. Curb parking shall be removed in accordance with the Traffic Control Plan. Removal of curb parking shall be minimized.
- B. The Contractor shall make arrangements directly with local authorities to keep the working area clear of parked vehicles.
- C. The Contractor may prohibit stopping in parking lanes where and when necessary in order to gain access to the work to provide the required traffic lanes in city streets and parking areas.
- D. The Contractor shall coordinate with the agency having jurisdiction and Sacramento County Sheriff for the location of "No Stopping" and "No Parking" signs.
- E. At least one (1) week in advance of construction, the Contractor shall furnish and place, where approved by the Sacramento County Sheriff and the Resident Engineer, portable "TOW AWAY – NO STOPPING" signs. The dates and times of parking removal shall be posted on the signs.
- F. The Contractor shall notify the policing agency having jurisdiction of all parking violators who require tow away from construction areas.

- G. Construction equipment not actively engaged in the work and employee vehicles shall not be parked in the vicinity of the work in such a manner as to further restrict or obstruct traffic flow. Vehicles and equipment in continuous or frequent use may be operated or parked in the same traffic lane as the work obstruction.

### **3.05 CONSTRUCTION SIGNAGE**

- A. All construction area signs shall conform to Section 10.06(F), Construction Signs, of the City of Folsom General Provisions.
- B. Sign spacing shall conform to the California Manual of Traffic Control Devices.
- C. Signs normally shall be installed 14 calendar days before work is to commence and must be removed immediately after work is complete. If at any time a sign is not required, it shall be covered or removed.
- D. The Contractor shall be responsible for the placement of advisory signs to inform the public of any street closure, detour, or construction affecting traffic at least 7 days before the closure or other significant disruption of normal traffic flow.
- E. Existing roadside signs conflicting with the construction area signs shall be either removed and reset upon completion of work or securely covered.

### **3.06 ILLUMINATION**

- A. Provide sufficient visibility on a 24-hour basis to approaching traffic whenever a street is closed partially or completely. Ensure that sufficient illumination is provided by means of portable flashing beacons, floodlights, or other similar devices. Mount all lighting fixtures in a manner which precludes glare to approaching traffic.
- B. Arrow boards or other traffic control devices and lighting which will operate outside of the normal working hours shall be battery-operated. The use of gas-fired generators during nonworking hours will not be allowed.

### **3.07 FLAGGING**

- A. Flaggers shall be required:
  - 1. When workers or equipment intermittently block a traffic lane
  - 2. When trucks or equipment enter or leave the work site from an adjacent traffic lane.
  - 3. Where Plans or permits allow the use of one lane for two directions of traffic.
  - 4. Wherever the safety of the public and/or workers determine there is a need.
- B. Flagging shall be carried out in accordance with California Manual of Uniform Traffic Control Devices. All flagging costs shall be considered as included in pay items for traffic control.

### **3.08 PEDESTRIAN SAFETY**

- A. The Contractor shall maintain safe and adequate pedestrian zones and public transportation stops as well as provide pedestrian crossings at intervals not to exceed 300 feet within the work zone.
- B. When the construction area crosses a crosswalk, the crosswalk shall be barricaded and signed accordingly.

### **3.09 TRAFFIC HANDLING AT SPECIFIC LOCATIONS**

- A. The Contractor shall maintain the full visibility and function of all school safety signing and striping within the work area. Additional temporary safety striping and signage shall be installed if deemed necessary by the agency having jurisdiction.

### **3.10 VEHICULAR AND PEDESTRIAN RAMPS**

- A. The Contractor shall provide and maintain ramps as shown on Plans or required by the Resident Engineer. Pedestrian ramps shall meet Americans with Disabilities Act requirements.

### **3.11 BARRICADING OPEN TRENCHES**

- A. Any excavation permitted by the City to be left open shall be barricaded with Type II or Type III barricades with flashers. Signs stating "OPEN TRENCH" shall be posted when requested by the City. All open excavated areas shall be barricaded with at least two (2) Type III barricades at the end of the excavation that faces oncoming traffic.
- B. Any excavation within four feet (4') of the traveled way, not protected by K-rail or a similar traffic control barrier approved by the City, shall be backfilled at the end of the work shift or plated in accordance with Section 10.06(G) "Temporary Bridging of Excavations and Trenches" of the City of Folsom General Provisions.

**\*\* END OF SECTION \*\***

## **SECTION 02820 CHAIN LINK FENCING**

### **PART 1 - GENERAL**

#### **1.01 Section Includes**

A. Chain link fencing, black vinyl coated, with top rail, and accessories.

#### **1.02 References**

A. The following documents are a part of this section insofar as they are specified and modified herein. In case of conflict between the requirements of this Section, and the following documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
City of Folsom	Standard Construction Specifications and Standard Drawings

#### **1.03 Submittals**

A. Shop drawings

1. Contractor shall submit the proposed fencing system layout indicating location of fencing materials.
2. Shop Drawings shall provide dimensions, details references, component finishes, location of applicable accessories, and required post foundations.
3. Contractor shall indicate construction installation methodology and explicitly indicate where required materials are to be installed.

B. Product data

1. Concrete mix-design,
2. Product data for all materials applicable to the proposed fencing system,
3. Manufacturer's catalog cuts indicating material compliance and specified options.

### **PART 2 - PRODUCTS**

#### **2.01 General**

A. All chain link materials shall conform to the most current version of City of Folsom Standard Drawings.

B. All metal parts for the chain link fencing shall be black vinyl coated.

#### **2.02 Manufacturers**

A. Approved Chain Link Manufacturer:

1. Master Halco
2. Or equal.

#### **2.03 Chain Link Fence Fabric**

A. Galvanized wire: Zinc coated Wire, ASTM A392 - 1.2oz/sf. Provide black vinyl coating on all metal fabric and parts.

- B. Size: Helically wound and woven to height of 6'-10" with 2-inch diamond mesh, 9 gauge, with a minimum tensile strength of 80,000 psi.
- C. Selvage of fabric shall be knuckled at top and bottom.

#### **2.04 Chain Link Fence Accessories**

- A. Chain link fence accessories [ASTM F626]: Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing. All metal parts shall be black vinyl coated.
- B. Post and Post Caps: 2" diameter posts. Formed steel weather-tight closure cap for tubular posts. Provide one cap for each post.
- C. Top rail and brace rail ends: Pressed steel per ASTM F626, for connection of rail and brace to terminal posts.
- D. Top rail sleeves: 7" expansion sleeve with spring, allowing for expansion and contraction of top rail.
- E. Wire ties: 9 gauge galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge for rails and braces. Hog ring ties of 12-1/2 gauge for attachment of fabric to tension wire.
- F. Brace and tension (stretcher bar) bands: Pressed steel.
- G. Tension (stretcher) bars: One piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section of 3/16" x 3/4" or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.
- H. Tension wire: Galvanized coated steel wire, 7 gauge, diameter wire with tensile strength of 75,000 psi.
- I. Truss rods & tightener: Steel rods with minimum diameter of 3/8". Capable of withstanding a tension of minimum 2,000 lbs. Adjustable tightness shall be by turnbuckle or equal having a 6" minimum uptake.
- J. Nuts and bolts are galvanized.

#### **2.05 Post Setting Materials**

- A. Concrete: See section 03310.

### **PART 3 - EXECUTION**

#### **3.01 Examination**

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Ensure property lines and legal boundaries of work are clearly established.

#### **3.02 Chain Link Fence Framing Installation**

- A. Install chain link fence in accordance with ASTM F567 and manufacturer's instructions.
- B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 15° or more.
- C. Space line posts uniformly at 8-feet maximum on center.
- D. Concrete set posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6" deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts

with heavy lateral loads. Set post bottom 36" below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post. Slope to direct water away from posts.

- E. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
- F. Bracing: Install horizontal pipe brace at mid-height for fences 6' and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.
- G. Tension wire: Provide tension wire at bottom of fabric. Install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12-1/2 gauge hog rings 16-inch on center.
- H. Top rail: Install lengths of 20' maximum. Connect joints with sleeves for rigid connections for expansion/contraction.

### **3.03 Chain Link Fabric Installation**

- A. Fabric: Install fabric on security side and attach so that fabric remains in tension after pulling force is released. Leave approximately 2-inch between finish grade and bottom selvage. Attach fabric with wire ties to line posts at 16-inch on center and to rails, braces, and tension wire at 16-inch on center.
- B. Tension (stretcher) bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 16-inch on center.

### **3.04 Chain Link Accessories**

- A. Tie wires: Bend ends of wire to minimize hazard to persons and clothing.
- B. Fasteners: Install nuts on side of fence opposite fabric side for added security.

### **3.05 Cleaning**

- A. Clean up debris and unused material and remove from the site.

**\*\* END OF SECTION \*\***

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**SECTION 02895**  
**SURVEY MONUMENT PERPETUATION AND REPLACEMENT**

**PART 1 - GENERAL**

**1.01 Section Includes**

- A. Survey Monument Perpetuation includes any monuments shown on the plans and/or found within the Project Limits subject to disturbance or destruction.
- B. Survey Monument Replacement including re-establishing/re-setting any survey monuments that are damaged or destroyed as a result of the Contractor's operation.

**1.02 References**

- A. Specifications of the Survey Monument Perpetuation and Replacement shall conform with City of Folsom Standard Construction Specifications, Standard Detail Drawings and Design Standards.
  - 1. New or replacement monuments shall be installed or constructed in accordance with City of Folsom Standard Detail Drawing RD-23.

**1.03 Requirements**

- A. Survey monumentation, markers and/or benchmarks (monuments) exist throughout the Project area.
- B. The Contractor shall be responsible for protecting and perpetuating monuments that may be affected by construction.
- C. The Contractor shall be responsible to arrange and pay for all surveys for the Project, including monuments.
- D. The Contractor shall arrange for a diligent, thorough search for survey monuments
  - 1. The search for survey monuments shall be performed by and under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice land surveying in accordance with Business and Professions Code Section 8771.
  - 2. The search for survey monuments shall occur prior to the beginning of construction work that could disturb or destroy a survey monument.
  - 3. Any monuments found shall be referenced and, if damaged or disturbed, reset by or under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice land surveying in accordance with Business and Professions Code Section 8771.
- E. A corner record or record of survey, as appropriate, shall be filed by the licensed land surveyor or civil engineer. Such points shall be referenced for use in replacement of monuments that are disturbed or removed during construction.

**1.04 Measurement and Payment**

- A. Measurement and Payment terms are provided in Section 01150 – Definition of Bid Items found elsewhere in these Specifications.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

## **SECTION 03100 CONCRETE FORMWORK**

### **PART 1 - GENERAL**

#### **1.01 Summary**

A. The work of this Section includes providing concrete formwork, bracing, shoring, and supports.

#### **1.02 References**

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

PS 1	U.S. Product Standard for Concrete Forms, Class I
ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 318	Building Code Requirements for Reinforcing Concrete
ACI 347	Recommended Practice for Concrete Formwork
Caltrans	2018 Caltrans Standard Specifications, Section 51

#### **1.03 Submittals**

A. The following shall be submitted in compliance with Section 01300 - Submittals:

1. Falsework Calculations and Drawings: The Contractor's attention is directed to the provisions of the California Division of Industrial Safety, Construction Safety Orders, which requires that all falsework or vertical shoring installations where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure, exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or provision for vehicular or railroad traffic through falsework or vertical shoring is made, shall be approved and signed by a civil engineer, registered in the State of California; provided further, that a copy of the falsework plan or shoring layout shall be available on the job site at all times.
2. Catalog information on:
  - a. Form ties and all related accessories, including taper tie plugs, if taper ties are used
  - b. Form gaskets
  - c. Form release ("bond breaker")

### **PART 2 - PRODUCTS**

#### **2.01 General**

- A. Materials for concrete forms and falsework shall be new or in new condition.
- B. Except as otherwise expressly accepted, all lumber brought on the job site for use as forms, shoring, or bracing shall be new material or in new condition. All forms shall be smooth surface forms except as specified on contract drawings.

#### **2.02 Form and Falsework Materials**

A. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:

1. All formwork materials shall conform to Section 51 of the Caltrans Standard Specifications and ACI Standard Recommended Practice for Concrete Formwork, ACI-347.
  2. Lumber shall be Douglas Fir or Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20.
  3. Plywood for concrete formwork shall be waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.
  4. Form materials shall be metal, wood, plywood, or other approved material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade shown.
  5. Unless otherwise indicated, all exterior corners in concrete members shall be provided with 3/4-inch or 5/8-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.
  6. All inside surfaces of the forms shall be thoroughly coated with an approved form sealer. The form sealer shall leave no film on the surface of the forms that can be absorbed by the concrete and shall be compatible with concrete paint.
- B. Materials for formwork hardware and reinforcing spacers:
1. All formwork hardware left inside the concrete shall have at least 2" clear cover.
  2. Concrete dobies are not permitted on the interior surface of fluid-containing structures.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. Tolerances: The variation from established grade or lines shall not exceed the tolerances of ACI 117.
- B. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The Contractor shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the work and replaced at the Contractor's expense. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.
- C. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly-placed concrete within 1/8" at exposed surfaces and 1/4" elsewhere.
- D. At exposed surfaces, plywood, grain, or other formwork irregularities shall not imprint concrete surface.

### **3.02 Form Design**

- A. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their

position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete.

- B. The forms shall be tight to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the Engineer. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03300 – Cast-in-Place Structural Concrete. The size, number, and location of such form windows shall be acceptable to the Engineer.
- C. Form windows are required for wall pour depths greater than 25 feet tall. At least one window shall be provided for each pour, but no less than one per 60 linear feet of horizontal wall length.
- D. Forming systems for walls taller than 14 feet or horizontal spans greater than 16 feet require a formal and site-specific design and submittal, stamped by a licensed civil engineer.
- E. Forms and falsework to support the roof and floor slabs shall be designed based on nationally recognized standards, but in no circumstance be less than the total dead load, plus a live load of 50 psf for horizontal surfaces, and a lateral load of 100 lbs per foot at top of forms.
- F. Lateral pressures used for form design shall conform to ACI 347-latest edition, but in no case be less than 60 lbs per cubic foot multiplied by the depth of the forms for continuous pours.

### **3.03 Construction**

- A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is shown. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is placed against trimmed ground in lieu of forms. Where soil slope or face cannot hold its shape during concrete operations, formwork shall be used.
- B. Construction Joints: Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete.
- C. Pipe stubs and anchor bolts shall be set in the forms where required.
- D. Form Ties
  - 1. Embedded Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar as indicated in Section 03300 – Cast-in-Place Structural Concrete. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1.5 inches back from the formed face or faces of the concrete.
  - 2. Removable Ties: The larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and

roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and below-grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls that are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a polymer-modified cement grout that shall match the color and texture of the surrounding wall surface.

3. Factor of safety = 2.0 against tensile failure

#### **3.04 Reuse of Forms**

- A. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces that are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the Engineer.

#### **3.05 Removal of Forms**

- A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 75 percent of the 28-day strength specified in Section 03300 – Cast-in-Place Structural Concrete; provided, that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained 75 percent of the specified 28-day strength and has been in place for a minimum of 7 days. The time required to establish said strength shall be as determined by test cylinder results from concrete used in the first pour. If the time so determined is more than the 7-day minimum, then that time shall be used as the minimum length of time. Forms for all vertical walls and columns shall remain in place at least 1 day after the concrete has been placed, provided that average air temperature is between 10 degrees F and 115 degrees F and concrete has sufficient strength to maintain form.
- B. Apply curing as required after form removal.

#### **3.06 Maintenance of Forms**

- A. Forms shall be cleaned, treated with a releasing agent, and maintained in accordance with ACI 347 and the following. Any excess lubricant shall be satisfactorily removed before placing the concrete. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

#### **3.07 Falsework**

- A. Falsework, including staging, walkways, forms, ladders, and similar appurtenances, shall be designed, engineered, constructed, and maintained according to the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction, and the requirements of the Construction Safety Orders of the California Division of Industrial Safety.

**\*\* END OF SECTION \*\***

## **SECTION 03200 REINFORCEMENT STEEL**

### **PART 1 - GENERAL**

#### **1.01 Summary**

A. The work of this Section includes providing all concrete reinforcement steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete and masonry construction, including all the wires, clips, supports, chairs, spacers, and other accessories.

#### **1.02 References**

ACI 117	Specification for Tolerances for Concrete Construction and Materials
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete
CRSI MSP-1	Concrete Reinforcing Steel Institute Manual of Standard Practice
WRI	Manual of Standard Practice for Welded Wire Fabric
AWS D1.4	Structural Welding Code - Reinforcing Steel
ASTM A82	Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM A185	Specification for Welded Steel Wire Fabric For Concrete Reinforcement
ASTM A615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
ASTM A775	Specification for Epoxy-Coated Reinforcing Steel Bars
Caltrans	Caltrans Standard Specifications Section 52

#### **1.03 Submittals**

A. The following shall be submitted in accordance with Section 01300 - Submittals:

1. Reinforcing Shop Drawings
  - 1) Bill of Materials
  - 2) Placing Drawing
  - 3) Splices
  - 4) Mechanical Splices
  - 5) Shop Bending Diagrams
  - 6) Embeds
  - 7) Anchor Bolts
  - 8) Sleeves
  - 9) Gates
  - 10) Conduits
  - 11) Dowels

2. General contractor shall coordinate all of the various discipline and subcontractor submittal prior to submitting for review by the engineer of record.
  3. Mill certificates for all reinforcing at time of site delivery
  4. Proof of CRSI membership, or equivalent trade membership
- B. Details of the concrete reinforcement steel and concrete inserts shall be submitted by the Contractor at the earliest possible date. Details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements indicated. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall include bar placement diagrams that clearly indicate the dimensions of each bar splice.
- C. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, manufacturer's literature shall be submitted which contains instructions and recommendations for installation for each type of coupler used; furnish current research reports by ICC.
- D. If reinforcement steel is spliced by welding at any location, the Contractor shall use ASTM A706 reinforcing. All welding shall comply with AWS D1.4. The Contractor shall submit a written welding procedure ("WPS") for each type of weld for each size of bar which is to be spliced by welding.

#### **1.04 Storage**

- A. Reinforcing, embeds and accessories shall be kept clean and free from dirt or grease.

## **PART 2 - PRODUCTS**

### **2.01 Reinforcement Steel**

- A. Reinforcement steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:
1. All reinforcement steel shall conform to Caltrans Section 52 and these additional requirements.
  2. Bar reinforcement shall conform to the requirements of ASTM A615 or A706 for Grade 60 Billet Steel Reinforcement.
  3. Welded wire fabric reinforcement shall conform to the requirements of ASTM A1064 and as indicated; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.
- B. Accessories
1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating. Plastic shall be gray in color.
  2. Wire for tying reinforcement shall be 18 gauge or heavier, black annealed.
  3. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located, and be used for horizontal bars at grade only. Wire ties shall be embedded in concrete block bar supports. Concrete blocks shall not be used on the inside face of hydraulic structures.

4. Epoxy coating for reinforcing and accessories, where specified or shown, shall conform to ASTM A775.

## **2.02 Mechanical Couplers**

- A. Mechanical couplers shall be provided where shown and where approved. The couplers shall be Type 2, as determined by ACI 318.
- B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied. This shall apply to all mechanical splices, including those splices intended for future connections.
- C. Approved couplers are Bar-Lock (Dayton) or Xtender (HRC) or equal.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. All reinforcement steel, welded wire fabric and other reinforcement shall be free of materials deleterious to bond. Minor rust that is not scaling or loose is acceptable.

### **3.02 Fabrication**

- A. Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as indicated. Bars shall be bent cold.
- B. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the fabricating tolerances defined in ACI 315.

### **3.03 Placing**

- A. Reinforcement steel shall be accurately positioned and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers that are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties that are embedded in the blocks. For concrete over formwork, the Contractor shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.
- B. Limitations on the use of bar support materials shall be as follows.
  1. Concrete Dobies: permitted at all locations except where architectural finish is required, or at interior side of fluid-containing wall.
  2. Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.
  3. Plastic Bar Supports: permitted at all locations except on grade.
- C. Minimum concrete coverage for steel reinforcement:

<u>Concrete exposure</u>	<u>Min Reinforcing Steel Cover (inches)</u>
Cast against and exposed to soil	3
Exposed to weather or water	2
All other applications	1 ½

- D. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
- E. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in ACI 318 and ACI 117.
- F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to the approval of the Engineer.
- G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30 inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane indicated.
- H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction.
- I. Epoxy coated reinforcing bars shall be stored, transported, and placed in such a manner as to avoid chipping of the epoxy coating. Non-abrasive slings made of nylon and similar materials shall be used. Specially coated bar supports shall be used. All chips or cracks in the epoxy coating shall be repaired with a compatible epoxy repair material prior to placing concrete.
- J. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.
- K. Tack welding of reinforcing bar is prohibited.

### **3.04 Splicing**

- A. General: Reinforcement bar splices shall only be used at locations indicated. When it is necessary to splice reinforcement at points other than where shown, locations and details shall be included on shop drawings.
- B. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner that will injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold, unless otherwise permitted by the Engineer. Bars partially embedded in concrete may be field-bent one time at an angle up to 30 degrees, and bent back to its original position. Rebending more than once will render the bar unacceptable. Unless Plans show otherwise, allow at least 40 bar diameters overlap on splices for deformed bars.
- C. Couplers that are located at a joint face shall be a type that can be set either flush or recessed from the face as shown. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. Couplers intended for future connections shall be recessed a minimum of 1/2 inch from the concrete surface. After the concrete is placed, the coupler shall be plugged with plastic plugs that have an O-ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged. Maintain minimum edge distance and concrete cover. Couplers shall be installed as required by manufacturer.

### **3.05 Cleaning and Protecting**

- A. Reinforcement steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it. Mild non-flaking surface rust is acceptable.
- B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be reinspected and, if necessary recleaned.

### **3.06 Inspection**

- A. Testing Agency shall be provided at least 24 hours advance notice to schedule inspections as required by the contract drawings and building code.

**\*\* END OF SECTION \*\***

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## **SECTION 03280 JOINTS IN CONCRETE PAVEMENT**

### **PART 1 - GENERAL**

#### **1.01 Description**

- A. The work of this Section includes providing expansion joints, contact joints, and shrinkage contraction (weakened plane) joints in concrete pavement, sidewalk, curb and gutter.
- B. Work shall be performed in accordance with the City of Folsom Standard Construction Specifications for requirements not listed herein.

#### **1.02 References**

ASTM D1751	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D994	Preformed Expansion Joint Filler for Concrete (Bituminous Type)

#### **1.03 Submittals**

- A. The following shall be submitted in compliance with Section 01300 - Submittals:
  - 1. Placement shop drawings indicating the location and type of all concrete joints
  - 2. Provide a list of the Contractor's proposed Joint forming and hand tool equipment
  - 3. Catalog cuts and samples of the preformed expansion joint filler material including complete product data

### **PART 2 - PRODUCTS**

#### **2.01 Pre-molded Joint Filler**

- A. Pre-molded joint filler shall be either Preformed Expansion Joint Filler (ASTM D994) or Non-extruding and Resilient Filler (ASTM D1751).

### **PART 3 - EXECUTION**

#### **3.01 Construction Joints**

- A. Before placing new concrete on or against set concrete, thoroughly roughen existing concrete surfaces and remove laitance, foreign matter and loose particles by sand blasting or wire brushing to the satisfaction of the Owner.

#### **3.02 Expansion Joints**

- A. Expansion joints in concrete pavement shall be constructed in accordance with the joint configuration as indicated on the contract drawings or as directed by the Engineer.
  - 1. Expansion Joint Filler shall be installed in strict accordance with the manufacturer's installation requirements.
  - 2. Expansion Joint Filler Thickness: Min. 1/2 inch; Max. 3/4 inch
  - 3. After concrete has been finished, a tooled edge shall be formed on each side of the expansion joint.

4. Clean all concrete from the expansion joint filler.
5. Seal all new expansion joints with an approved Expansion Joint Sealant:
  - a. Install in strict accordance with the Manufacturer's required installation procedures.
  - b. In the event of a premature delamination or failure of the sealant application, the Contractor shall consult with the manufacturer's field representative or third party expert to determine the cause of the failure.
  - c. The Contractor will not be compensated for any sealant re-applications determined to be a misapplication or discrepancy between the Manufacturer's required installation procedures and the installation methods utilized by the Contractor.
  - d. Seal all horizontal expansion joints with a Self-leveling Polyurethane Elastomeric Sealant
    - 1) Sealant Manufacturers: Sikaflex 2C SL (Color: Limestone) or Approved Equal
  - e. Seal all vertical expansion joints with a Non-Sag Polyurethane Elastomeric Sealant
    - 1) Sealant Manufacturers: Sikaflex 2C NS (Color: Limestone) or Approved Equal

### **3.03 Shrinkage Control Joints (Weakened Plane Joints)**

- A. Shrinkage control joints in concrete pavement shall be a tooled or sawcut joint and comply with the configuration of the joint as indicated on the drawings.

**\*\* END OF SECTION \*\***

## **SECTION 03300 CAST-IN-PLACE STRUCTURAL CONCRETE**

### **PART 1 - GENERAL**

#### **1.01 Summary**

##### A. Section Includes

1. Cast-in-place structural reinforced concrete
2. Concrete accessories

#### **1.02 References**

##### A. American Concrete Institute (ACI)

- |         |   |
|---------|---|
| ACI 117 | Standard Tolerances for Concrete Construction and Materials     |
| ACI 301 | Specifications for Structural Concrete for Buildings            |
| ACI 304 | Guide for Measuring, Mixing, Transporting, and Placing Concrete |
| ACI 305 | Hot Weather Concreting  |
| ACI 306 | Cold Weather Concreting   |
| ACI 308 | Guide to Curing Concrete  |
| ACI 309 | Consolidation of Concrete                                       |
| ACI 318 | Building Code Requirements for Structural Concrete              |
| ACI 350 | Environmental Engineering Concrete Structures                   |

##### B. American Society for Testing and Materials (ASTM)

- |           |  |
|-----------|--|
| ASTM C31  | Practices for Making and Curing Concrete Test Specimens in the Field                             |
| ASTM C33  | Specification for Concrete Aggregates  |
| ASTM C39  | Test Method for Compressive Strength of Cylindrical Concrete Specimens                           |
| ASTM C94  | Specification for Ready-Mixed Concrete   |
| ASTM C143 | Test Method for Slump of Portland Cement Concrete  |
| ASTM C150 | Specification for Portland Cement  |
| ASTM C157 | Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete                   |
| ASTM C172 | Standard Method of Sampling Freshly Mixed Concrete   |
| ASTM C192 | Method of Making and Curing Concrete Test Specimens in the Laboratory                            |
| ASTM C260 | Specification for Air-Entraining Admixtures for Concrete   |
| ASTM C289 | Test Method For Potential Reactivity of Aggregates (Chemical Method)                             |
| ASTM C309 | Specifications for Liquid Membrane-Forming Compounds for Curing Concrete                         |
| ASTM C494 | Specification for Chemical Admixtures for Concrete   |
| ASTM C618 | Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete |

ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates  
for use in Construction & Criteria for Laboratory Evaluation

- C. Caltrans Standard Specifications, 2018
- D. City of Folsom Standard Construction Specifications

### 1.03 Definitions

- A. "Cold Weather" is defined as a period when, for more than 3 consecutive days, the following conditions exist:
  - 1. Average daily air temperature is less than 40 F degrees (5 C) and
  - 2. Air temperature is not greater than 50 F degrees (10 C) for more than one-half of any 24-hour period.
- B. "Hot weather" is defined by any one of the following conditions:
  - 1. Ambient air temperature above 90 F degrees (32 C).
- C. "Mass Concrete" refers to single pour cast-in-place concrete that is greater than 2'-10" thick, or is 2'-6" thick or greater, with an area larger than 500 square feet.

### 1.04 Submittals

- A. The following shall be submitted in compliance with Section 01300 - Submittals:
- B. General:
  - 1. All submittals must be provided for Engineer of Record approval at least 3 weeks prior to construction.
  - 2. Contractor's proposed concrete placement materials and methodologies must be consistent with requirements stated in Specification Sections:
    - a. 03100 – Concrete Formwork
    - b. 03200 – Reinforcement Steel
- C. Submit concrete mix design for each concrete type per ACI 301:
  - 1. Mix design proportions indicating design strength and testing standards
  - 2. Concrete materials product data and 3<sup>rd</sup> party testing documentation
  - 3. Admixture product information
  - 4. Water test results
  - 5. Waterstop samples for hydraulic structures
- D. Contractor shall also submit the following:
  - 1. Shrinkage test results from prior test mixes per ASTM C157 for hydraulic structures.
  - 2. Concrete Curing methods and applicable product data per ACI 301.
  - 3. Repair procedures for concrete repair per ACI 224.1 and ACI 301.
- E. Contractor's proposed procedures for Hot Weather Concreting, Cold Weather Concreting, and Mass Concrete Placement.
- F. Contractor's proposed repair strategies for defects, honeycombing, and cracking.

## **1.05 Quality Assurance**

- A. Qualifications: All foremen supervising construction shall have a minimum of 3 years experience in similar work, and at least 3 previous projects of similar type, and shall be familiar with ACI 301.
- B. Field Testing
  - 1. Daily inspection written reports shall be provided to the Owner's Representative and engineer of record providing detailed information of work completed within 24 hours.
  - 2. During concrete placement, the following duties shall be performed by the Inspector:
    - a. Ambient air temperature test
    - b. Concrete temperature test
    - c. Concrete slump test
    - d. Collection of samples for lab testing
    - e. Confirm accuracy of batch ticket
  - 3. Pre-pour conference: after submittals have been provided and before construction has been commenced, a concrete conference shall be coordinated between the Inspector, Engineer of Record, and Contractor.
- C. Lab Testing
  - 1. Compression testing per ACI 318 chapter 5.
  - 2. Shrinkage testing per ASTM C157 for hydraulic structures.
    - a. One shrinkage test is required for the first batch of concrete, and every 500 cubic yards of fresh concrete thereafter.
    - b. Acceptance criteria is 0.035% (0.00035) shrinkage at 28 days.

## **1.06 Project Conditions**

- A. Soil subgrade
  - 1. Prior to setting reinforcing and pouring concrete on soil, the geotechnical engineer of record shall approve of the soil.
- B. Environmental Requirements:
  - 1. Concrete placement shall be limited to temperature ranges per ACI 301.
  - 2. Concrete placement shall be limited to weather conditions per ACI 301.
- C. Wet weather construction. Between the months of October and April, the contractor shall provide a 2" thick minimum mud-mat and sump pit at the bottom of foundation excavations that will be open for more than 72 hours prior to structural concrete placement. In all cases, where rainwater has saturated the bottom of foundation excavation grade prior to structural concrete placement, the grade shall be recompacted prior to concrete placement.

## **PART 2 - PRODUCTS**

### **2.01 General**

- A. Except as noted below, all products and materials used in proportioning, mixing, transport, placement, consolidation, curing, and repair shall satisfy Caltrans General Specifications-Section 51, City of Folsom Standard Construction Specifications, ACI 301, and the Construction Drawings.

## **2.02 Materials**

### **A. Concrete materials**

1. Aggregate per ACI 301
2. Cementitious materials per ACI 301
  - a. Cement shall be Portland cement.
  - b. Fly ash shall be provided at 15% minimum, 25% maximum of cementitious materials.
3. Admixtures
  - a. Admixtures volumes per cubic yard of concrete shall be clearly stated on the concrete mix design. Admixtures shall only be used at the discretion of the Engineer in accordance with the Approved quantities. Contractor may propose the utilization of admixtures as necessary to meet the concrete design and workability requirements.
  - b. Concrete mix designed for hydraulic structures require shrinkage-reducing admixtures.
    - 1) Shrinkage Reducing Admixtures shall be Eclipse 4500 by W.R. Grace & Co or Approved Equal.

### **B. Water shall be potable, and have the following limitations:**

1. Chlorides (as Cl) no more than 250 mg/L per EPA method 300.
2. Sulfates (as SO<sub>4</sub>) no more than 250 mg/L per EPA method 300.
3. Total dissolved solids no more than 500 mg/L per EPA method 160.
4. Water quality shall be analyzed by EPA methods. Test results shall be provided to the Engineer of Record for the first batch of concrete, and every 500 cubic yards of fresh concrete thereafter.

### **C. Concrete Curing compounds shall be in accordance with ACI 301.**

### **D. Miscellaneous Materials**

1. Waterstops shall be 6" tall PVC, with flat ribbed construction.
  - a. Manufacturers:
    - 1) Sika Corporation – Greenstreak Waterstop system or Approved Equal.
2. Plugs for formwork wall tie holes shall be Dayton Sureplug A-58 or Approved Equal.
3. For formwork ties that are left in place, provide plastic cone spacers for 1.5 inch breakback.

## **2.03 Equipment**

1. Equipment shall conform to ACI 301.

## **PART 3 - EXECUTION**

### **3.01 Preparation**

- A. Construction shall not be commenced until the applicable submittals have been approved by the Engineer of Record, and the Inspector has been scheduled.
- B. Reinforcing, embedded items, sleeves, and inserts shall be set and secured prior to fresh concrete placement. Interconnect anchor bolt groups with steel templates.

C. Construction Joints:

1. Construction joints shall be water-blasted prior to casting fresh concrete against existing concrete.
2. New concrete shall not be placed adjacent to existing concrete younger than 3 days old for hydraulic structures; 2 days otherwise.

D. Bonding agent shall not be used except where specially required on the Construction Drawings.

E. Formwork temperature is verified per ACI 301.

F. Subgrade or hardened concrete to be cast against conforms to ACI 301.

### 3.02 Installation

A. General:

1. For Cold weather climate concrete applications/construction, work at any location shall be in accordance with the methods and materials indicated in the Caltrans Standard Specifications.

B. Placement of fresh concrete in forms per ACI 301.

C. Placement of fresh concrete on soil per ACI 301.

D. Placement of fresh concrete shall be limited to weather constraints per ACI 301.

E. Depositing fresh concrete per ACI 301 with the following requirements:

1. For hot weather conditions, maximum time from batching to discharge shall not exceed 45 minutes unless otherwise Approved by the Structural Engineer of Record.
2. For normal weather conditions, maximum time from batching to discharge shall not exceed 60 minutes unless otherwise Approved by the Structural Engineer of Record.
3. Time between lift placement shall not exceed 30 minutes for hot weather placement; 60 minutes otherwise unless otherwise Approved by the Structural Engineer of Record.

F. Consolidate fresh concrete per ACI 301.

G. Construction joints: Contractor shall not move construction joints from locations shown on Construction Drawings without approval by Structural Engineer of Record.

H. Finishing formed surfaces

1. Exposed edges shall have 1 inch chamfers for all vertical and horizontal finished edges, except slabs on grade which shall receive a 0.75-inch rounded corner on all horizontal corners.
2. Filling Tie Holes:
  - a. No sooner than 14 days after formwork removal, clean and roughen the entire tie hole, and cone taper zone where exists, using an aggressive wire brush.
  - b. Use Dayton Sure Plug A-58 to plug round tie holes on both wall faces.
  - c. Recess plug back 1.0 inches deeper than face of wall or recess cone taper.
  - d. Use Sikatop 123 Plus mortar or approved equal to fill and patch hole.

I. Finishing Unformed Surfaces:

1. Fresh concrete placement per ACI 301.
2. Finishes definitions per ACI 301 with the following requirements:

- a. Broom finish coarseness shall not exceed 1/16 inch amplitude, and shall be applied perpendicular to the predominate slope of the finished concrete.
  - b. Scratch Finish may also be termed “Roughened Surface” on the Construction Drawings.
3. Finish schedule
- a. Scratch Finish shall be applied to:
    - 1) Construction joints.
    - 2) Surfaces intended to receive bonded cementitious mixtures.
  - b. Float Finish shall be applied to:
    - 1) Walks, drives, steps, ramps, and for surfaces intended to receive waterproofing, roofing, insulation, or tiling.
  - c. Trowel Finish shall be applied to:
    - 1) Floor intended as interior walking surfaces.
    - 2) Exterior walking surfaces with less than 2 percent slope.
  - d. Broom Finish shall be applied to:
    - 1) Exterior walking surfaces with more than 2 percent slope.
    - 2) Elevated slabs, overhangs, bridges where guard railing is required.

J. Curing shall conform to ACI 301 with the following additional requirements

- 1. Where a protective coating will be applied to the concrete after curing, liquid (“membrane”) curing compounds shall not be used.
- 2. Where a liquid curing compound is used, the compound shall be pigmented. Pigmentation shall be removable without special chemicals.

K. Tolerances per ACI 117.

### 3.03 Protection

A. Protection shall be per ACI 301.

### 3.04 Repair

A. Repair shall be per ACI 301 with the following requirements:

- 1. Patching mortar shall be Sikatop 123 Plus or approved equal.
- 2. Use Sikadur 32 HiMod bonding agent or approved equal.
- 3. Honeycombs and defects deeper than 38 mm (1.5 inches) shall require approval by Engineer of Record prior to commencing repair work.
- 4. Cracks wider than 0.5 mm (0.02 inches) for hydraulic structures shall be repaired prior to leak testing.
- 5. Cracks wider than 1 mm (0.04 inches) shall be repaired.

**\*\* END OF SECTION \*\***

**SECTION 03310  
CAST-IN-PLACE SITEWORK CONCRETE**

**PART 1 - GENERAL**

**1.01 Summary**

- A. The work of this Section includes providing finished cast-in-place concrete, sitework concrete, air placed concrete, including formwork, steel reinforcement, mixing, placing curing, and repairing.
- B. Sitework concrete includes curbs, gutters, catch basins, sidewalks, steps on grade, pavements, fence and guard post embedment, underground duct bank encasement, and all concrete work indicated to be sitework concrete.

**1.02 Reference**

<u>Reference</u>	<u>Title</u>
ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 301	Specifications for Structural Concrete for Buildings
ACI 318	Building Code Requirements for Structural Concrete
Caltrans	California Dept of Transportation Standard Specifications, latest edition

**1.03 Submittals**

- A. Submittals shall be made in compliance with Section 01300 – Submittals.
- B. Required submittals shall be provided in accordance with the requirements of Section 03300 – Cast-in-Place Structural Concrete.

**1.04 Quality Control**

- A. Tests on component materials, for the compressive strength of concrete, and for construction tolerances shall be performed in accordance with the requirements of 03300 - Cast-in-Place Structural Concrete.
- B. Inspection: Prior to casting concrete or setting reinforcing, the geotechnical engineer of record shall observe and approve the subgrade.

**PART 2 - PRODUCTS**

**2.01 Concrete Materials**

- A. Concrete component materials, including curing materials and joint materials shall be in accordance with Section 03300 – Cast-in-Place Structural Concrete, with the exception that all cast-in-place sitework concrete shall be as follows:
  - 1. Reinforced concrete pavement for vehicular traffic: Shall have developed a minimum compressive strength of 4,000 pounds per square inch at 28 days.
  - 2. All other sitework concrete: 5 sack (minimum) and shall have developed a minimum compressive strength of 2,500 pounds per square inch at 28 days.
- B. Abandoned formwork. Except where explicitly shown on the Contract Documents, formwork shall not be left in place.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. Proportioning and mixing, preparation of surfaces for concreting, handling, transporting and placing concrete, finishing and curing concrete surfaces and related procedures shall be performed in accordance with Section 03300 – Cast-in-Place Structural Concrete.
- B. Concrete shall not be cast in a line longer than 70 feet in a single day.
- C. Delays between adjacent pours shall be at least 48 hours.
- D. Sitework concrete cast against structural concrete shall be separated by building paper or other barrier to prevent bond, except as explicitly shown on the Drawings.
- E. For non-structural paving, no single placement shall exceed 200 square feet or 14 feet in any direction without a shrinkage contraction joint.

**\*\* END OF SECTION \*\***

# SECTION 03315 GROUT

## PART 1 - GENERAL

### 1.01 Summary

- A. The work of this Section includes providing grout other than that required for masonry work.
- B. The following types of grout are included in the work of this Section:
  - 1. Non-Shrink Grout: This type of grout shall be used wherever grout is required unless another type is specifically indicated.
  - 2. Cement Grout
  - 3. Epoxy Grout
  - 4. Topping Grout and Concrete Fill
- C. Except as otherwise indicated, the current versions of the following apply to the work of this Section:

<u>Reference</u>	<u>Title</u>
CRD-C 621	Corps of Engineers Specification for Non-shrink Grout
ASTM C109	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
ASTM C531	Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfacing
ASTM C579	Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacing
ASTM C827	Test Method for Early Volume Change of Cementitious Mixtures
ASTM D696	Test Method for Coefficient of Linear Thermal Expansion of Plastics

- D. The Contractor shall also utilize the City of Folsom Standard Construction Specifications Section 2.4 for construction requirements not listed herein.

### 1.02 Submittals

- A. The following shall be submitted in compliance with Section 01300 – Submittal Procedures:
  - 1. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of non-shrink and epoxy grouts proposed for use in the work.
  - 2. Certified test results verifying the compressive strength, shrinkage, and expansion properties.

### 1.03 Quality Control

- A. Field Tests
  - 1. When a project is used without documentation, compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the Engineer to insure continued compliance with these specifications.

2. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109. A set of three specimens will be made for testing at 7 days, 28 days, and each additional time period as appropriate.
  3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Owner's representative. A set of three specimens will be made for testing at 7 days, and each earlier time period as appropriate.
- B. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor shall assist the Owner's representative in obtaining specimens for testing. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens.

## **PART 2 - PRODUCTS**

### **2.01 Cement Grout**

- A. Cement grout mix design shall satisfy the same requirement as structural concrete, except that cement grout has no large aggregate requirement when the grout thickness is less than 3".

### **2.02 Prepackaged Grouts**

#### **A. Non-Shrink Grout**

1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout indicated herein shall be that recommended by the manufacturer for the particular application.
2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.
3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi and shall meet the requirements of CRD C 621.

#### **B. Application**

1. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout indicated herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.
2. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.

### **2.03 Topping Grout and Concrete Fill**

- A. Grout for topping of slabs and concrete fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement grout. All materials and procedures specified for concrete

in Section 03300 – Cast-in-Place Structural Concrete shall apply except as indicated otherwise herein.

- B. Topping grout and concrete fill shall contain a minimum of 564 pound of cement per cubic yard with a maximum water cement ratio of 0.45. Where concrete fill is thicker than 3 inches, structural concrete as indicated in Section 03300 – Cast-in-Place Structural Concrete may be used.
- C. Strength: Minimum compressive strength of topping grout and concrete fill at the end of 28 days shall be 4000 psi.

#### **2.04 Curing Materials**

- A. Curing materials shall be as indicated in Section 03300 – Cast-in-Place Structural Concrete for cement grout and as recommended by the manufacturer of prepackaged grouts.

#### **2.05 Consistency**

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.
- B. Unless otherwise noted on contract dwgs, grout for base plates and equipment leveling shall have flowable, semi-flowable, and packable viscosities. Flowable and semi-flowable consistencies requires formwork.

#### **2.06 Measurement of Ingredients**

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement is not an acceptable method of measurement.

### **PART 3 - EXECUTION**

#### **3.01 General**

- A. All surface preparation, curing, and protection of cement grout shall be as required. The finish of the grout surface shall be troweled smooth unless noted otherwise.
- B. Where pre-packaged product is used, the manufacturer's representative shall provide on-site technical assistance upon request.
- C. Base concrete or masonry must have attained its design strength before grout is placed. When bonding to an existing cementitious material is expected, waterblasting or sandblasting to roughen the substrate is required.

#### **3.02 Grouting Procedures**

- A. Base Plate Grouting
  1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a grout thickness not exceeding 2x the anchor bolt diameter.
  2. After the base plate has been set in position at the proper elevation double nutted on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout. The grout shall be placed so there a no voids between the bottom of the base plate and the concrete.

## B. Topping Grout

1. All mechanical, electrical, and finish work shall be completed prior to placement of topping or concrete fill. The base slab shall be given a roughened textured surface by sandblasting or waterblasting to ensure bonding to the base slab.
2. The minimum thickness of grout topping and concrete fill shall be one inch. Where the finished surface of concrete fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2-inches wide by 1-1/2-inches deep.
3. The base slab shall be thoroughly cleaned and wetted prior to placing topping and fill. No topping concrete shall be placed until the slab is complete free from standing pools or ponds of water. The topping and fill shall be compacted by rolling or tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping and fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

**\*\* END OF SECTION \*\***

## **SECTION 03400 PRECAST CONCRETE**

### **PART 1 - GENERAL**

#### **1.01 Summary**

- A. The Contractor shall provide and install all precast items as required including all appurtenances necessary to make a complete installation. Electrical precast pullboxes and vaults are excluded from this section.
- B. The Contractor shall also utilize the City of Folsom Standard Construction Specifications for construction requirements not listed herein.
- C. References
  - ACI 318 Building Code Requirements for Structural Concrete
  - ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary
  - ACPA Concrete Pipe Handbook
  - ACPA Design Manual
  - AWS D1.1 Structural Welding Code – Steel
  - AWS D1.4 Structural Welding Code – Reinforcing Steel
  - NPCA QC Manual Quality Control Manual for Precast Concrete Plants
  - PCI Design Handbook

#### **1.02 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 or drawings for at least 5 years.

#### **1.03 Submittals**

- A. The following items shall be submitted in compliance with Section 01300 - Submittals:
  - 1. Quality control procedures established by the precast manufacturer in accordance with the NPCA Quality Control Manual for Precast Concrete Plants.
  - 2. Shop Drawings
    - a. The drawings for precast concrete units shall be shop drawings furnished by the precast concrete producer for approval by the Engineer. These drawings shall demonstrate that the applicable industry design standards have been met. These drawings shall show complete design, exact dimensions, installation, and construction information in such detail as to enable the engineer of record to determine the adequacy of the proposed units for the intended purpose. Deviations from the primary construction documents shall be clouded. The precast concrete units shall be produced in accordance with the approved drawings.

### 3. Precast Concrete Unit Data

- a. The precast concrete producer shall supply data sheets showing conformance to project drawings and requirements and to applicable industry design standards listed in this specification. The precast concrete producer shall provide sufficient information as to demonstrate that such products will perform the intended task.

### 4. Anchorage, Lifting Inserts and Devices

- a. For anchors, lifting inserts and other devices, the precast concrete producer shall provide product data sheets and proper installation instructions upon request. The precast concrete unit dimensions and safe working load shall be clearly indicated.
- b. Steel anchors exposed to long term weather shall be protected by hot dip galvanization.

### 5. Accessory Items

- a. For items including, but not limited to sealants, gaskets, pipe entry connectors, 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.

## B. Design Data

1. The precast concrete producer shall supply precast concrete unit design calculations and concrete mix design proportions and appropriate mix design test data. Design calculations shall be signed by a licensed professional engineer.

## C. Test Reports

1. 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. 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, flexural strength, plastic or hardened air content, freeze-thaw durability, abrasion and absorption.
3. The precast concrete producer will supply copies of in-plant QA/QC inspection reports.

## D. Certificates

1. Submit quality control procedures established in accordance with NPCA Quality Control Manual for Precast Concrete Plants or verification of current NPCA Plant Certification.

## 1.04 Design

### A. Precast Concrete Unit Design

1. Design standard precast concrete units to withstand indicated design load conditions in accordance with applicable industry design standards ACI 318, ACI 350, ACPA Design Manual, PCI MNL-120, and AASHTO. 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. All calculations shall be prepared by a registered engineer.
2. Minimum design loading for soil: Lateral earth pressures, as defined by the Drawings, with not less than 2'-0" soil surcharge.

### B. Joints and Sealants

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

C. Durability and performance requirements

1. Concrete Compressive Strength

- a. Precast concrete units shall have a 28-day compressive strength (f'c) of 4,000 psi.

D. Water-Cement Ratio

1. Concrete shall have a water-cement ratio of 0.48 or less.

E. 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 %
3/8	4.5 to 7.5
1/2	4.0 to 7.0
3/4	3.5 to 6.5

**1.05 Quality Assurance**

- A. Precast concrete producer shall demonstrate adherence to the standards set forth in the NPCA Quality Control Manual for Precast Concrete Plants. The precast concrete producer shall be certified by the NPCA Plant Certification Program prior to and during production of the products for this project.

**1.06 Handling, Storage and Delivery**

- A. Handling: 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 shop drawings.
- B. Storage- precast concrete units shall be stored in a manner that will minimize potential damage.
- C. Delivery: Precast concrete units shall be delivered to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite all precast concrete units shall be inspected by the Engineer for quality and final acceptance.
- D. Acceptable crack dimensions: In addition to the criteria specified under ASTM 1433, the maximum crack length under service conditions is 1/64" wide x 2" long. Precast members with cracks wider and longer are subject to rejection and re-casting at Contractor's expense.

**PART 2 - PRODUCTS**

**2.01 Maintenance Holes and Manholes**

- A. Storm drain manholes shall comply with the requirements of the City of Folsom Standard Construction Specifications Section 7.6.
- B. Pre-cast Concrete Maintenance Hole and Manhole Sections: Standard maintenance holes shall be constructed of precast reinforced sections conforming to ASTM C478 and as shown. Pre-cast concrete rings, cones, and flat slabs shall be manufactured by a process that will produce a

dense, homogeneous concrete section of first quality. Cement used in all pre-cast sections shall conform to Type V except where noted otherwise.

- C. Joint Sealer: Shall meet all the requirements of Federal Specifications SS-S-00210 and shall be Ram-Nek by K.T. Snyder Company, Inc.; Kent-Seal by Hamilton-Kent, or equal.

## **2.02 Utility Boxes and Vaults**

- A. Design Loads: Design loads shall consist of live load, dead load, impact load, hydrostatic load, and other loads that may occur unless otherwise indicated on the drawings. Live loads shall be for H-20 per AASHTO Standard Specifications for Highway Bridges-latest edition.
- B. Floors: Unless otherwise indicated on the drawings, precast vaults shall have concrete floors.
- C. Forms: All forms used in placing concrete shall be sufficiently designed and braced to maintain alignment under pressures of concrete placement.
- D. Concrete
  - 1. Aggregates used in the concrete mix either coarse or fine, excluding light-weight aggregates, shall conform to specifications as outlined by ASTM C33.
  - 2. All light-weight aggregates, fine or coarse, shall conform to specifications as outlined by ASTM C330.
  - 3. Both types of aggregates shall be properly graded and free of any deleterious substances so as to produce a homogeneous concrete mix when blended with cement.
- E. Cement: The cement shall be Type II low alkali Portland Cement and shall meet ASTM C150 Type V.
- F. Compressive Strength: Sufficient cement content shall be used per batch so as to produce a minimum strength of 4,000 psi at 28 days or other strength by design when required.
- G. Placing: per ACI 301.
- H. Curing: Concrete while still in the forms may be steam cured after an initial set has taken place. Steam temperature shall not exceed 160°F, nor raised from normal ambient temperature at a rate exceeding 40°F per hour. Steam curing shall be considered complete after sufficient time has elapsed to produce adequate strength to withstand any structural strain that may be subjected during the form stripping operation. Additional curing may be applied by means of water spraying or membrane curing compound to reach the ultimate strength requirements.
- I. Reinforcing Steel: ASTM A615 grade 60 or A706.
- J. Preformed Joint Sealant: The joint sealing compound shall be Quik-Seal, a preformed, cold applied, ready to use plastic joint sealing compound as supplied by Quikset Utility Vaults, Santa Ana, California; Ram-Neck by K.T. Snyder Company; or approved equal.

## **PART 3 - EXECUTION**

### **3.01 Precast Concrete Maintenance Hole Sections**

- A. Precast concrete sections shall be set so as to be vertical, with sections in true alignment. The joint of the previously set section shall be covered with mortar or joint sealant before the next section is placed. Joints shall be waterproof.

### **3.02 Precast Concrete Utility Boxes and Vaults**

- A. Precast concrete utility boxes and vaults shall be installed in accordance with the manufacturer's recommendations, unless otherwise required by the drawings. All joints shall be sealed by the use of preformed sealant and mortar or non-shrink grout so as to be water tight.

### **3.03 Connections**

- A. Connections to manufactured, pre-cast items shall be made by casting sections of pipe into the items, using non-shrink grout as shown on the drawings, and/or using an approved resilient connector. All such connections shall be water-tight.

### **3.04 Soil backfill**

- A. Engineered soil backfilling operations next to precast concrete structures shall follow the same requirements as cast-in-place structures. Backfill soils shall be placed in lifts where the highest lift on one side of the structure is not more than 1'-0" higher than the lowest lift.

**\*\* END OF SECTION \*\***

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**SECTION 04232**  
**REINFORCED CONCRETE BLOCK MASONRY**

**PART 1 - GENERAL**

**1.01 Summary**

A. The work of this Section includes providing concrete masonry work complete, including reinforcing steel, embedded items, and all other appurtenant work.

**1.02 References**

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

<b><u>Reference</u></b>	<b><u>Title</u></b>
ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete Structures
ACI 530	Building Code Requirements for Concrete Masonry Structures
ACI 530.1	Specifications for Masonry Structures
ASTM A615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
ASTM C5	Specification for Quicklime for Structural Purposes
ASTM C55	Building Brick, Concrete
ASTM C90	Specification for Hollow Load-Bearing Concrete Masonry Units
ASTM C140	Method of Sampling and Testing Concrete Masonry Units
ASTM C144	Specification for Aggregate for Masonry Mortar
ASTM C145	Solid Load-Bearing Concrete Masonry Units
ASTM C150	Specification for Portland Cement
ASTM C207	Specification for Hydrated Lime for Masonry Purposes
ASTM C270	Specification for Mortar for Unit Masonry
ASTM C331	Specification for Lightweight Aggregates for Concrete Masonry Units
ASTM C404	Specification for Aggregates for Masonry Grout
ASTM C426	Test Method for Drying Shrinkage of Concrete Block
ASTM E476	Grout for Reinforced and Nonreinforced Unit Masonry
ASTM E447	Test Method for Compressive Strength of Masonry Prisms
Portland Cement Association	Concrete Masonry Handbook

**1.03 Submittals**

A. The following shall be submitted in compliance with Section 01300 – Submittals requirements:

1. Samples of concrete masonry unit colors with texture ranges as specified under Part 2 Products” shall be submitted to the construction manager for selection of color. Full size samples of the blocks selected shall be submitted for final approval by the Owner after color and texture selection. Samples of mortar colors shall be submitted for color selection by the Construction Manager.
2. Concrete masonry block unit material certificate, and documented conformance to ASTM C140 shall be submitted showing material compliance with these Specifications. The Construction Manager’s approval shall be obtained prior to delivery of concrete masonry units to the job site.
3. Mill Certificates: Steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel.
4. Drawings shall be submitted for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Bar schedules, diagrams of bend bars, stirrup spacing, lateral ties and other arrangements and assemblies shall be shown as required for fabrication and placement.
5. Mortar product information.
6. Ready-mix design for grout.
7. Test results of masonry prisms (where required).
8. Anchor, fastener, tie, and metal accessory hardware catalog and technical documentation.
9. Sealants for movement (“control”) joints.
10. Hot weather construction procedures.
11. Cold weather construction procedure.

#### **1.04 Quality Assurance**

##### **A. Testing of Mortar and Grout**

1. Contractor shall ensure that mortar mixing is consistent throughout the project. Where prism testing is required, mortar mixing method used for prism shall be utilized for production.

##### **B. Testing of Masonry Prisms**

1. The Owner will have masonry prisms tested where required by the contract drawings. Tests will be taken at the following times:
  - a. Prior to production, at least three masonry prisms shall be made for each type of block indicated herein; except separate prisms are not required for block which only varies by texture.
  - b. At any change in materials during construction, at least five masonry prisms shall be made for each type of block affected.
  - c. One set of at least three masonry prisms shall be made for each masonry structure, besides, and every 5,000 square feet of wall.

C. The prisms shall be constructed by the Contractor in the presence of the Owner’s Representative and approved inspector. The same personnel who are laying the block in the structure shall construct the masonry prisms.

D. The masonry prisms shall be constructed and will be constructed and tested per ASTM C 1314.

E. Compression tests will include three prisms tested at 28 days after grouting.

- F. The average compressive strength of prisms tested at 28 days shall exceed the value calculated by ASTM C 1314.
- G. If the compressive strength of the prisms fails to meet the requirements of the contract drawings, adjustments shall be made to the mix designs for the mortar, or grout, or both, as needed to produce the specified strength. The masonry units shall also be laboratory tested to verify compliance with the requirements of ASTM C 90, Grade N-1.
- H. If the compressive strength of the prisms, made during construction of the work and tested as indicated herein, fails to meet the requirement, prisms or cores shall be cut from the walls in sufficient numbers and in sufficient locations to adequately determine the strength of the walls. Those portions of the walls represented by specimens failing to meet the required compressive strength shall be subject to removal and replacement.

### **1.05 Product Delivery, Storage and Handling**

- A. Cement, lime, and other cementitious materials shall be delivered to the site and stored in dry, weather-tight sheds or enclosures, in unbroken bags, barrels, or other containers, plainly marked and labeled with the manufacturers' names and brands.
- B. Mortar and grout shall be stored and handled in a manner which will prevent the inclusion of foreign materials and damage by water or dampness.
- C. Masonry units shall be handled with care to avoid chipping and breakage, and shall be stored as directed in the Concrete Masonry Handbook. Materials stored on floors or slabs shall be stacked in such manner that the uniformly-distributed loading does not overload floor.
- D. Masonry materials shall be protected from contact with the earth and exposure to the weather and shall be kept dry and clean until used. Where daily temperature exceeds 90°F, fog spray newly constructed masonry until damp for first three days.

## **PART 2 - PRODUCTS**

### **2.01 Concrete Masonry Units**

- A. Concrete masonry units shall conform to ASTM C90, Type I, with maximum linear shrinkage of 0.065 percent from standard to oven-dried condition. Units shall be medium weight unless indicated otherwise.
- B. Concrete masonry units shall be 8-inch by 8-inch by 16-inch modular size standard units, with one end open or both ends open.
- C. All bond beam, corner, lintel, sill, and other specially shaped blocks shall be provided and used where required or necessary. Specially shaped non-standard blocks may be constructed by saw cutting.

### **2.02 Materials for Mortar and Grout**

- A. Materials for mortar and grout shall conform to the following requirements:
  - 1. Portland cement shall be Type II, low alkali, conforming to ASTM C150.
  - 2. Lime paste shall be made with pulverized quicklime, or with hydrated lime, which shall be allowed to soak not less than 72 hrs before use; except, that hydrated lime processed by the steam method shall be allowed to soak not less than 24 hrs and shall be made by adding the lime to the water. In lieu of hydrated lime paste for use in mortar, the hydrated lime may be added in the dry form. Hydrated lime shall be Type S, conforming to ASTM C207. Pulverized quicklime shall conform to ANSI/ASTM C5, shall pass a No. 20 sieve, and 90 percent shall pass a No. 50 sieve.

3. Sand shall conform to ASTM C 144. Coarse aggregate shall conform to ASTM C 404. Largest aggregate shall be 3/8 inches or less.
4. Water for mixing shall be clear potable water.
5. Reinforcing steel shall be per contract drawings.
6. Admixture for mortar shall not be detrimental to the bonding or help the process of efflorescence.
7. Ready-mix grout is preferred over site mix. Where grout is site-mixed, full time special inspection is required.

### **2.03 Manufacturers**

- A. Products shall be of the following manufacture and type (or equal):
  1. Admixture for Mortar
    - a. Master Builder's "Omicron Mortarproofing"
    - b. Sika Chemical Co. "Sika Red Label"
  2. Admixture for Grout
    - a. Sika Chemical Co. "Sika Grout Aid" Type II
    - b. Master Builder's "MasterPozzoloth 80" normal

## **PART 3 - EXECUTION**

### **3.01 General**

- A. Concrete masonry shall conform to the ACI 530.1.
- B. Concrete masonry units shall not be placed when air temperature is below 40 degrees F (4 degrees C) and shall be protected against direct exposure to the wind and sun when erected when the ambient air temperature exceeds 99 degrees F (37 degrees C) in the shade with relative humidity less than 50 percent.
- C. Concrete masonry shall conform to the following:
  1. Lay concrete masonry units cured, dry, and with surfaces cleaned.
  2. Lay masonry units true, plumb and level.
  3. Protect partially laid wall as well as units in storage from moisture.
- D. Tolerances for concrete masonry units shall conform to the following:
  1. Maximum variation from plumb in walls and corners:
    - a. 1/4-inch over 10 feet
  2. Maximum variation from level or indicated elevations:
    - a. 1/4-inch in any bay or 20 feet
    - b. 1/2-inch in 40 feet.
  3. Maximum variation from plan position indicated on the Drawings:
    - a. 1/2-inch maximum
- E. Measurements for mortar and grout shall be accurately made. Shovel measurements are not acceptable. Mortar proportions shall be accurately controlled and maintained.

### **3.02 Shoring and Bracing**

- A. All shoring and bracing shall be provided as required for the work. Shoring and bracing shall be constructed to required shapes and sizes, capable of supporting and sustaining the loads to which they will be subjected without failure or deflection. Shores and bracing shall be left in place until concrete masonry can safely carry all required live and dead loads.
- B. Concrete masonry walls shall be adequately braced to withstand all forces to which they will be subjected during construction.

### **3.03 Mortar**

- A. Mortar for concrete block masonry shall conform to ASTM C270.
- B. Mortar color shall match block color, except where specified differently on contract drawings.

### **3.04 Construction – General**

- A. All work shall be performed in accordance with the provisions of the applicable code for reinforced concrete hollow-unit masonry.
- B. The Contractor shall set or embed in his work all anchors, bolts, reglets, sleeves, conduits, and other items as required.
- C. All block cutting shall be by machine.
- D. Masonry units shall be supported off the ground and shall be covered to protect them from rain. Only clean, dry, uncracked units shall be incorporated into the work. Concrete masonry units shall not be wetted.
- E. All reinforcing steel shall be cleaned of all loose rust and scale, and all oil, dirt, paint, laitance, or other substances which may be detrimental to or reduce bonding of the steel and concrete.
- F. Immediately before starting work, the concrete upon which the masonry will be laid shall be cleaned with water under pressure.
- G. A full mortar joint for first course shall be provided.
- H. Units shall be shoved tightly against adjacent units to assure a good mortar bond.

### **3.05 Equipment**

- A. All equipment for mixing and transporting the mortar and grout shall be clean and free from set mortar, dirt, or other foreign matter.

### **3.06 Mixing**

- A. Mortar shall be mixed per ASTM C 270. Retempering shall be done on the mortar board by adding water within a basin formed within the mortar, and the mortar reworked into the water. Mortar which is not used within one hour shall be discarded.

### **3.07 Erection of Concrete Block Masonry**

- A. Masonry work shall be erected in-plane, plumb, level, straight, and true to dimensions shown and executed in accordance with acceptable practices of the trade.
- B. Concrete masonry units shall be laid with full-face shell mortar beds. Vertical head joints shall be solidly filled with mortar from face of unit to a distance behind the face equal to not less than the thickness of longitudinal face shells. Cross-webs of starting course courses shall be solidly bedded in mortar.

- C. Unless noted or shown otherwise, masonry shall be laid up in straight uniform courses with running bonds.
- D. All masonry shall be erected to preserve the unobstructed vertical continuity of the cells measuring not less than 3-inch by 3-inch in cross-section. Walls and cross webs shall be fully bedded in mortar. All head and end joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.
- E. Where horizontal reinforced beams are shown, special units shall be used or regular units shall be modified to allow for placement of continuous horizontal reinforcement bars. Small mesh expanded metal lath or wire screening shall be used in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or units shall be provided with solid bottoms.

### **3.08 Joints**

- A. Vertical and horizontal joints shall be uniform and approximately 3/8-inch wide. Joints shall be concave-tooled to a dense surface. Depth of rake shall be no deeper than 1/8-inch. Special care shall be used in tooling joints so as to match existing construction.

### **3.09 Cleanouts**

- A. Cleanout openings shall be provided at the bottoms of all cells to be filled at each lift or pour of grout, where such lift or pour is over 5 ft in height. Cleanout size shall be 3-inch minimum. Any overhanging mortar or other obstructions or debris shall be removed from the insides of such cell walls. The cleanouts shall be sealed before grouting and after inspection. Cleanout openings shall match the finished wall in exposed masonry.

### **3.10 Reinforcement**

- A. Reinforcement bars shall not be used with kinks or bends not shown on the drawings or final shop drawings, nor shall bars be used with reduced cross-section due to excessive rusting or other causes.
- B. Reinforcement shall be positioned accurately at the spacing indicated. Vertical bars shall be supported and secured against displacement. Horizontal reinforcement shall be placed as the masonry work progresses.
- C. Reinforcement bars shall be spliced where shown on contract drawings; bars shall not be spliced at other points except as submitted on the shop drawings. Laps may be contact or non-contact.
- D. Prefabricated horizontal joint reinforcement shall be embedded as required on contract drawings.
- E. Deep cut bond beam blocks shall be used where horizontal reinforcing steel is embedded.
- F. Knock-out openings shall have no steel or joint reinforcing running through the opening. Head, jambs, and sill blocks shall be used to provide an even finish surface to install the window unit when blocks are removed. Joints at head, jambs, and sills shall be stacked and continuous.

### **3.11 Grouting**

- A. All cells and bond beam spaces shall be filled solidly with grout unless indicated otherwise. Grouting shall not be started until the wall has cured for 24 hours. Grout heights poured per table 7 ACI 530.1.
- B. All grout shall be consolidated at time of pouring by puddling or vibrating. Where the grouting operation has been stopped for one hour or longer, horizontal construction joints shall be formed by stopping the grout pour 1-1/2 inches below the top of the uppermost unit.

### **3.12 Protection**

- A. Wall surfaces shall be protected from droppings of mortar or grout during construction.
- B. Masonry materials shall be protected from contact with the earth and exposure to the weather and shall be kept dry and clean until used.

### **3.13 Joint Sealant**

- A. All movement joints that have no mortar or deeply raked joints shall be sealed against moisture and provide at least 1/8" movement.

### **3.14 Finishing and Cleaning**

- A. Masonry shall not be wet-finished unless exposed to extreme hot weather or hot wind and then only by using a nozzle-regulated fog spray sufficient only to dampen the face but not of such quantity to cause water to flow down over the masonry.
- B. Finish masonry shall be cleaned and pointed in a manner satisfactory to the Construction Manager, based upon the standards established by the approved sample panel.
- C. All exposed to view interior and exterior colored masonry work shall be cleaned by light sandblasting to remove all stains and other imperfections.
- D. All exposed masonry surfaces of openings and window and door openings such as sills, heads, and jambs shall be finish block surfaces, not formed surfaces, unless indicated otherwise. Closed bottom bond beam blocks shall be used at heads and sills.

**\*\* END OF SECTION \*\***

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# SECTION 05500 METAL FABRICATIONS

## PART 1 - GENERAL

### 1.01 Summary

A. Miscellaneous metalwork includes the following:

1. Seat Angles, Supports and Brackets.
2. Gratings.
3. Floor and Cover Plates.
4. Concrete Stair Nosings
5. Aluminum Stairs.
6. Manhole Frames and Covers
7. Ladders

### 1.02 Codes

A. The work of this Section shall comply with the current edition of the California Building Code.

### 1.03 Specifications and Standards

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Federal Specifications:

- |                |                                    |
|----------------|------------------------------------|
| QQ-F-461 C (1) | Floor Plate, Steel, Rolled         |
| MIL-6-18015    | (Ships) Aluminum Planks, (6063-T6) |

2. Commercial Standards:

- |           |  |
|-----------|--|
| AA        | Specification M12-C22-A41 Aluminum Finishes  |
| AISC MO11 | Manual of Steel Constructions  |
| AWS       | American Welding Society Standards for Welding, Brazing, & Nondestructive Examination        |
| ASTM A36  | Specification for Structural Steel   |
| ASTM A48  | Specification for Gray Iron Castings   |
| ASTM A53  | Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless         |
| ASTM A123 | Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products              |
| ASTM A125 | Specification for Steel Springs, Helical, Heat Treated                                       |
| ASTM A153 | Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware                          |
| ASTM A283 | Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars |
| ASTM A307 | Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile                           |

ASTM A320	Specification for Alloy-Steel Bolting Materials for Low-Temperature Service
ASTM A489	Carbon Steel Eyebolts
ASTM A569	Specification for Steel, Carbon, (0.15 Maximum Percent) Hot Rolled, Sheet and Strip, Commercial Quality
ASTM A575	Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM B98	Specification for Copper-Silicon Alloy Rod, Bar, and Shapes
ASTM B210	Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
ASTM B221	Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
ASTM B438	Specification for Sintered Bronze Bearings (Oil-Impregnated)
ANSI/AWS D1.1	Structural Welding Code - Steel
NFPA 101	Life Safety Code
NAAMM 531	Metal Bar Grating Manual
NAAMM	Metal Stairs Manual
OSHA	Code of Federal Regulations Title 29, Part 1900-1990

#### **1.04 Shop Drawings and Samples**

- A. The following shall be submitted in compliance with General Conditions Section 1300 - Submittals:
1. Shop drawings:
    - a. Miscellaneous metalwork including seat angles, supports, brackets and guides,
    - b. Gratings and grating supports,
    - c. Metal stairs,
    - d. Ladders,
    - e. Manhole Frames and Covers.
  2. Product data:
    - a. Gratings and stair tread,
    - b. Stair nosings,
    - c. Manhole frames and covers,
    - d. Ladders.
  3. Samples
    - a. Guardrails with specified finishes.
  4. Quality control submittals:
    - a. Design data.
    - b. Test reports:

- 1) Guardrails: 3 copies of certified tests performed by an independent testing laboratory certifying that guardrails meet current State and Occupational Safety and Health Administration strength requirements.
- c. Gratings:
  - 1) Grating manufacturers' calculations showing that gratings will meet specified design load, stress, and deflection requirements for each size grating for each span.
  - 2) Reports of tests performed.
- d. Planks:
  - 1) Plank manufacturers' calculations showing that planks will meet specified load-bearing and deflection requirements for each size plank for each span.
  - 2) Reports of tests performed.

## **PART 2 - PRODUCTS**

### **2.01 Manufacturers**

- A. Products of the type or model (if any) indicated shall be manufactured by one of the following (or equal):
  1. Aluminum Grating:
    - a. Harsco Industrial IKG
    - b. McNichols Company
  2. Steel Gratings:
    - a. Harsco Industrial
    - b. McNichols Company
  3. Floor and Cover Plates:
    - a. Alcoa C-102 Aluminum Tread Plate
    - b. Reynolds Diamond Tread Plate
  4. Safety Stair Nosings:
    - a. Wooster Products, Incorporated Alumogrit, Type 101
    - b. American Abrasive Metals Company Alumalum, Style A
    - c. Safe-T-Metal Company Incorporated Style AX
  5. Manhole Frames and Covers
  6. Ladders

### **2.02 Materials**

- A. Materials: Except as otherwise indicated, products fabricated of structural steel shapes, plates and bars shall comply with the requirements of ASTM A 36 or ASTM A283.
- B. All metalwork, fasteners and fabricated supports or other structural steel exposed to potable water shall be of NSF-61 approved stainless steel for potable water service.
- C. Stainless Steel: Stainless steel metalwork and bolts shall be of Type 304 or 316 stainless steel for all corrosive environments.

## 2.03 Fabrication

### A. Corrosion Protection:

1. Miscellaneous steel metalwork shall be hot-dip galvanized after fabrication except as otherwise indicated.
2. Miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment shall be coated in accordance with Section 09900-Protective Coating Systems.

### B. Welding:

1. Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" and supplemented by other standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.
2. In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall comply with the AWS Code.
3. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

### C. Galvanizing:

1. Where galvanizing is indicated, structural steel plates, shapes, bars and fabricated assemblies shall be thoroughly cleaned of rust and scale and shall be galvanized in accordance with the requirements of ASTM A 123.
2. Any galvanized part that becomes warped during the galvanizing operation shall be straightened.
3. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.

## 2.04 Bolts

### A. Bolt Requirements: Bolts shall comply with the following:

1. The nuts shall be capable of developing the full strength of the bolts.
  - a. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads.
  - b. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
2. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 3 threads beyond the nut.

### B. Standard Service Bolts (Not Buried, Corrosive or Submerged):

1. Except where otherwise indicated, bolts and nuts shall be steel and shall be hot-dip galvanized after fabrication.
2. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing.
3. Except as otherwise indicated herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 307 Grade A or B, or threaded parts of ASTM A 36.

C. Buried, Corrosive or Submerged Bolts:

1. Unless otherwise indicated, bolts, anchor bolts, nuts and washers, which are buried, submerged, or below the top of the wall inside any hydraulic structure or as indicated on the Drawings shall be of Type 304 or 316 stainless steel.

D. Unless otherwise indicated, eyebolts shall conform to ASTM A 489.

## 2.05 Seat Angles, Supports and Brackets

A. Seat angles over slide gate guides shall be welded to the guides.

B. Seat angles for supports for floor plates, clips for precast panels and brackets for piping shall be steel, hot-dip galvanized after fabrication unless otherwise indicated.

C. For angles used in corrosive, below top of wall inside any hydraulic structure or submerged environments material shall be Type 304L or 316L stainless steel.

D. Seat angles for aluminum grating shall be aluminum unless otherwise noted.

E. Seat angles for steel grating shall be hot-dipped galvanized steel.

## 2.06 Metal Gratings

A. General:

1. Fabricate grating to cover areas indicated on the Drawings.
2. Unless otherwise indicated on the Drawings, grating over an opening shall cover entire opening.
3. Make cutouts in grating where required for equipment access or protrusion, including valve operators or stems, and gate frames.
4. Band ends of grating and edges of cutouts in grating:
  - a. End banding: 1/4 inch less than height of grating, with top of grating and top edge of banding flush.
  - b. Cutout banding: Full-height of grating.
  - c. Use banding of same material as grating.
  - d. Panel layout: Enable installation and subsequent removal of grating around protrusions or piping.
  - e. Openings 6 inches and larger: Lay out grating panels with edges of 2 adjacent panels located on centerline of opening.
  - f. Openings smaller than 6 inches: Locate opening at edge of single panel.
  - g. Where an area requires more than 1 grating section to cover area, clamp adjacent grating sections together at 1/4-points with fasteners acceptable to Engineer.
  - h. Fabricate grating in units of maximum 50 pounds each.
5. When requested by Engineer, test 1 section of each size grating for each span length involved on the job under full load:
  - a. Furnish a suitable dial gauge for measuring deflections.
6. Grating shall be aluminum, unless otherwise specified or indicated on the Drawings.

B. Aluminum grating:

1. Material for gratings, shelf angles, and rebates: 6061-T6 or 6063-T6 aluminum alloy, except cross bars may be 6063-T5 aluminum alloy.
2. Shelf angle concrete anchors: Type 304 or Type 316 stainless steel.
3. Grating rebate rod anchors: 6061-T6 or 6063-T6 aluminum alloy.
4. Bar size and spacing: As determined by manufacturer to enable grating to support design load.
5. Both bearing bars and cross bars shall be continuous.
6. Grating shall be serrated to produce a nonskid walking surface.
7. Openings shall be banded with bars having the same dimensions as the bearing bars.
  - a. Openings 6-inch and larger: layout opening centerline at edge of two adjacent grating sections.
  - b. Openings 6-inch and smaller: layout opening at edge of single grating section.
8. Perimeter edges shall be banded with bars flush at the top surface of the grating and 1/4 inch clear of the bottom surface.
  - a. Bars terminating against edge bars shall be welded to the edge bars when welded construction is used.
  - b. When crimped or swaged construction is used, bars at edges shall protrude a maximum of 1/16 inch and shall be peened or ground to a smooth surface.
9. No single piece of grating shall weigh more than 50 pounds unless otherwise indicated.
10. Rough weld beads and sharp metal edges on gratings and plates shall be ground smooth. Welds exposed to view shall be uniform and neat.
11. Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, holes shall be sub punched and reamed or shall be drilled.
12. Bearing bars shall be punched to receive the cross bars.
  - a. After insertion in the bearing bars, cross bars shall be deformed by a hydraulic press or similar means to permanently lock the bars into the bearing bar openings.
  - b. Fabrication methods employing bending or notching of bearing or cross bars will not be permitted.
  - c. Design live load: A minimum of 150 pounds per square foot uniform live load on entire grating area, but not less than the live load indicated on the Drawings for the area where grating is located.
  - d. Maximum fiber stress for design load: 12,000 pounds per square inch.
  - e. Maximum deflection due to design load: 1/360 of grating clear span.
  - f. Maximum spacing of main grating bars: 1-1/8 inches clear between bars.
  - g. Minimum grating height: 1-1/2 inches.

C. Aluminum grating planks:

1. Materials: Meet requirements previously specified for aluminum grating.

2. Fabrication:
    - a. Meet requirements previously specified for aluminum grating.
  3. Heavy duty.
  4. Unpunched surface with cross hatched anti-skid surface.
  5. Minimum weight of 4.8 pounds per square foot.
  6. Provide 1-inch diameter hole with smooth edges at each end for each plank.
  7. Furnish plank assemblies in 2-foot widths.
  8. Manufacturers: One of the following or equal:
    - a. Harsco Industrial IKG.
    - b. Ohio Gratings, Inc.
  9. Planks shall not lock with adjacent planks allowing the removal of individual planks without disturbing the adjacent planks.
- D. Heavy-duty steel grating:
1. Heavy-duty type, fabricated from structural steel and designed in accordance with AASHTO Standard Specifications for Highway Bridges, using H-20 loading.
  2. Hot-dip galvanized after fabrication in accordance with ASTM A 123.
  3. Manufacturers: One of the following or equal:
    - a. Reliance Steel Products Company, Heavy-Duty Steel Grating.
    - b. Harsco Industrial IKG.

## **2.07 Floor and Cover Plates:**

- A. Design Criteria: As indicated on the Drawings
- B. Plates shall be set flush with surrounding floor.
- C. No single piece of floor and cover plate shall weigh more than 80 pounds unless specifically detailed otherwise.
- D. Plates shall be aluminum unless otherwise indicated.
- E. The size of the openings shall be as shown on the plans.
- F. Steel Checker plates, if indicated, shall be hot dip galvanized after fabrication.

## **2.08 Aluminum Stair Nosing**

- A. Material: Cast aluminum abrasive nosings with aluminum oxide granules integrally cast into metal, forming permanent, nonslip, long-wearing surface.
- B. For installation in cast-in-place stairs.
- C. Configuration: 4 inches wide, fabricated with integrally cast stainless steel anchors at approximately 12-inch centers. Length to extend within 3 inches of stair edge on each side.

## **2.09 Aluminum Stairs**

- A. Unless otherwise indicated, stairs shall be aluminum.
- B. Aluminum structural shapes shall be alloy 6061-T6 meeting the ASTM specifications included in Aluminum Association current Construction Manual Series.

- C. Stairs shown are schematic. The Contractor shall design and construct the stairs, support system, footings and all necessary appurtenances.
- D. Fasteners shall be Type 304 or 316 stainless steel.

## **2.10 Manhole Frames and Covers**

### **A. Materials:**

- 1. Cast iron, ASTM A48, Class 30-B
- 2. Covers shall be gasketed to provide a seal between the frame and cover.

### **B. Fabrication:**

- 1. Castings shall be clean and free from blow or sand holes, or defects of any kind.
- 2. Castings shall meet the requirements of local County/City/Owner standards.
- 3. Type: Heavy-duty traffic type, with combined minimum set weight of 265 pounds.
- 4. Machine horizontal and vertical bearing surfaces to fit neatly, with easily removable cover bearing firmly in frame without rocking.
- 5. Frame:
  - a. Bottom flange type.
  - b. Approximately 4-1/2 inches frame height.
  - c. 24 inches diameter clear inside dimension and approximately 32 inches bottom flange outside diameter, unless otherwise indicated on the Drawings.
  - d. Cover:
    - 1) Skid-resistant grid pattern design stamped with name of utility service provided by manhole, such as "ELECTRICAL," "SEWER," "TELEPHONE," or "WATER."
    - 2) Solid type without ventilation holes.
- 6. Finish: Unpainted.

## **2.11 Ladders**

### **A. General:**

- 1. Type: Safety type conforming to local, State, and Occupational Safety and Health Administration standards as minimum. Furnish guards for ladder wells.
- 2. Size: 18 inches wide between side rails of length, size, shape, detail, and location indicated on the Drawings.
- 3. All ladders, fasteners, brackets and other metallic component inside a potable water tank or otherwise in contact with potable water shall be NSF-61 approved stainless steel.

### **B. Stainless steel ladders:**

- 1. Materials: Stainless steel, NSF-61 approved.
- 2. Rungs:
  - a. 1-inch minimum square bar or tube with 1/8-inch grooves in top and deeply serrated on all sides.
  - b. Capable of withstanding 1,000-pound load without failure.
- 3. Side rails: Minimum 4-inch by 1/2-inch flat bars.

4. Fabrication:
  - a. Welded construction, of size, shape, location, and details indicated on the Drawings.
  - b. For ladders over 20 feet high, furnish standard ladder cages or fall prevention system designed in accordance with State and Occupational Safety and Health Administration requirements.
5. Fall prevention system: Include but not limit to railing, brackets, clamps, 2 sleeves, and 2 belts, satisfying Occupational Safety and Health Administration safe climbing requirements and fabricated from NSF-61 approved stainless steel:
  - a. Manufacturers: One of the following or equal:
    - 1) Miller by Honeywell, Saf-T-Climb.
    - 2) Sur-Loc, Climbers Buddy System.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. Fabrication and Erection: Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."
- B. General:
  1. Fieldwork, including cutting and threading, shall not be permitted on galvanized items.
  2. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.
  3. Grouting of anchor bolts with non-shrink or epoxy grouts, where indicated, shall be in accordance with Section 03315 Grout.
  4. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.
  5. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if indicated, recesses or blockouts shall be formed in the concrete.
    - a. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned.
    - b. Recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place.
    - c. Embedments shall comply with Section 03300 Cast-in-Place Structural Concrete.
  6. Holes shall be punched 1/16-inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.
  7. Fabrication including cutting, drilling, punching, threading and tapping required for miscellaneous metal or adjacent work shall be performed prior to hot-dip galvanizing.

### **3.02 Installation of Seat Angles, Supports and Guides**

- A. Seat angles shall be set flush with the floor. Aluminum material in contact with concrete shall be coated per specification Section 09900-Protective coating systems.

### **3.03 Installation of Grating, Floor and Cover Plates**

- A. Grating, floor and cover plates shall be field measured for proper cutouts and proper sizes.
- B. Maximum 1/8-inch clearance between ends of grating and at inside face of vertical leg of edge angles.
- C. Installed grating shall not slide off or out of support.
- D. Top surfaces of adjacent grating sections shall be flush, in the same plane.

### **3.04 Installation of Safety Stair Nosings**

- A. Unless otherwise indicated, safety stair nosings shall be installed on all concrete stairs, including top tread on upper concrete slab.
  - 1. Center nosing on step with approximately 3-inches from each stair edge.
  - 2. Nosings shall be secured to concrete with suitable anchors at 15 inches on centers and not more than 4 inches from the ends.
- B. Coat aluminum surfaces in contact with concrete per Section 09900-protective Coating Systems.
- C. Rubber tape, 1/8-inch thick, shall be provided at both ends and cut to fit shape of nosing prior to concrete placement.

### **3.05 Aluminum Stairs**

- A. Fabrication: Stairs shall be fabricated in accordance with the Aluminum Association Standards and manufacturer's recommendations.
  - 1. Sheared edges exposed in finished work shall be ground smooth.
- B. Welding: Stairs shall be welded with Gas Metal Arc (MIG) or Gas Tungsten Arc (TIG) processes in accordance with the manufacturer's written instructions and with recommendations of the American Welding Society contained in the Welding Handbook, as last revised.
  - 1. All exposed aluminum welds shall be ground smooth.
- C. Installation: Erection shall be in accordance with the Aluminum Association.
  - 1. Mill markings shall not be removed from concealed surfaces.
  - 2. Inked or painted identification marks on exposed surfaces not otherwise coated shall be removed after installed material has been inspected and approved.
  - 3. Stairs shall be fitted accurately and field measured where necessary.

### **3.06 Installation of Manhole Frames and Covers**

- A. Manhole frames and covers shall be set flush with the surrounding surfaces unless otherwise specified.

### **3.07 Ladders**

- A. Secure to supporting surface with bent plate clips providing minimum 8 inches between supporting surface and center of rungs.
- B. Where exit from ladder is forward over top rung, extend side rails 3 feet 3 inches minimum above landing, and return the rails with a radius bend to the landing.
- C. Where exit from ladder is to side, extend ladder 5 feet 6 inches minimum above landing and rigidly secure at top.

D. Erect rail straight, level, plumb, and true to position indicated on the Drawings. Correct deviations from true line or grade which are visible to the eye.

**\*\* END OF SECTION \*\***

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## SECTION 05910 HOT-DIP ZINC COATING

### PART 1 - GENERAL

#### 1.01 Summary

A. This Section specifies hot-dip zinc coating. Unless otherwise specified, steel items not fully encased in a building envelope shall be hot-dip zinc coated. Also termed hot dip galvanized.

B. References

<u>Reference</u>	<u>Title</u>
ASTM A90	Standard Test Methods for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A123	Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip
ASTM A153	Zinc Coating on Iron and Steel Hardware
ASTM A384	Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
ASTM A385	Providing High Quality Zinc Coatings on Assembled Products
ASTM A386	Zinc Coating on Assembled Steel Products
MILSPEC DOD-P-21035	Paint, High Zinc Dust Content, Galvanizing Repair

### PART 2 - PRODUCTS

#### 2.01 Materials

A. The coating material shall be as specified in ASTM A153 or ASTM A123.

### PART 3 - EXECUTION

#### 3.01 Galvanizing

A. The thickness, chemistry, and all other engineering properties of galvanizing shall be defined by ASTM A153 and ASTM A123.

#### 3.02 Field Repairs

A. Where zinc coating has been damaged, substrate surface shall be cleaned and repaired with zinc dust-zinc oxide coating in accordance with MILSPEC DOD-P-21035. Field repair of zinc coated surfaces, including Unistruts shall be accomplished with Z.R.C., as manufactured by Z.R.C. Chemical Products Co.; Galvicon as manufactured by Galvicon Co.; or equal.

#### 3.03 Post-Galvanizing Coating

A. When paint is required over a hot-dip galvanized coating, the galvanized surface requires special preparation. Chemical or abrasive methods may be used, with care exercised to not remove too much of the galvanized coating.

**\*\*END OF SECTION\*\***

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## **SECTION 13100 CATHODIC PROTECTION**

### **PART 1 - GENERAL**

#### **1.01 Description**

- A. Cathodic protection shall conform to the provisions of the City of Folsom Standard Construction Specifications.
- B. Cathodic protection shall be furnished and installed and shall comply in all respects with the requirements of the latest City of Folsom Standard Construction Specifications for cathodic protection and corrosion control, these Specifications, and as directed by the City Engineer.
- C. The Contractor shall furnish all materials, install all equipment and provide all labor necessary to complete the work shown on the drawings and or listed below and all other work and miscellaneous items not specifically mentioned but reasonably inferred, including all accessories and appurtenances required for a complete system. The intent of this specification is to provide for a complete, functional cathodic protection system for the pipeline appurtenances, valves and ductile iron fittings required for the Project.
- D. Work included in this section consists of the components of the cathodic protection system, including anodes, cables, test stations and any other work necessary to complete the installation. A partial list of work included is as follows:
  - 1. Cathodic protection of all buried, ductile iron pipe, welded steel pipe, fittings, valves, risers and appurtenances associated with the referenced water pipelines.
  - 2. Polyethylene encasement of all buried ductile iron pipe, fittings, valves, risers and appurtenances associated in polyethylene with the referenced water pipelines.
  - 3. Bonding of buried, non-welded ferrous metal pipe joints.
  - 4. Trenching, drilling, and other excavation.
  - 5. Installation of prepackaged magnesium anodes, cables, test stations, insulating joints and coatings.
  - 6. Backfill and compaction of backfill.
  - 7. Provide shop drawings, reports, permits, and obtain Engineer's approval where required.
  - 8. Correction of all deficiencies.
  - 9. Cleanup and restoration of surface.
  - 10. Work shall include the provision of all materials, equipment, and apparatus not specifically mentioned herein or noted on the plans, but which are obviously necessary to complete the work.

#### **1.02 Code Requirements**

- A. All materials, workmanship and installation shall conform to all requirements of the legally constituted authority having jurisdiction. These authorities include, but are not limited to, the latest revision of the State of California, Department of Industrial Relations, Division of Industrial Safety Orders of the Industrial Accident Commission; and all other applicable State, County, or City codes and regulations. Nothing in the drawings or specifications is to be construed to permit work not conforming to any of these regulations and codes. Where larger

size or better grade materials than those required by these regulations and codes are specified, the specifications and drawings shall have precedence.

### **1.03 References**

- A. ASTM - American Society for Testing and Materials
- B. IEEE - Institute of Electrical and Electronic Engineers
- C. NEMA - National Electrical Manufacturers' Association
- D. NACE - National Association of Corrosion Engineers
- E. OSHA - Occupational Safety and Health Administration

### **1.04 Quality Assurance**

#### A. General

1. All work shall be performed to the satisfaction of the Engineer.

#### B. Materials

1. The contractor shall use only new, highest quality cathodic protection components, and standard products from a manufacturer regularly engaged in the production of such material or equipment. The Contractor shall not substitute for the specified materials unless approved by the Engineer.

#### C. Testing

1. Cathodic protection components shall be subject to testing to ensure proper installation and operation. Electrical continuity of the pipelines, proper operation of anodes, test leads and all other cathodic protection components shall be tested by the Contractor in order to ensure proper installation and operation. Contractor shall submit the results of its testing to the City prior to paving. The Contractor shall be responsible for correction of all deficiencies identified by the testing and all costs incurred for retesting prior to final acceptance.

#### D. Compaction

1. Compaction of backfill for anodes and trenches shall match the existing conditions and shall be approved by the Engineer.

### **1.05 Requirements**

- A. All buried metallic pipes, fittings and appurtenances associated with the water pipelines shall be doubly encased in 8-mil V-BIO® Enhanced Polywrap polyethylene per AWWA C-105.
- B. Galvanic cathodic protection shall be installed on all buried metallic pipe, valves, fittings, risers and appurtenances.
- C. All rubber gaskets, mechanical joints and flexible couplings shall be bonded along the entire buried length of ductile iron pipe.
- D. All buried insulating joints on the ductile iron pipe shall be coated with a wax tape coating system.

### **1.06 Delivery, Storage, and Handling**

- A. Deliver cathodic protection materials to the Site in original, sealed containers.
- B. Replace all anodes with damaged lead wire.

### **1.07 Material Submittals**

- A. Prior to commencing work, the Contractor shall submit for approval by the City Engineer copies of the following items in accordance with Section 01300 – Submittals, a complete list of cathodic protection equipment and material, including name and manufacturer, catalog number, size, finish and any other pertinent data necessary for proper identification and to determine conformance with specifications.
- B. These items include but are not limited to:
  - 1. Anodes
  - 2. Cable
  - 3. Terminal Box, Shunt, Wire Termination Material & Procedure, Wire Identification.
  - 4. Traffic Valve Box
  - 5. Cable Splicing Materials
  - 6. Exothermic Weld Equipment and Supplies
  - 7. Pin Brazing Equipment and Supplies
  - 8. Coating of Cable-to-Pipe Connection
  - 9. Cable Warning Tape
  - 10. Cable Identification Tags
  - 11. Conduit and Fittings
  - 12. Bitumastic Coating

### **1.08 Interference and Exact Locations**

- A. The Contractor shall coordinate and properly relate this work to the site and to the work of all trades. However, the Contractor shall visit the premises and be thoroughly familiarized with all details of the work and working conditions, verify existing conditions in the field, determine the exact locations of existing pipelines and structures and advise the Engineer of any discrepancy that may prevent or hinder the specified work from being completed. The Contractor shall be solely responsible for location and marking underground structures so as to avoid damage during construction.

## **PART 2 - PRODUCTS**

### **2.01 General**

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

### **2.02 Sacrificial Magnesium Anodes**

- A. The anodes shall be high potential magnesium anodes with composition and dimensions as indicated below. Each anode shall be cast with a steel core and the core shall protrude from one end and shall be of sufficient length to permit attachment of a lead wire.

B. Each anode shall conform to the following chemical composition and dimensions:

1. Element Content (Wt %)

Aluminum	0.010%
Manganese	0.50 to 1.30 %
Iron	0.03% Max.
Nickel	0.001% Max.
Copper	0.02% Max.
Total Other Impurities	0.05 each or 3 % Max Total
Magnesium	Remainder of Balance

2. Bare anode dimensions:

<u>Nominal Wt. Bare (lbs)</u>	<u>Height (in.)</u>	<u>Width (in.)</u>	<u>Length (in.)</u>
5	3	3	7.5
9	3	3	13.5
17	4	4	17
32	5	5	21

C. Anode Core Strap: Galvanized steel, with one end of anode recessed to provide access to the rod for connection of the lead wire.

D. Lead Wire/Cable: No. 10 AWG, Type High Molecular Weight Polyethylene (HMWPE), color black, silver brazed to the rod, making a mechanically secure connection

E. Soldered Connection and Core: Seal entirely with electrical potting compound.

F. Magnesium Anode Packaging: Prepackaged in a cloth bag containing low resistivity backfill consisting of 75% hydrated gypsum, 20% bentonite, and 5% sodium sulfate.

### 2.03 Cable

A. All underground cables utilized for bonding cables shall be single conductor, stranded copper, Type CP, insulated for 600 volts with High Molecular Weight Polyethylene (HMWPE) in accordance with the requirements of ASTM D1248, Type 1, Class C, Category 5, Grades E-4 and E-5.

B. All wires/cables for galvanic anodes and test stations shall be Type HMWPE, stranded copper, sized as shown on the plans, and shall conform to Federal Specifications JC-30B.

C. Test Leads and Anode Leads: Extend 18 inches minimum above grade after connection to test station terminal board.

D. Cable Terminations: All cables that terminate in the terminal boxes shall have ring type connectors that are sized appropriately for the terminal bolts. The ring connectors shall be either a soldered ring type connection or a heavy duty, compression type crimp connection.

### 2.04 Components

A. Terminal Box: High impact molded Lexan plastic, Model "T-3" as manufactured by Tinker & Razor, or approved equal, with nickel plated brass hardware as indicated on Drawings.

B. Traffic Valve Box: ~~Brooks Type 1RT Traffic Box, or~~ Christy G-5 Traffic Box or approved equal.

- C. Valve Box Covers: Cast iron, with legend "CP TEST" as indicated on Drawings.
- D. Anode metering shunts shall be 0.01 ohm, 6 amp capacity, with 1% accuracy, from the same manufacturer as the terminal box.
- E. Test Stations: Ground level test stations shall be Brooks, Type 1RT traffic box with a 12 pound cast iron lid as shown on the drawing. The cover shall be manufactured with "CP-TEST" markings for easy identification.

## 2.05 Cable Splicing Materials

- A. Wire Connectors: One-piece, tin-plated crimp-on lug connector or a three-piece copper split bolt connector as manufactured by Burndy Co., Thomas and Betts. No steel hardware is allowed.
- B. Insulation of Splices: Buried splices shall be sealed with an inner wrap of rubber splicing tape such as Scotch 130C or approved equal and an outer wrap of PVC tape such as Scotch 88 or approved equal.
- C. Rubber Coating: Coating the entire splice connection with two coats of 3M Scotchkote Electrical Coating.

## 2.06 Cable-To-Pipe Connections - Exothermic Welding

- A. Ductile Iron Pipe or Fittings
  - 1. Accomplish all cable connections to the ductile iron pipe or fittings utilizing an exothermic welding process.
  - 2. Weld Equipment Manufacturers: From one of the following manufacturers, or approved equal:
    - a. Erico Products, "Cadweld."
    - b. Continental Industries, Inc., "Thermoweld."
  - 3. Cable Connections to Pipe and Fittings: Manufacturer's standard exothermic weld kits, unless indicated otherwise on Drawings. Exothermic welds for the ductile iron fittings shall be made using the weld metal for cast iron pipe.
  - 4. Size all materials for welding in accordance with recommendations in manufacturers' literature.
  - 5. Use copper wire sleeves and individual components from one manufacturer when making welds.
  - 6. Cable-to-Pipe Coating Material: Coating material for cable-to-pipe connections shall be Handy Caps and Roybond 747 primer as manufactured by Royston products or Propoxy 20 epoxy putty as manufactured by the Hercules Chemical Company or approved equal.

6-7. \_\_\_\_\_ Joint Bonds shall be No. 6 awg with HMWPE insulation.

## 2.07 Cable-To-Pipe Connections – Pin Brazing (For Flexible Expansion Joints)

- A. General: Pin brazing equipment based upon Electric-arc silver soldering using a specially designed portable Pin Brazing unit, a hollow brazing pin containing silver solder and flux shall be utilized for cable-to-structure connections. The unit may be battery powered or powered with a welding generator. Battery pack, pins with fuse wire, ceramic ferrules and cable lugs shall be in accordance with the manufacturer's recommendations for each wire size and pipe or fitting size and material. Brazing materials and equipment shall be the product of a single manufacturer. All material and equipment utilized for brazing shall be from one manufacturer.
  - 1. BAC - GMC Electrical, Ontario, CA.

2. Farwest Corrosion Control, Hayward, CA.

B. Cable-to-Pipe Coating Material: Coating material for cable-to-pipe connections shall be Handicaps as manufactured by Royston products or Propoxy 20 epoxy putty as manufactured by the Hercules Chemical Company or approved equal.

### **2.08 Cable Warning Tape**

All buried test station and anode cables shall have plastic warning tape installed a minimum of 12 inches above the top of the cables for the entire buried length of the cables. The warning tape shall be 4 inches wide and shall be yellow with black lettering with the legend "CAUTION, CATHODIC PROTECTION CABLES BURIED BELOW" in 3 inch high lettering printed at a minimum of seven foot intervals along the entire buried length of the cable.

### **2.09 Cable Identification Tags**

All cables in the terminal boxes shall be identified. The identification tags shall be white plastic "zip-tie" type straps with a plastic tab of sufficient size to allow the pipeline station to be written on the tab with a permanent felt tip marker.

### **2.10 Rigid PVC Conduit and Fittings**

Rigid polyvinylchloride (PVC) conduit and fittings shall be Schedule 40, manufactured to NEMA TC-2 and WC-1094 specifications and shall be U.L. approved.

### **2.11 Bitumastic**

Coating for all buried bolts, nuts and metallic washers of the ductile iron pipe and any copper insulating corporation stops shall be Bitumastic 300M coal tar mastic coating, as manufactured by Carboline or approved equal.

### **2.12 Polyethylene Sheets For Pipe Encasement**

The polyethylene sheets used for encasement of the ductile iron pipe and fittings shall be minimum 8-mils thick V-BIO® Enhanced Polywrap in accordance with AWWA C-105. The polyethylene sleeves used for encasement of buried galvanized steel pipe or copper pipe shall be minimum 6-mils thick and shall be of sufficient diameter to slip over the pipe without getting damaged.

## **PART 3 - EXECUTION**

### **3.01 General Requirements**

All materials, workmanship and installation shall conform to all requirements of the legally constituted authority having jurisdiction. These authorities include, but are not limited to, the latest revision of the State of California, Department of Industrial Relations, Division of Industrial Safety, Electrical Orders; The National Electric Code, General Construction Safety Orders of the Industrial Accident Commission; and all other applicable State, County, or City standards and regulations. Nothing in the drawings or specifications is to be construed to permit work not conforming to these regulations and codes. Where larger size or better grade materials than required by these regulations and codes are specified, the specifications and drawings shall have precedence.

### **3.02 Storage of Materials**

All materials and equipment to be used in construction shall be stored in such a manner to be protected from detrimental effects from the elements. If warehouse storage cannot be provided,

materials and equipment shall be stacked well above ground level and protected from the elements with plastic sheeting or other method as appropriate.

### **3.03 Joint Bonding**

- A. At each anode installation site, bond all buried non-welded, rubber gasket joints, mechanical joints, and fusion-bonded epoxy coated flanges for continuity.
- B. Install joint bonds with a wire loop extended above the bonded joint. The overall length of the conductor shall permit sufficient flexibility of each fitting across the joint without transferring any tensile stress to the bond cable.
- C. Ensure proper connection of cables to fittings.
- D. Coat each fitting where the coating is damaged with a patch kit, as supplied by the pipe coating manufacturer, in accordance with the manufacturer's written instructions.

### **3.04 Exothermic Welds**

- A. Install exothermic weld connections in accordance with the Drawings.
- B. Remove coating materials from the surface over an area just sufficient to make the connection.
- C. Clean steel surfaces to white metal by grinding or filing prior to welding the conductor. Resin impregnated grinding wheels are not permitted.
- D. Do not bury connections to the structures or piping until the Engineer has inspected the connections and given permission to backfill. Connections made in violation of this provision will be rejected.
- E. Test exothermic welds for adherence to the pipe and for electrical continuity between the pipe and wires.
- F. Use a 22 ounce hammer for testing adherence by striking a blow using a moderate amount of force to the weld. Take care to avoid hitting the wires.
- G. All defective welds shall be removed and replaced.
- H. All exposed surfaces of copper and steel shall be covered with a minimum thickness of 1/4-inch of insulating material as shown on the drawings or as follows. The exposed metal and surrounding surface shall be cleaned of contaminants and coated with Royston Roybond 747 primer. After the primer has dried, the Royston Handy Cap shall be applied.

### **3.05 Pin Brazing (For Flexible Expansion Joints)**

Cable-to-pipe connections for buried ductile iron flexible expansion joints and any stainless steel pipe shall be installed in the manner shown on the Drawings utilizing a pin-brazing technique. Cut wire with a wire cutter to prevent deforming the wire ends. Do not deform the wire. Remove only enough insulation from the wire to allow the brazed connection to be made. The surface of the stainless steel structure shall be ground or filed to a bright, shiny, clean and dry surface before brazing the wire connection. The wire is to be held at a 90 degree angle to the surface when brazing. Only one wire is to be attached with each braze. All wire to structure braze shall be a minimum of 6 inches apart. As soon as the braze has cooled, the brazed connection shall be tested for strength by striking a sharp blow with a two-pound hammer while pulling firmly on the wire. All unsound brazed connections are to be redone and retested. Assure that the area to be coated is thoroughly cleaned by wire brushing. All exposed surfaces of copper, steel and surrounding surface shall be cleaned of contaminants and covered with a minimum thickness of 1/4-inch of epoxy or Roybond 747 primer and Handy Cap as shown on the Drawings.

### **3.06 Cables**

- A. Inspect bottom of finished trenches to ensure they are free from stones, roots, other materials which might injure the insulation of the conductors.
- B. Lay wires in the ground straight, without kinks, with a minimum cover of 30 inches.
- C. Run cable in continuous length, free of joints or splices, unless otherwise specified or indicated on Drawings. Use care during installation to avoid punctures, cuts and similar damage to the insulation. Replace entire cable run where any damage to insulation occurs.
- D. Leave a minimum of 18 inches of slack for each conductor at each test station housing. Slack shall be that amount of cable which, when the cover is removed and the cable extended, protrudes beyond the opening of the box or enclosure.
- E. No bend shall have a radius of less than eight times the diameter of that cable.
- F. Strip insulation from the cable to make metal-to-metal connection to each binding post.

### **3.07 Sacrificial Magnesium Anodes**

- A. Excavate a hole to a minimum of 3 inches larger than the package sacrificial anode diameter, 1 foot below the pipe and a minimum of 3 feet from the fitting.
- B. Excavate the lead cable trench to a minimum depth of 30 inches.
- C. Remove plastic or paper bags from the anode before lowering into the hole. The cloth bag is to remain around the anode.
- D. Exercise care to preclude damaging the cloth bag and lead wire insulation on the sacrificial anode. Do not lift or support anode by the lead cable.
- E. Center the packaged anode in the hole and backfill with native soil free of rocks and other foreign objects
- F. Flood the anode hole with 5 gallons of fresh water when the backfill reaches one foot above the anode.
- G. Installation of Anodes for Ductile Iron Fittings or Pipe: Anodes shall be installed in the trench horizontally or vertically after excavation to proper depth, equal to the bottom of the pipeline, a minimum of 3 feet from the fittings or pipelines. Spacing between anodes shall be 10 feet (typical) if multiple anodes are installed at a single test station location.

### **3.08 Anode Test Stations**

- A. Install anode test stations where indicated on Drawings. Provide a concrete collar where anode test stations are to be installed in native soil. Set collar level flush with top of curb or finish grade in paved areas and two (2) inches above grade in landscaped and unimproved areas. Provide a minimum of 18 inches of slack for each cable in each test station. Sufficient slack shall be provided to allow removal of the terminal box from the test station without disconnecting any of the cables.
- B. In accordance with City of Folsom standards a flexible marker shall be installed at each Anode Test Station in an arrangement suitable to the Engineer. Marker shall legibly indicate "COF CTS".

### **3.09 Field Coating of Buried Flange Hardware**

- A. All buried nuts and bolts shall be coated with bitumastic prior to polyethylene encasement. After flange hardware is installed use wire brush, power brush or an abrasive cleaning pad to remove all loose material, dirt and grime from substrate to a minimum cleanliness of SSPC SP2. Apply Bitumastic coating liberally with a medium bristle brush to the extent that all surfaces are

completely covered with no bare spots visually evident. Coat exposed surfaces of bolts, washers and nuts, giving special attention to the bottom-side surfaces. Follow the manufacturer's recommendations for drying times required before polyethylene encasement and backfill.

### **3.10 Polyethylene Encasement of Pipe and Fittings**

- A. All ductile iron pipe and fittings shall be doubly encased in minimum 8-mils thick V-BIO® Enhanced Polywrap polyethylene in accordance with AWWA C-105.

### **3.11 System Testing**

- A. After the Contractor has completed the installation of the cathodic protection system, the system will be energized, tested, and adjusted by the Contractor to assure conformance with the specifications, electrical isolation, pipe-to-soil potential measurements, anode current output, etc. Any and all deficiencies shall be corrected by the Contractor at its cost and retested prior to final acceptance. All retesting shall be at the Contractor's expense. Contractor shall submit the test results to the City Engineer for review and approval.

**\*\* END OF SECTION \*\***

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## SECTION 15000 PIPING MATERIALS AND COMPONENTS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This section specifies the general requirements for piping materials and components and their installation and testing and shall be used in conjunction with the Section 15060 - Piping Systems and the Contract Drawings.

#### 1.02 REFERENCES

- A. This section references the following documents. They are a part of this section insofar as specified and modified herein. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI A13.1	Scheme for the Identification of Piping Systems
AWWA C651	Disinfecting Water Mains
MTL-STD-810C	Military Standard Environmental Test Methods

#### 1.03 DIAGRAMMED PIPELINES

- A. Various pipelines are shown on the drawings in diagram form. These diagrammed pipelines shall be furnished, fabricated, erected and otherwise installed to lines, elevations, locations and dimensions as shown, specified or required for a complete installation. The Contractor shall verify all dimensions shown on the Plans and shall take such field dimensions as may be necessary to properly install all diagrammed pipelines.
- B. The cost of furnishing, fabricating, locating, erecting and otherwise completely and properly installing all diagrammed pipelines shall be included in the lump sum Contract bid price and no separate payment will be made thereof.

### PART 2 - PRODUCTS

#### 2.01 PIPING

##### A. Material

1. Unless otherwise specified, piping materials, including pipe, gaskets, fittings, connection and joint assemblies, lining and coating, shall be selected from those listed on the Section 15060 - Piping Systems. Piping materials shall conform to detailed specifications for each type of pipe and piping appurtenance specified in Division 15.

##### B. Flange Assemblies

1. Flat faced flanges shall not be bolted to raised face flanges.
2. Gaskets for flat faced flanges shall be the full face type.
3. No raised faced flanges or gaskets.
4. Utilize only flat faced flanges when using flanges to mate dissimilar piping materials.

## **2.02 PIPE IDENTIFICATION**

### **A. Plastic Coding Markers**

1. Plastic markers for coding pipe shall conform to ANSI A13.1 as manufactured by Brady, Seton, or equal.
2. Markers shall be the mechanically-attached type that are easily removable; they shall not be the adhesive applied type.
  - a. Markers shall consist of pressure sensitive legends applied to plastic backing that is strapped or otherwise mechanically attached to the pipe.
  - b. Legend and backing shall be resistant to petroleum based oils and grease and shall meet the criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C.
  - c. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.
3. Markers bearing the legends on background colors selected by the Owner's Representative shall be provided in the heights required by ANSI A13.1.
4. Pipe markers shall include unidirectional and bidirectional arrows required by ANSI A13.1.

### **B. Tracer Wire**

1. Tracer wire shall be #10 coated, insulated solid copper wire and included for piping as indicated herein.

### **C. Warning Tape**

1. Warning tape shall be 12 inches wide and included for piping as indicated herein. Tracer tape shall be made of inert plastic material suitable for direct burial and capable of stretching to twice its original length.
2. Warning tape shall be blue for potable and non-potable water, and green for all other utilities.
3. A warning message shall be printed on the tape.
  - a. For Potable and Non-Potable Water, the message shall read "CAUTION: BURIED WATER PIPE BELOW."
  - b. For all other services the message shall read "CAUTION: BURIED PIPE BELOW". Letters shall be with black and the message shall be printed at maximum intervals of 2 feet.
4. The message shall be printed at maximum intervals of 2 feet.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

#### **A. General:**

1. Only proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be used.
2. The interior of all pipes shall be cleaned of all foreign matter before installing.
3. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
4. Lay pipe with label facing up.

5. At the end of each workday, while pipe laying is NOT in progress, the open ends of the installed pipe shall be closed to prevent trench water from entering into the interior of the pipe.
  - a. Adequate backfill shall be deposited on pipe to prevent floating of pipe.
  - b. Any pipe that has floated shall be removed from the trench, cleaned, and re-laid in an acceptable manner.
  - c. The use of burlap, wood, or other similar temporary plugs will not be permitted.
6. Cable, rope, or other devices used for lowering fittings into trench shall be attached around the exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fitting's interior for handling.

#### B. Diagrammed Pipe

1. Where such pipelines are shown only in diagram, they shall be arranged clear of other pipelines, equipment and walking areas, and shall be accessible for maintenance.
  - a. Such pipelines shall be fitted and installed in a neat and workmanlike manner in accordance with approved shop drawings.
  - b. An adequate number of unions shall be provided to facilitate dismantling or removal.
2. The final locations of appurtenances included as part of diagrammed pipelines shall be shown on the approved shop drawings or as determined in the field by the Owner's Representative.

#### C. Anchorage

1. All bends, plugs, joints, caps and tees in pressure piping systems shall be anchored by means of restrained joints unless otherwise specified or shown.

#### D. Pipe Flexibility

1. Unless otherwise specified or shown, wherever piping 6 inches in diameter and larger passes from concrete to earth, two (2) sleeve-type flexible pipe couplings or flexible joints shall be provided with the first joint between 2 feet and 3 feet from the face of the structure.
  - a. The spacing between the two couplings shall be between 2 and 3 feet.
  - b. A single sleeve-type flexible pipe coupling can be utilized if the concrete wall penetration employs a flexible pipe seal.
  - c. Where required for resistance to pressure, flexible couplings shall be restrained.

#### E. Vents and Drains

1. Manual air vents shall be provided at the high points of each reach of pipeline whether shown or not shown on drawings.
  - a. Manual air vents shall consist of a ¼" bronze cock and short copper tubing return.
  - b. Copper tubing shall be routed to the nearest floor.
  - c. Manual air vents in piping systems for fluids containing solids shall be 1-inch non-lubricated eccentric plug valves fitted with quick couplers.
2. Whether shown or not shown on drawings, all pipelines within the pump station shall be provided with a tap or welded nipple and valved drain on the bottom of the pipe.
  - a. Drains shall be piped to a sump, gutter, floor drain or other collection point.
  - b. Drain valves shall be 1" gate valves unless shown otherwise.
  - c. When drains cannot be run to collection points, they shall be rerouted to a point of easy access.

## F. Pipe Identification

### 1. Pipe Coding

- a. After application of the specified coating or painting and insulation systems, exposed piping, both interior and exterior, and all piping in ceiling spaces, pipe trenches, pipe chases and valve boxes shall be identified with plastic markers.
- b. Locate pipe markers and color bands wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels and plenums), and exterior nonconcealed locations, in locations as follows:
  - 1) Near each valve and control device.
  - 2) Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
  - 3) Near locations where pipes pass through walls or floors/ceilings, or enter nonaccessible enclosures.
  - 4) At access doors, manholes and similar access points which permit view of concealed piping.
  - 5) Near major equipment items and other points of origination and termination
  - 6) Spaced intermediately at maximum spacing of 20 feet along each piping run, except reduce spacing to 10 feet in congested areas of piping and equipment, i.e., mechanical rooms.

### 2. Warning Tape and Tracer Wire

- a. Warning tape shall be installed a minimum of 12 inches above all potable water, recycled water, primary influent and foul air pipes. Tape shall be spread flat with message side up before backfilling.
- b. Tracer wire shall be continuous and attached to all potable water and recycled water pipes. Tracer wire through valve boxes shall be placed outside of riser and inside of valve box.

## 3.02 CLEANING AND FLUSHING

### A. General:

1. The Contractor may, in order to facilitate the cleaning of sections of buried or exposed piping between isolating valves, clean and test the system as specified in this section, prior to connection to the valving. Use of this procedure, however, will not waive the requirement for a full test of the completed system.
2. Unless specified otherwise, piping 24 inches in diameter and smaller shall first be cleaned by pulling a tightly fitting cleaning ball or swab through the system.
3. Piping larger than 24 inches in diameter may be cleaned manually or with a cleaning ball or swab.

### B. Air Systems:

1. Air or Foul Air system piping 6 inches in diameter and smaller shall be blown out, using air or the testing medium specified.
2. Air or Foul Air system piping larger than 6 inches shall be cleaned by having a swab or "pig" drawn through the entire length of the pipe. After connection to the equipment, it shall then be blown out using the equipment.

### C. Liquid Systems:

1. After completion of cleaning, piping systems 12" and less shall be flushed with clean water for a minimum period of 15 minutes at the flow rate required to produce a minimum velocity of 6 feet per second.
  - a. Contractor is responsible for all temporary piping and facilities required.
  - b. Contractor shall comply with all State and Local regulations and requirements for disposal of flushing water.
2. Potable water piping systems shall be flushed and disinfected in accordance with AWWA C651. Post disinfection testing shall be done and paid for by the Contractor.

### 3.03 TESTING

#### A. Upon completion of installation the Contractor shall test each piping system.

1. Pressures, media and test durations shall be as specified in the Section 15060 and per the City of Folsom Standard Construction Specifications.
2. Equipment that may be damaged by the specified test conditions shall be isolated.
3. Each test gauge shall be selected so that the specified test pressure falls within the upper half of the gauge's range.
4. The Contractor shall notify the Owner's Representative prior to each test and shall perform each test in the presence of the Owner's Representative.
5. Pipes shall not be encased in concrete until pressure test is completed and passed.
6. Pipes shall not be covered by concrete slabs or pavement until pressure test is completed and passed.
7. Exposed Pipes shall not be insulated until pressure test is completed and passed.
8. Flanges or flex couplings shall not be backfilled or buried until pressure test is completed and passed.

#### B. Pumped or Pressure Systems:

1. Prior to testing, the pipeline shall be slowly and carefully filled with water. All air shall be expelled slowly from the pipe and appurtenances in a manner so as not to create excessive surge pressures.
2. The pipeline shall be filled with water at least twenty-four hours prior to testing when disinfection is required.
3. The Contractor may not test against valves.
4. The length of pipe being tested at any one time shall not exceed 2,000 feet unless otherwise approved by the Owner's Representative.
5. The pipeline then shall be brought up to testing pressure as required per Section 15060, measured at the lowest point of the section of the pressure zone being tested.
6. The test duration shall be two hours. Pressure in the pipeline shall be maintained at test pressure for the full two-hour duration.
7. The allowable leakage per test section shall be zero for all pressure pipe.
8. During the pressure test, all accessible appurtenances shall be inspected for visual signs of leakage.

9. All visible leaks shall be corrected immediately, regardless of the amount of leakage and the test shall be run again for its full duration.
10. All leaks detected shall be repaired to a water tight condition.

#### C. Gravity Systems

##### 1. Mandrel Test

- a. The test shall be performed after backfill and compaction but prior to final paving and prior to leak testing.
- b. The pipeline shall be balled and flushed just prior to pulling the mandrel through.
- c. A rigid mandrel with a circular cross section of 95% of true average inside diameter shall be pulled through by hand.
- d. If the mandrel sticks in the pipe at any point, the pipe shall be repaired or replaced and retested.

##### 2. Pressure Test

- a. Prior to testing, the pipeline shall be slowly and carefully filled with water. All air shall be expelled slowly from the pipe and appurtenances in a manner so as not to create excessive surge pressures.
- b. The pipeline shall be filled with water at least twenty-four hours prior to testing when.
- c. Where air valves or other suitable outlets are not available for releasing air before applying the test, approved taps and fittings shall be installed and later securely plugged.
- d. The pipeline shall be brought up to testing pressure as required per Section 15060, measured at the lowest point of the section of the pressure zone being tested.
- e. During the pressure and leakage test, all accessible appurtenances shall be inspected for visual signs of leakage.
- f. All visible leaks shall be corrected immediately, regardless of the amount of leakage and the test shall be run again for its full duration.
- g. All leaks detected shall be repaired to a water tight condition.

#### D. Air Systems

##### 1. Air piping pressure test using water:

- a. Shall be tested by bringing the section being tested to the test pressure for the duration specified.
- b. Leakage shall be zero for the duration specified.

##### 2. Air piping pressure test using air:

- a. Pressure test the section to 3.5 psi and hold above 3.0 psi for not less than 5 minutes. Add air necessary to keep the pressure above 3.0 psi. At the end of this 5 minute saturation period, note the pressure (must be above 3.0 psi) and begin the time period. If the pressure drops 0.5 psi in less than the time given in the following table the section of pipe shall not have passed the test.

<b>Pipe Size (inches)</b>	<b>Minimum Time (seconds)</b>
1-4	122
6	184
8	245
10	306
12	367
15	460
>15	370 x pipe diameter in feet

**\*\* END OF SECTION \*\***

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## SECTION 15060 PIPING SYSTEMS

### PART 1 - DESCRIPTION

#### 1.01 General

A. This Section specifies requirements for piping systems consisting of pipe, fittings and valves.

#### 1.02 References

A. This Section references the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI B16.3	Malleable-Iron Threaded Fittings
ANSI B16.9	Factory-Made Wrought Steel Butt-Welding Fittings
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless
ASTM A234	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A312	Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A403	Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM D2751	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C106	Standard for Gray-Iron Pipe Centrifugally Cast in Metal Molds for Water or Other Liquids
AWWA C108	Standard for Cast-Iron Pipe Centrifugally Cast in Sand-Lined Molds for Water or Other Liquids
AWWA C110	Gray-Iron and Ductile Iron Fittings 3 Inch Through 48 Inch for Water and Other Liquids
AWWA C111	Standard for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C151	Standard for Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids
AWWA C200	Steel Water Pipe 6 Inches and Larger
AWWA C205	Standard for Cement-Mortar Protective Lining and Coating for

<u>Reference</u>	<u>Title</u>
	Steel Water Pipe 4 Inches and Larger - Shop Applied.
AWWA C208	Standard Dimensions for Steel Water Pipe
AWWA C210	Standard for Coal-Tar Epoxy Coating System for the Interior and Exterior of Steel Water Pipe

### 1.03 Piping System Specification Sheets (Pipespec)

- A. Each process piping system is specified in the following sections.:
- B. Piping services are grouped according to the chemical and physical properties of the fluid conveyed and/or by the temperature or pressure requirements. Each grouping of services is identified by a piping system number.
- C. The following list the piping services and associated system fluid category, and pipe marker background color of each service.

<b>Service Abbreviation</b>	<b>Service</b>	<b>Category</b>	<b>Color</b>
W	Potable Water	Water	Blue
D	Drain	Wastewater	Green
AIR	Pressurized Air	Air	Yellow

### 1.04 Drinking Water System Components

- A. All water system components with wetted parts in contact with drinking water shall be in conformance with the U.S. Safe Drinking Water Act, the California State Waterworks Standards, and local Health Department Standards, including the requirements stated in the latest or most current version of NSF/ANSI 61 Annex G, NSF/ANSI 372 for “lead free” plumbing.

## PART 2 - PRODUCTS

### 2.01 Water (W) – Potable Water

- A. Test Medium: Water
- B. Test Pressure: 218 psi minimum (150% of 145-psi design pressure)
- C. Test Duration: 120 Minutes with no detectable leakage or pressure loss
- D. Flange Gaskets: shall be full faced Styrene Butadiene Rubber (SBR),
- E. Joint/Coupling Gaskets: SBR or Buna-N Rubber
- F. Exposed Piping: 3-inch and smaller
  - 1. Pipe: Copper Type L with soldered joints.
  - 2. Fittings: Wrought copper or cast bronze sweat fittings.
  - 3. Valves: Bronze Ball, Gate
- G. Exposed Piping: 4-inch and larger
  - 1. Pipe:

- a. Ductile iron, AWWA C151 CL 350 for sizes 4"-14" and CL 250 for sizes 16" and larger, cement-mortar lined per AWWA C104, Epoxy coated per AWWA C116
  - b. Welded Steel AWWA C200, Fusion Bonded Epoxy lined and coated per AWWA C213 (where indicated on plans at pipeline creek crossings)
  - 2. Fittings: Ductile iron, AWWA C110 or C153, thickness, lining, and coating to match pipe, Flanged
  - 3. Joints: Flanged, Restrained Push-on, Restrained Mechanical Joint
  - 4. Valves: Gate valves (less than 12-inch), Butterfly valves (12-inch and larger). All Valves shall be epoxy lined and coated or fusion bonded epoxy. All valves shall be NSF-61 approved.
  - 5. Note: All piping shall be fully restrained. Restrained flanged coupling adapter or dismantling joints to be provided to facilitate removal of equipment where required or indicated.
- H. Buried Piping: 3-inch and smaller
- 1. Pipe: PVC SCH 80, normal impact, solvent welded joints.
  - 2. Fittings: PVC SCH 80, normal impact.
  - 3. Valves: Bronze Gate, Ball valves
- I. Buried Piping: 4-inch and larger
- 1. Pipe:
    - a. Ductile iron, AWWA C151 CL 350 for sizes 4"-14" and CL 250 for sizes 16" and larger, cement-mortar lined in accordance with AWWA C104, asphaltic coating per ANSI/AWWA C151/A21.51 and polyethylene encasement per AWWA C105
    - b. Welded Steel AWWA C200, cement-mortar lined and coated per AWWA C205 (where indicated on plans at pump station site)
  - 2. Fittings: Ductile iron, AWWA C110 or C153, thickness, lining, and coating to match pipe, Restrained Mechanical Joint or Flanged as shown
  - 3. Joints: Restrained Push-on, Flanged, or Restrained Mechanical
  - 4. Valves: Gate valves (less than 12-inch), Butterfly valves (12-inch and larger). All Valves shall be epoxy lined and coated or fusion bonded epoxy. All valves shall be NSF-61 approved.
  - 5. Note: All piping shall be fully restrained.

## **2.02 Drain (D) - Wastewater**

- A. Test: Deflection testing per Section 15000 3.03 (C)
- B. Coupling/Joint Gaskets: Elastomeric per ASTM F477
- C. Buried Piping: 1 1/4-inch and larger
  - 1. Pipe: PVC SDR 26 per ASTM D-3034 or Sch 80
  - 2. Fittings: PVC SDR 26 or Sch 80
  - 3. Joints: Solvent Welded per ASTM D 2564 or Push-on gasketed
  - 4. Valves: None
  - 5. Cleanouts: Locate in valve boxes marked Sewer. Cleanouts to be provided at a maximum spacing of 100'
  - 6. Note: All drain pipe to have a minimum 1% slope to the point of discharge.

## **2.03 Air**

- A. Test Medium: Water
- B. Test Pressure: 218 psi minimum (150% of 145-psi design pressure)
- C. Test Duration: 120 Minutes with no detectable leakage or pressure loss
- D. Buried and Exposed Piping: (1-inch)
  - 1. Pipe: 304 or 316 SST, Sch 10S or 40S
  - 2. Fittings: Flanged, Welded or Grooved
  - 3. Valves: Ball

## **PART 3 - EXECUTION (NOT USED)**

**\*\* END OF SECTION \*\***

# SECTION 15061

## STEEL PIPE

### PART 1 - GENERAL

#### 1.01 Summary

A. This section specifies the requirements for furnishing and installation of welded steel pipe (WSP), fittings, connections, linings, and coatings for water service application. WSP and fittings shall be fabricated in accordance with AWWA C200 and C208 for minimum fitting dimensions, lined and coated in accordance with C205 Standard, and as supplemented by the requirements herein.

#### B. References

1. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AWWA C200	Standard for Steel Water Pipe
AWWA C203	Standard for Coal-Tar Protective Coatings and Linings for Steel water Pipeline - Enamel and Tape - Hot Applied.
AWWA M11	Steel Pipe – A Guide for Design and Installation
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe – Shop Applied
AWWA C206	Standard for Field Welding of Steel Water Pipe
AWWA C207	Standard for Steel Pipe Flanges for Waterworks Service
AWWA C208	Standard for Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C209	Cold-Applied Tape Coatings for Steel Water Pipe, Special Sections, Connections, and Fittings
AWWA C213	Fusion Epoxy Lining and Coating for Steel Water Pipelines
AWWA C602	Standard for Cement-Mortar Lining of Water Pipelines – In Place
AWWA C604	Installation of Buried Steel Water Pipe
ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
ASTM A105	Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A139	Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
ASTM A234	Standard Specification for Steel Pipe Fittings
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A370	Standard Test methods and Definitions for Mechanical Testing of Steel Products

ASTM A572	Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A1011	Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM A1018	Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM E165	Standard Practice for Liquid Penetrant Testing for General Industry
ASTM F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F594	Standard Specification for Stainless Steel Nuts
AWS D1.1	Structural Welding Code - Steel
AWS A3.0	Standard Welding Terms and Definitions
AWS QC1	Standard for AWS Certification for Welding Inspectors
NSF 61	Drinking Water System Components – Health Effects
SPFA	Steel Pipe Fabricators Association Quality Certification Program for Steel Pipe and Accessory Manufacturers

## 1.02 SUBMITTALS

- A. Furnish submittals in accordance with Section 01300.
- B. The Contractor shall submit shop drawings of the pipe and fittings to the Engineer for approval in accordance with the following requirements:
  1. Pipeline Layout Drawings
    - a. Pipeline Layouts shall be submitted showing stations, offsets, and elevations. Pipeline layouts shall also include: the pipe station and invert elevation at all changes to horizontal alignment or grade; all elements for curves and bends, both horizontal and vertical; and limits within each section of restrained and/or welded joints or concrete encasement.
    - b. Pipeline Layout Drawings shall be submitted for approval with pothole data.
      - 1) Provide for a review period of minimum two (2) weeks.
  2. Details for each pipe section, joint, fitting, or special, including type and thickness of cylinder; position, type, size, and area of reinforcement; manufacturing tolerances; maximum joint deflection; welding details for restrained joints; coating and lining holdbacks; field joint test procedures, joint bond details, fabrication tolerances, and all other pertinent information required for the manufacture and installation of the product.
  3. Locations and details of closures for length adjustment and constructability.
- C. Affidavits of Compliance with AWWA C200, AWWA C205, AWWA C209, ASTM A53, and ASTM A106.
- D. Design calculations for structural design of the pipe, special sections, and joints, sufficient to ascertain the pipe and fittings conform to the Specifications and are suitable for intended loads.
  1. Design calculations for the pipe shall be submitted to the Engineer for review no later than the submittal of the aforementioned layout drawings.

- E. Drawings showing the location and details of bulkheads for hydrostatic testing of the pipeline, and details for the removal of test bulkheads.
- F. Material specifications and steel reinforcement schedules including and describing all materials to be used.
- G. The Contractor shall furnish Factory test reports of the following:
  - 1. Mill Test certificates identifying physical and chemical properties of all steel products
  - 2. Mortar Cylinder test reports
  - 3. Hydrostatic test results
  - 4. Production weld test results
- H. Contractor shall provide samples and test specimens for certification tests at no additional cost to Owner.
- I. Coating manufacturer's qualifications and material data sheets.
- J. The Contractor shall submit complete welding information regarding location, type, size, and extent of all welds
  - 1. Distinguish in writing between shop and field welds.
  - 2. Indicate weld requirements using symbols and sketches detailing the welded joints. Include the preparation of parent metal required for welding.
- K. Reports of ASME Section IX welding certifications.
- L. Detail drawings indicating the proposed stulling and bracing.
- M. Detail drawings indicating the type, number, and other pertinent details of the slings proposed for pipe handling.

### **1.03 QUALITY ASSURANCE**

#### **A. Manufacturer Qualifications**

- 1. Pipe fabrication process at the plant facility shall have current SPFA and ISO 9001 Certification.
- 2. The pipe manufacturer shall have a minimum of ten (10) years continuous experience in manufacturing the pipe and fittings specified for this project.
- 3. Qualifying experience for pipe and fittings fabrication shall include a minimum of three projects completed or in current fabrication within the past ten (10) years with similar diameters and wall thickness.

#### **B. Welder Qualifications**

- 1. Qualify and certify welding procedures, welders, and operators in accordance with ASME Section IX and AWWA C200, for shop welding and AWS D1.1 for project site welding of piping work.
- 2. Qualification for welders: Field and manufacturer welders and welding operators shall be qualified under the standard qualification procedures of the ASME Boiler and Pressure Vessel Code, Section IX or AWS D1.1.
- 3. Qualify welders at no additional cost to Owner.

- C. Qualify welders under the provisions of AWS D1.1, by a qualified, approved testing agency not more than 12 months prior to commencing work or have had continual production welding experience since the date of their latest qualification.

## **1.04 DESIGN REQUIREMENTS**

### **A. Steel Cylinder Thickness**

1. Design the cylinder thickness in conformance with AWWA Manual M11 as modified and supplemented herein.
2. Design the thickness of the steel cylinder to account for loads resulting from the following conditions as applicable. Cylinder thickness may be adjusted in segments along the alignment to accommodate varying loading requirements. Design the cylinder thickness to the greater of the following:
  - a. As indicated on the Pipe Schedule on the Drawings
  - b. Maximum design internal pressure taking into account, design pressure, surge pressure, and any additional design factors.
  - c. Earth and superimposed loads based on design factors indicated.
  - d. Longitudinal Bending
  - e. Thrust Loads
  - f. External Pressure
  - g. Vacuum Pressure
  - h. Buckling
  - i. Handling
  - j. Minimum Allowable
  - k. Any other unlisted loads

### **B. Special Sections**

1. Design special sections from pipe cylinders designed in accordance with this specification.
2. Design special sections in conformance with AWWA Manual M11 as modified and supplemented herein.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Jifco, Inc.
- B. Northwest Pipe
- C. Hanson
- D. Mid America
- E. Or Approved Equal

### **2.02 PIPE**

- A. Pipe shall be cement mortar lined and coated or fusion epoxy lined and coated steel cylinder pipe per AWWA C200 where shown on plans.
- B. AWWA C200 pipe minimum wall thickness shall be 0.25 inches. Increased thickness shall be provided where specified.

- C. NSF Certification – All materials that may be in contact with drinking water shall be in compliance with NSF/ANSI 61.
- D. Fabricated pipe spools shall be welded by ASME-certified welders. Welds shall be made in accordance with the requirements of ASME Section IX, ANSI B31.1, ANSI B31.3, or AWWA C200, C207 and C208.
- E. For pipe 14 inches in nominal size and larger, the inside diameter after lining shall not be less than the nominal diameter indicated.
- F. Pipe smaller than 14 inches in diameter may be furnished in standard commercial pipe sizes in accordance with the indicated commercial pipe standards.
- G. Provide closure and correction pieces as necessary by the construction sequence at each heading in the pipe laying operation and to adjust the pipe to conform to the pipe stationing indicated. In addition to those required for the construction sequences, locate correction pieces and closure assemblies as indicated.
- H. Steel Cylinder:
  - 1. Steel pipe and fittings shall be fabricated from steel sheet, plate, or coil that conforms to:
    - a. Yield Strength: 36,000 psi minimum.
    - b. Coils: Steel coils shall be made from the continuous cast process or continuous cast slabs conforming to the physical and chemical characteristics of ASTM A1011 (for thickness up to 0.239 inch) or ASTM A1018 (for thickness greater than 0.239 inch).
    - c. Steel Plates: plates shall conform to ASTM A283, Grade D
    - d. Fittings can also be fabricated from plate conforming to ASTM A36 or ASTM A572 Grade 42.
  - 2. Use material conforming to one of the following for pipe fabricated from commercial steel pipe:
    - a. ASTM A139, Grades B or C
    - b. ASTM A53, Grades A or B
  - 3. Steel coils or plates shall be fine grained, fully milled and manufactured using the continuous casting process. The maximum carbon content shall be 0.25%. The maximum sulfur content shall not exceed 0.015%. The steel shall also meet a maximum carbon content of 0.45% as determined by criteria specified in AWS D1.1.
  - 4. Minimum tensile test elongation: 22% in a 2-inch gauge length
  - 5. Steel exceeding 1/2-inch in thickness used in fabricated pipe: Test for notch toughness using the Charpy-V Notch test per ASTM A370.
    - a. Acceptance criteria for absorbed energy: An average of 25 foot pounds at a test temperature of 30° Fahrenheit.
  - 6. Steel pipe and fittings shall be fabricated and tested in conformance with AWWA C200. The cylinders shall be fabricated by butt-welded spiral seam, girth seam or longitudinal seam.
  - 7. An expanding press or swaging die shall form bells for the lap-welded field joints.

### **2.03 FITTINGS AND APPURTENANCES**

- A. Steel fittings and appurtenances shall conform to the requirements of ASTM A234 or ASTM A105, ANSI B16.11.
- B. Fabricated steel fittings and appurtenances shall conform to AWWA C200 and C208. All fittings shall be designed in accordance with AWWA Manual M11 for the design pressures of the external loads shown.

- C. Wall thickness for fittings shall be reinforced to withstand either internal pressures, both circumferential and longitudinal, or external loading conditions, whichever is greater. In no case shall wall thickness of fittings be less than that of adjacent pipe.

## **2.04 CONNECTIONS**

### **A. Welded Joints:**

1. Provide field welds in accordance with AWWA C206. See plans for connection details.
2. Welded connections shall be sound and free from embedded scale or slag, with tensile strength of weld not less than that of thinner connected sections. Welds to be watertight.
3. Field Welds of buried piping shall be one of the following:
  - a. Bell and spigot lap welds
    - 1) Provide double weld lap joints where indicated or specified
    - 2) Provide ¼" NPT air test holes with lining blockouts, unless otherwise indicated or specified.
  - b. Butt strap welds
    - 1) Shall be welded both inside and outside joint.
    - 2) Longitudinal joint in the butt-strap to use full-penetration welds before making the circumferential fillet welds.
    - 3) Provide ¼" NPT air test holes with lining blockouts, unless otherwise indicated or specified.
    - 4) Do not make alignment changes at butt-strap joints
    - 5) Do not use mitered Butt-straps

### **B. Flange Connections:**

1. Flanges: Unless otherwise specified, steel flanges shall be Class E ring flanges for internal pressures up to 275 psi in accordance with AWWA C207. Flanges shall be in conformance with ASME B16.447 for higher pressure applications.
2. All Bolts and nuts shall be type 316 stainless steel per ASTM F593 and F594.
3. Use flat faced flanges to mate with dissimilar materials.
4. Blind flanges shall be in accordance with the appropriate standard as determined by the maximum operating pressure.

- C. Gaskets shall be as specified in Section 15060.

## **2.05 PIPE LINING**

- A. All materials that may be in contact with drinking water shall be in compliance with NSF/ANSI 61.

### **B. Cement Mortar Lining:**

1. Where specified, pipe (including butt ends) and fittings shall be lined with cement mortar as specified in AWWA C205, as modified and supplemented below:
  - a. Mortar lining thickness shall conform to the following:

Nominal Pipe Diameter (in)	Lining Thickness (in)	Lining Tolerance (in)
4-11	5/16	+/- 5/64
12-16	3/8	+/- 3/32
17-24	1/2	+/- 1/8
>24	1	+/- 3/16

- b. Fly ash or pozzolan shall not be used as a cement replacement.
- c. Hold back shop-applied interior linings from the ends of the pipe as indicated.
- d. Cement mortar lining cracks shall be classified and repaired in conformance with AWWA C205.
- e. Taper cement mortar lining as required for valve interfacing.

C. Epoxy Lining:

- 1. Where specified, pipe (including butt ends) and fittings shall be epoxy lined with not less than 10 mils of epoxy. Surfaces shall be prepared in accordance with SSPC-SP 10 Near White Blast Cleaning, and the lining applied as recommended by the manufacturer.
- 2. Epoxy lining shall be Hi-Build Epoxoline, Carboline, or equal.

D. Fusion Epoxy Lining:

- 1. Where specified, pipe (including butt ends) and fittings shall be fusion epoxy lined in accordance with AWWA C213. Surface preparation shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. The application method shall be by the fluidized bed method and shall attain 12 mils minimum dry film thickness.
- 2. Fusion epoxy lining shall be 3M Scotchkote 206N, or equal.
- 3. Field welds, connections and otherwise damaged areas shall be patched according to the manufacturer's instructions with 3M Scotchkote 206N.

**2.06 PIPE COATING**

A. Cement Mortar Coating:

- 1. Where specified, pipe and fittings shall be coated with cement mortar in accordance with AWWA C205 except the coating thickness shall be 1-inch, minimum.
- 2. Fly ash or pozzolan shall not be used as a cement replacement.
- 3. Hold back shop-applied exterior coatings from the ends of the pipe as indicated.
- 4. Cement mortar coating cracks shall be classified and repaired in conformance with AWWA C205.
- 5. Flanges and portions of pipe and fittings not covered with cement mortar shall be shop primed.
- 6. Unless otherwise indicated, coat exterior surfaces of specials passing through structure walls from the center of the wall or the wall flange to the end of the special.

B. Epoxy Coating:

- 1. Refer to Section 09900 for epoxy coating of pipes.

C. Fusion Epoxy Coating:

1. Where specified, pipe and fittings shall be fusion epoxy coated in accordance with AWWA C213. Surface preparation shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. The application method shall be by the fluidized bed method and shall attain 12 mils minimum dry film thickness.
2. Fusion epoxy coating shall be 3M Scotchkote 206N, or equal.
3. Field welds, connections and otherwise damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 206N.

## **2.07 SOURCE QUALITY CONTROL**

### **A. Conduct factory testing to evaluate pipe components in accordance with the requirements of AWWA C200 and C205.**

1. Provide copies of test results showing compliance with referenced standard:
  - a. Steel test reports
  - b. Submit mill test certificates identifying chemical and physical properties of each lot of steel delivered
  - c. Mortar cylinder test reports.
  - d. Any other test reports required.
2. Certificates of Compliance

### **B. Pipe Marking**

1. Provide each pipe, fitting, or appurtenance with a clear, permanent, waterproof, marked identification on the spigot end of the pipe. Markings shall include the following:
  - a. Identify each pipe section, joint, fitting, and special by the piece number shown on the pipeline layout schedule corresponding to its position along the pipeline layout
  - b. Size and design class of pipe, as indicated on pipeline layout schedule
  - c. Date of manufacture
  - d. Manufacturer's trademark or name
  - e. Piecemarks
  - f. Bends: field top mark, long side of bend, and deflection angle
  - g. Beveled Pipe: field top mark, long side of bevel, and bevel degree
  - h. Special notations and tagging of special items for location on pipeline
  - i. For specials and fittings, provide a 2-inch wide by 24-inch long stripe applied along the top centerline at each end.

### **C. Tests of Shop Production Welds**

1. Perform tests of production welds in conformance with AWWA C200 and other applicable standards.

## **2.08 PIPE STULLING**

- A. Provide stulling and cross bracing for all pipe sections to prevent damage during handling, storage, hauling, installation, backfilling, and compaction.
- B. Submit details of the stulling assembly and cross bracing for review by Engineer prior to start of pipe fabrication.

- C. After primary cure of lining, manufacturer shall furnish and install wood stulls and wedges for shipping, handling, and storage. The contractor may need to install additional bracing as required by the installation method, or other field conditions.
- D. For pipe 48 inches in diameter and greater, provide stulling with a minimum of six (6) points of contact (3 cross braces, vertical, 60 degrees, and 120 degrees) positioned at the ends of each pipe section and at 8 foot (maximum) intervals.
- E. Protect and maintain pipe ends and openings shall be covered with polyethylene or other suitable caps in an air tight manner to maintain adequate moisture within the pipe for protection of the lining. End seals shall remain in place until pipe has been backfilled to finished grade.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

#### **A. Delivery, Handling, And Storage**

1. During loading, transportation and unloading, prevent damage to pipes and coatings. Load and unload each pipe under control at all times.
2. Under no circumstances shall a dropped pipe be installed, unless inspected and accepted in writing by the Owner.
3. Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation to protect pipe, lining, and coating.
4. Pipe shall be stulled as required to maintain roundness of +/- 1% during shipping and handling.
5. Adjust stulling in pipe arriving on the job site as necessary to the correct dimensions prior to laying the pipe in the trench.
6. Do not roll coated pipe during handling operation.
7. Coated pipe shall be shipped on padded bunks with nylon belt tie-down straps or padded banding located approximately over stulling.
8. The Contractor shall inspect each pipe and fitting to ensure there are no damaged portions of the pipe. The Contractor shall immediately notify the Owner's Representative if damaged pipe is delivered to the project site.
9. Coated pipe shall be handled with two minimum 12-inch wide belt slings attached to a spreader bar, unless approved by the Engineer. The Contractor is prohibited from using cable slings or chains.
10. Lifting points shall be no closer than the 1/3 and 2/3 points along the length of the section. Select lifting points that do not result in damage to the pipe.
11. Pipe products delivered to the site shall be stored only on saddles or mounds of granular material or soil.
  - a. Fittings and appurtenances delivered to the site shall be stored such that the surface of the painted appurtenance is not resting on the ground or saddle.
12. No pipe shall be installed where the lining or coating surfaces show cracks or other defects that may be harmful as determined by the Engineer. Such damaged lining and/or coating surfaces shall be repaired, or a new undamaged pipe shall be furnished and installed, at no additional cost to the Owner.

13. Keep plastics caps over the openings of pipe and fittings to prevent excessive dryness of the cement-mortar lining. Maintain caps by fixing any tears or replacing damaged caps. Introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged caps.
14. Pipe plastic coverings or end plastic caps shall remain on the open pipe ends while they are stored onsite until they are being installed.

### **3.02 SHOP WELDING**

#### **A. General**

1. Perform welding in accordance with AWWA C200 by an unvarying arc-welding process that excludes the atmosphere during the process of deposition and while the metal is in a molten state.
  2. Where shop-welded pipe cylinder joints are necessary, provide butt-welded joints with complete penetration and fusion.
- B.** Pre-qualify all welding procedures used to fabricate pipe under the provisions of AWS D1.1. At the minimum, provide welding procedures for longitudinal, girth, and spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and flange welds, plates for lug connections, and attachments and fitup welds.
- C.** Perform all fabrication and welding by skilled welding operators and tackers who have had previous successful experience in the methods and materials to be used.
- D.** Use equipment for pipe fabrication that has previous successful experience in the methods and materials to be used and shall provide welding that meets the requirements consistently.

### **3.03 FACTORY INSPECTION AND TESTING**

- A.** Provide for the inspection of all pipe and specials at the place of manufacture in accordance with the provisions of AWWA C200 as supplemented by the requirements herein.
- B.** Notify the Engineer in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.
- C.** Perform tests at no additional costs to Owner.
- D.** Make necessary provisions for the Engineer to witness all testing. The Engineer shall have the right to witness all testing conducted by the Contractor, provided the Contractor's schedule is not delayed for the convenience of the Engineer.
- E.** In addition to those tests specifically required, Engineer may request additional samples of any material. Furnish such additional samples at no cost to Owner.
- F.** Except as modified herein, test all materials used in the manufacture of the pipe in accordance with the requirements of AWWA C200.
1. After the pipe cylinder is completed and prior to lining, hydraulically test each section of pipe to a pressure that will produce at least 75 percent of the yield strength of the steel.
  2. In addition to the tests required in AWWA C200, conduct weld tests on specimens that represent each 5,000 feet of production welds.
- G.** Testing of Completed Steel Plate Special Sections
1. Perform hydrostatic testing of the following specials with a pressure equal to 1-1/2 times the design working pressure if the special has been fabricated from straight pipe not previously test.
    - a. Elbows, wyes, crosses, and manifolds
    - b. Tees with the side outlet diameter greater than 30 percent of main pipe diameter.

2. Test all specials not hydrostatic tested by the liquid penetrant inspection method in accordance with ASTM E165, under Method B.
3. Repair any weld defects, cracks, leaks, distortion, or signs of distress identified through the testing procedures. Gouge out weld defects and re-weld. Retest the special after corrections.
4. Where welded test heads or bulkheads are used, provide extra length to each opening of the special. After removal of each test head, trim the special back to the design points with all finished plate edges ground smooth, straight, and prepared for the field joint.
5. Perform testing before untested joints have been coated or lined.
6. Perform testing of steel pipe hinges per AWWA C207

### **3.04 INSTALLATION**

- A. For this Section, “pipe” means both pipe and specials.
- B. Inspect each pipe section prior to installation to ensure that there are no damaged portions of the pipe.
  1. After identification and repair of damage, do not install the damaged section of pipe until Engineer has accepted the repairs in writing.
  2. Make necessary weld repairs and grind smooth any burrs, gouges, weld splatter, or other defects prior to placement.
  3. Repair damaged linings and coatings prior to installation, or provide a new undamaged section in its place.
- C. Install work in accordance with AWWA M11, AWWA C604, and per contract documents.
- D. Keep stulling in place until pipe has been backfilled to one foot above the pipe. Keep vertical stulling in place until pipe is backfilled to finished grade.
- E. Before placement of pipe into trench, each pipe component shall be thoroughly cleaned of any foreign substance, which may have collected thereon and shall be kept clean at all times after. During any interruption to work, the Contractor shall keep the openings of all pipes and fittings closed.
- F. Excavation, backfill, and compaction shall conform to Section 02200.
- G. Pipe Laying
  1. For Flowable fill
    - a. Support the pipe on sandbags until the flowable fill is placed.
    - b. Make excavations as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.
    - c. Take precautions to avoid floating the pipe during the placement of flowable fill.
    - d. In the event of pipe flotation, remove the out-of-position piping, remove all associated flowable fill, replace the pipe to the proper grade, and replace the backfill prior to proceeding to the next section of pipe laying.
  2. Lay each pipe section in the order and position shown on the laying schedule and to the indicated line and grade, with tolerance of approximately one inch plus or minus.
  3. Where necessary to revise the alignment or raise or lower the pipe due to unforeseen obstructions or other causes, contact the Engineer immediately. Provide the Engineer with the information necessary to evaluate the proposed change in grade or alignment.

4. Do not misfit any joint any amount which will be detrimental to the strength and water tightness of the finished joint. Maintain the minimum joint engagement as indicated.
  5. Moderate deflections and long radius curves may be made by means of beveled joint rings, by pulling standard joints, by using short lengths of pipe, or combination of these methods; except do not use pulled joints in combination with beveled joints.
  6. Limit the maximum angle for gasketed or welded pulled joints to conform to the manufacturer's recommendations or the angle which results from a 3/4 inch pull out from normal joint closure, whichever is less.
  7. Except for short runs that may be permitted by Engineer, lay pipe uphill on grades exceeding 10 percent. Where permitted, block each pipe section laid on a downhill grade greater than 10 percent and hold it in place until sufficient support is furnished by the following pipe to prevent movement. Prevent pipe from moving downslope from the action of temperature cycles.
- H. Do not install pipe upon a foundation into which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. Do not lay pipe unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.
- I. After installation, protect the openings of all pipe and specials with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water or any undesirable substance. Design bulkheads to prevent drying out of the interior of the pipe. Introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads.
- J. At all times, provide means to prevent the pipe from floating due to water entering the trench from any source. In the event of any damage due to flotation, restore the pipe and bedding to its specified condition, at no additional cost to the Owner.
- K. As pipe laying progresses, keep the pipe interior free of all debris. Clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, grouting of joints, and any necessary interior repairs, prior to hydrostatic testing the completed pipeline.
- L. Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the end of each work day.

### **3.05 JOINTS**

#### **A. Welded Joints**

1. Perform welding in accordance with AWWA C206 and this Section.
2. For flange attachment perform in accordance with AWWA C207.
3. Have each welding operator affix an assigned symbol to all their welds.
4. Mark each longitudinal joint at the extent of each operator's welding.
5. Where exterior welds are performed, provide adequate space and a safe environment for welding and inspection of the joints.
6. During installation of pipe with welded joints in either straight alignment or on curves, lay the pipe so that at least the minimum joint engagement is provided at all points around the circumference of the joint.
7. Do not make angular deflections at butt-strap joints or flexible coupling joints.
8. After the pipe has been laid but prior to welding the joints, backfill each section of newly laid pipe between the joints to at least one foot above the top of the pipe. Prevent movement of the pipe during initial backfill. Prevent backfill material from being deposited on the joint.
9. Control of Temperature Stresses

- a. To control temperature stresses, shade the un-backfilled joint areas of the pipe from the direct rays of the sun by the use of properly supported awnings, umbrellas, tarpaulins, or other suitable materials for a minimum period of two hours prior to the beginning of the welding operation until the weld has been completed.
  - b. Do not rest shading materials at the joint area directly on the pipe but support the shading materials to allow air circulation around the pipe. Shading of the pipe joints need not be performed when the ambient air temperature is below 45 degrees Fahrenheit.
10. Prior to the beginning of the joint welding, remove any tack welds used to position the pipe during laying. Equally distribute any annular space between the faying surfaces of the bell and spigot around the circumference of the joint by shimming, tacking, and fitting. Where more than one pass is required for the weld, make a root pass completely around the joint circumference prior to the additional passes required to complete the weld. Each pass except the first and final one may be lightly peened to relieve temperature stresses. Remove all dirt, slag, and flux before applying the succeeding bead.
  11. At all butt-strapped and double welded joints, complete the inside welds before starting on the outside weld. After welding, remove weld splatter and grind burrs smooth.
  12. Unless double welded joints are indicated, field-welded lap joints may be made on the inside or outside of the pipe unless otherwise indicated.

**B. Flanged Joints:**

1. Insert slip-on flange on pipe.
2. Assure maximum tolerances for flange faces from normal with respect to axis of pipe is 0.005 inch per foot of flange diameter.
3. Test flanges after welding to pipe for true to face condition and reface, if necessary, to bring to specified tolerance.
4. Leave 1/8- to 3/8-inch of flange bolts projecting beyond face of nut after tightening.
5. Coordinate dimensions and drillings of flanges with flanges for valves, pumps, equipment, tank, and other interconnecting piping systems.
6. When bolting flange joints, exercise extreme care to assure that there is no restraint on opposite end of pipe or fitting which would prevent uniform gasket compression or cause unnecessary stress, bending or torsional strains being applied to cast flanges or flanged fittings.
  - a. Allow one (1) flange free movement in any direction while bolts are being tightened.
7. Do not assemble adjoining flexible coupled, mechanical coupled or welded joints until flanged joints in piping system have been tightened.
8. Gradually tighten flange bolts uniformly to permit even gasket compression.
9. Do not overstress bolts to compensate for poor installation.

**3.06 FIELD LINING AND COATING OF JOINTS**

- A. Field mortar lining and coating of interior and exterior joints and butt straps shall be in accordance with AWWA C602 and C205. Thicknesses shall match adjacent surfaces.
- B. Field epoxy line and coat interior and exterior joints in accordance with the requirements of Section 09900.

**3.07 COATING OF BURIED VALVES, COUPLINGS, AND APPURTENANCES**

- A. After pipeline pressure testing, coat valves, couplings, flanged joints, and appurtenances in accordance with the requirements of the specified coating and lining system.

- B. If the joints are air or water tested using a procedure and test plugs acceptable to the Engineer, the requirement for coating valves, couplings, flanged joints, and appurtenances after pipeline pressure testing will be waived.

### **3.08 CORROSION CONTROL**

- A. Joint Bonding: bond all un-welded pipe joints using continuity bonding details indicated in Section 13100 – Cathodic Protection.
- B. Provide cathodic protection as indicated on the Contract Drawings.

### **3.09 FIELD TESTING**

#### **A. Welded Joints**

1. As soon as practicable after welding of each single welded lap joint or butt joint, test each joint.
  - a. Perform joint test by the liquid penetrant inspection procedure conforming to the requirements of ASTM E165, under Method B.
  - b. As an alternative, the Contractor may elect to perform joint test by x-ray method. Submit proposed testing procedures and equipment to Engineer for approval.
2. Remove all defects by carbon arc-air gouging, re-weld, and retest.
3. Test double-welded lap joints and butt-strap joints by the solution film method using air pressure between the double welds using a procedure acceptable to the Engineer.
4. Mark each circumferential joint, nozzle, or other weld into places 180 degrees apart.

#### **B. Deflection Testing**

1. For all piping with a nominal size of 36 inches or greater, perform pipe deflection measurements and submit to the Engineer.
2. Record deflection measurements on forms approved by Engineer. Include the pipe station, diameter measurements and the calculated deflection percentages.
3. Take measurements in the presence of the Engineer, unless Engineer has waived this requirement in writing.
4. Take measurements of each pipe section at the quarter point, two per pipe section, excluding elbows, reducers, and tees.
5. Take measurements after the pipe embedment backfill has been placed and compacted and after stulling has been removed.
6. Measure deflection at a minimum vertically (invert to crown) and horizontally (springline).
7. Calculate deflections as follows:
  - a.  $\text{Deflection} = (\text{Measured ID} - \text{Design ID}) / \text{Design ID}$
  - b. Deflection Tolerance: less than or equal to 2 percent
8. Deflection exceeding tolerance
  - a. Excavate failed pipe section between successful test points, re-insert stulling to requirements listed above, and replace backfill as indicated.
  - b. For pipe sections where deflections exceed the allowable and to eliminate the influence of the lining tolerance, Contractor may opt to chip out a small area of the lining and re-calculate the deflections to the inside diameter of the steel cylinder taking into account the thickness of the lining in the deflection calculation. Repair holes as specified herein.

9. Retest failed section following repairs.

C. Pressure Testing

1. Test pressure and duration shall be per Section 15060 – Piping Systems
2. The pressure test shall begin after the pipe has been filled with water and allowed to stand under a slight pressure for a minimum of 48 hours to allow the mortar lining to absorb water and allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be inspected for leaks. If leaks are found, corrective measure satisfactory to the Engineer shall be taken.
3. All visible leaks shall be repaired in a manner acceptable to the Engineer.
4. If the pipeline fails to pass the pressure test, the Contractor shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipeline. This shall continue until the pipeline passes the pressure test.

D. Disposal of Testing Water

1. Dispose of all testing water per City of Folsom requirements.
2. Prior to disposal, all testing water shall be treated to meet environmental regulations

E. Coordinate disposal

**3.10 FABRICATION**

A. Fabrication of Pipe

1. General
  - a. Fabricate pipe consisting of a steel cylinder, shop lined and coated as indicated
  - b. Apply cement mortar linings and coatings in accordance with AWWA C205, and as modified in these Specifications.
  - c. Apply fusion epoxy linings and coatings in accordance with AWWA C213, and as modified in these Specifications.
2. Steel Cylinder Thicknesses: Conform to the design requirements as specified in Section 1.04A of this section.
3. Field Joints:
  - a. Single-welded lap joints unless otherwise indicated
  - b. Double-welded lap joints where indicated.
  - c. Butt-strap joints only where required for closures or where indicated.
  - d. Joint design requirements: Meet or exceed the design pressure of the abutting pipe.
  - e. Welded Lap Joints:
    - 1) Form bell ends for welded lap joints by an expanding press or by being moved axially over a die in such a manner as to stretch the plate beyond its elastic limit to form a round bell with a sized diameter and shape.
    - 2) Do not form bells by a rolling process.
    - 3) Chamfer the inside corner of the bell and the outside corner of the spigot 1/16-inch to facilitate jointing the pipe in the field.
    - 4) Check lap joints for size and shape using accurate templates before the pipe is mortar lined and coated.

- 5) Maximum annular space between the outside of the spigot and the inside of the bell contact surface: 1/8 inch, measured in a radial direction when the pipe is joined in the field and fully engaged.
- 6) Minimum fillet weld sizes: Conform to AWWA C206.

#### 4. Restrained Joints

- a. Provide restrained joints where indicated or where necessary to resist thrust forces.
- b. Joint Types:
  - 1) Single-welded lap joints
  - 2) Double-welded lap joints
  - 3) Double-welded butt-strap joints.
- c. Joint Designs:
  - 1) Include considerations of stresses induced in the steel cylinder, lap joints, any stresses caused by temperature differentials, and by thrust at bulkheads, elbows, reducers, and line valves resulting from the test pressure.
  - 2) Do not exceed 50 percent of the specified minimum yield strength of the grade of steel utilized, or 18,000 psi, whichever is less, for the part being examined when longitudinal thrust is assumed to be uniformly distributed around the circumference of the joint.
- d. Do not exceed 18,000 psi under test pressure for fillet weld design stress.

#### 5. Cut pipe ends square on joints where butt straps are used.

#### 6. Beveled joints:

- a. Where beveled joints are necessary to make alignment changes, fabricate beveled joints as follows:
  - 1) Maximum angle: 5 degrees.
  - 2) Fabricate bevel on the bell end of the pipe section

### B. Fabrication of Special Sections

1. Conform to the dimensions per AWWA C208.
2. For elbows, unless otherwise indicated,
  - a. Minimum radius: 2.5 times the pipe diameter
  - b. Maximum angle on each segment of elbow: 22.5 degrees
3. Fabricate specials of the same material and minimum thickness as the pipe.
4. Check stresses of specials per AWWA M11 and adjust steel cylinder thickness as necessary.
5. Threaded outlet couplings: Forged steel suitable for 3,000 psi service.
6. Outlets, Tees, Wyes, Crosses, and Elbows
  - a. Fabricate outlets 14-inch and smaller from Schedule 30 or heavier steel pipe in the standard outside diameters.
  - b. Design outlet reinforcement in accordance with AWWA Manual M11, except use the greater of  $1.25 P_w$  (Working Pressure) or  $0.9375 P_t$  (Transient Pressure) for the design pressure, P.
  - c. Unless otherwise indicated, outlets 2 inches in diameter and smaller need not be reinforced.

- d. In lieu of saddle or wrapper reinforcement as required by the design procedure in AWWA Manual M11, specials with outlets may be fabricated of steel plate having a thickness equal to the sum of the pipe wall plus the required reinforcement.
  - e. Provide crotch plate reinforcement in accordance with AWWA Manual M11.
  - f. Fabricate outlets so that there is at least 18 inches between the outer edge of the reinforcing plate or outlet and any field joint.
  - g. Orient fabricated tees, wyes, crosses, elbows, and manifolds fabricated from cylinders with longitudinal or spiral weld joints to provide at least 6 inches clearances from outlets and reinforcing plates. If, due to the large size of reinforcing plates, this clearance cannot be achieved, inspect the cylinder joints and the reinforcing plate fillet welds by the liquid penetrant inspection method after fabrication of the outlet in accordance with ASTM E165, under method B. Test all welds that have a clearance of less than 12 inches with adjacent welds.
  - h. Provide joints to match the requirements of the associated pipe unless otherwise indicated.
7. Blind Flanges
- a. Install blind flanges in accordance with AWWA C207.
  - b. For blind flanges on pipe over 48-inches in diameter, install ring flange and dished head in accordance with AWWA C207.

**\*\* END OF SECTION \*\***

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## SECTION 15062 DUCTILE IRON PIPE

### PART 1 - GENERAL

#### 1.01 Summary

A. This section specifies ductile iron pipe, ductile or gray iron fittings and gaskets.

#### 1.02 References

A. This section contains references to some or all of the following documents, most recent edition. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI/ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI/ASME B1.20.1	Pipe Threads General Purpose
ANSI/ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings
ANSI/ASME B16.5	Pipe Flanges and Flanged Fittings
ANSI/ASME B18.2.1	Square and Hex Bolts and Screws (Inch Series)
ANSI/ASME B18.2.2	Square and Hex Nuts (Inch Series)
ANSI/ASME B31.1	Power Piping; Includes Addenda (2005) and Addenda (2006)
ANSI/ASME B31.8	Gas Transmission and Distribution Piping Systems
ANSI/AWWA C104/A21.4	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
ANSI/AWWA C105/A21.5	Polyethylene Encasement for Ductile Iron Pipe Systems
ANSI/AWWA C110/A21.10	Ductile Iron and Gray Iron Fittings (3-in through 48-in)
ANSI/AWWA C111/A21.11	Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges
ANSI/AWWA C116/A21.16	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings
ANSI/AWWA C150/A21.50	Thickness Design of Ductile Iron Pipe
ANSI/AWWA C151/A21.51	Ductile Iron Pipe, Centrifugally Cast, for Water (3-in through 64-in)
ANSI/AWWA C153/A21.53	Ductile Iron Compact Fittings for Water Service

<b><u>Reference</u></b>	<b><u>Title</u></b>
ANSI/AWWA C600	Installation of Ductile Iron Water Mains and their Appurtenances
ANSI/AWWA C606	Grooved and Shouldered Joints
ANSI B18.2.1	Square and Hex Bolts and Screws
ASTM A377	Index of Specifications for Ductile Iron Pressure Pipe
ASTM A193	Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A194	Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A674	Standard Practice for Polyethylene Encasement for Ductile Iron Piping for Water or Other Liquids
ASTM A716	Pipe Specification for Ductile Iron Culvert Pipe
ASTM A746	Standard Specifications for Ductile Iron Gravity Sewer Pipe

### **1.03 Drinking Water System Components**

- A. All water system components with wetted parts in contact with drinking water shall be in conformance with the U.S. Safe Drinking Water Act, the California State Waterworks Standards, and local Health Department Standards, including the requirements stated in the latest or most current version of NSF/ANSI 61 Annex G, NSF/ANSI 372 for “lead free” plumbing.

### **1.04 Definitions**

- A. Where cast iron pipe is specified the term and symbol shall mean ductile iron pipe.

### **1.05 Submittals**

- A. The Contractor shall submit the following in accordance with Section 01300 – Submittals:
1. Shop drawings
  2. Alignment/ layout drawings
  3. Certification that such length of pipe has been tested physically for ductility and has satisfactorily passed such tests.
  4. Manufacturers’ Affidavits of compliance with applicable references.
  5. Manufacturer’s product data to include size, type, weight, gasket materials, materials standards and installation requirements for pipe, connections and fittings.
  6. Certified hydrostatic test reports

### **1.06 Quality Assurance**

- A. Testing
1. Factory testing shall conform to the requirements of all applicable references.

## PART 2 - PRODUCTS

### 2.01 Pipe

A. Pipe design, materials, and manufacture shall comply with the latest revision of the following documents:

Item	Document
Thickness Design	ANSI/AWWA C150/A21.50
Pressure Pipe (Water and Other Liquids)	ANSI/AWWA C151/A21.51
Pressure Pipe (Gas)	ANSI/ASME B31.8
Non-Pressure Pipe (Sewer)	ASTM A746
Non-Pressure Pipe (Other Liquids)	ANSI/AWWA C151/A21.51
Non-Pressure Pipe (Culvert)	ASTM A716
Threaded Flange	ANSI/AWWA C115/A21.15
Fittings	ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53
Rubber Gaskets <sup>1</sup>	ANSI/AWWA C111/A21.11
Polyethylene Encasement (Water)	ANSI/AWWA C105/A21.5
Polyethylene Encasement (Other Liquids)	ASTM A674

<sup>1</sup> Manufactured in accordance with the applicable requirements of the AWWA standard, material specified below

### 2.02 Connections and Fittings

A. Connections

#### 1. Joints

a. Push-on and Mechanical:

- 1) The plain ends of push-on pipe and mechanical joint pipe shall be marked with paint to show the required depth of penetration for making the joint.
- 2) All joints shall be fully-restrained type, either integrally or externally.
- 3) Pipe joint shall be US Pipe TR Flex or American Ductile Iron Pipe Flex Ring.

b. Mechanically Restrained:

- 1) Mechanically restrained joints shall be designed to prevent separation of the joint by the pipe's internal thrust after installation.
- 2) The design shall permit disassembling of the joint for repair and maintenance.
- 3) Mechanical restraints to be 100% domestic only, "No Import Parts" or restraint glands.
- 4) For restrained joints at fittings, Restraints for ductile iron shall be Ford Meter Box Series 1400-D-SZ, EBAA Iron Series 1100 (3"-54"), Romac Romagrip (3"-48"), Star Pipe Stargrip Series 3000 (3"-36"), Sigma One-Lok Series D-SLDE (3"-48"), or US Pipe TR Flex (no gripper rings).

#### 2. Flange Assemblies

- a. Flange assemblies shall be provided as specified in Section 15000 - 2.01 and herein.
  - b. Flanges shall be full-faced in accordance with ANSI B16.1
  - c. Insulated flanges shall be provided for flanged piping system connections between dissimilar metals.
3. Flexible Expansion Joints:
- a. Where shown on the Drawings, flexible expansion joints shall be
    - 1) 350 psi minimum pressure rated
    - 2) Minimum deflection of 15° per ball joint
    - 3) Minimum expansion of 4 inches
4. Grooved End Couplings:
- a. Where shown on the Drawings, grooved end couplings shall be
    - 1) Victaulic Firelock or equal.
5. Sleeve-Type Couplings
- a. 30 inches and Smaller:
    - 1) Unless otherwise specified, couplings shall be ductile iron construction.
      - a) Standard couplings shall be PowerSeal 3501, Romac 501 or equal.
6. Flanged Coupling Adapters
- a. FCAs shall be restrained type, Sigma, Romac RFCA or Smith Blair Series 920 or 911.
7. Gaskets
- a. Gaskets shall be designated in Section 15060 – Piping Systems
8. Bolts:
- a. General
    - 1) Bolt Threads shall be ANSI B.1.1, standard coarse thread series;
    - 2) Bolts shall be Class 2A,
    - 3) Nuts shall be Class 2B.
    - 4) Bolt length shall conform to ANSI B16.5.
  - b. Material:
    - 1) Unless otherwise specified, bolts and nuts for submergence or buried applications shall be 316 stainless steel per ASTM F193 heavy hex head.
      - a) Length such that after installation, end of bolts projects 1/8-inch to 3/8 inch beyond outer face of nut. Nuts shall comply with ASTM A194 heavy hex pattern.
      - b) Galvanized or cadmium steel bolts are not acceptable substitutes for stainless steel, regardless of any other protective coatings.
    - 2) Flange assembly bolts for other installations shall be SAE Grade 5, ANSI B18.2.1 standard square or hexagon head carbon steel machine bolts with ANSI B18.2.2 standard hot pressed hexagon nuts.

## B. Fittings

1. Ends shall be flanged, mechanical joint, as specified in the Section 15060 – Piping Systems or as shown in the Drawings.

## **2.03 Pipe and Fitting Protection**

### **A. Lining**

1. Unless otherwise shown or specified, lining shall be cement mortar lining conforming to ANSI/AWWA C104/A21.4. Mortar lining seal shall be asphaltic coating per ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
2. For all raw or screened wastewater service (sewer force main-SFM, or wastewater-WW) the pipe shall be lined with Tnemec 431 or Protecto 401. Apply lining thickness as recommended by the coatings manufacturer.
3. Where specified, glass lining shall consist of vitreous and inorganic material applied to the internal surfaces that have been prepared by sandblasting. The lining shall be applied in a minimum of two (2) coats, separately applied and coated. The entire coating shall be a minimum of 10 mils and a maximum of 25 mils dry film thickness. Lining shall have a hardness of 5-6 on the MOHS scale and a density of 2.5-3.0 grams per cubic centimeter as measured by ASTM D-792. Repair field cuts per manufacturer's recommendations.

### **B. Coating**

1. Buried and Encased Service:
  - a. Asphaltic coating per ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
2. Exposed Service (except as noted on drawings):
  - a. Supply bare pipe – no asphaltic coating.
  - b. Provide fusion-bonded epoxy coating per Section 09900 – Protective Coating Systems.
3. Submerged Service:
  - a. Coat per Section 09900 – Protective Coating Systems.

### **C. Polyethylene Encasement**

1. Double V-Bio Polyethylene encasement shall be used on all buried ductile iron pipe and fittings. Installation of polyethylene shall be as specified in ANSI/AWWA C105/A21.5, Section 5-4.2.1, DIPRA's "Polyethylene Encasement" brochure, and these specifications.
2. Pipe, fittings, valves and couplings shall be wrapped. Fittings that require concrete backing shall be wrapped prior to placing the concrete.
3. The polyethylene encasement shall be V-BIO® Enhanced Polywrap as manufactured by US Pipe or approved equal.
4. The polyethylene encasement seams and overlaps shall be wrapped and held in place by means of a 2-inch wide plastic backed adhesive tape. The tape shall be Polyken No. 900 (polyethylene), Scotchwrap No. 50 (polyvinyl), or equal. The tape shall be such that the adhesive shall bond securely to both metal surfaces and polyethylene film.

### **D. Corrosion Control**

1. Cathodic protection shall be provided per Section 13100 – Cathodic Protection.
2. Where indicated, all lines exceeding 100 feet in length shall be electrically continuous by means of an exothermic weld.
3. Corrosion test stations shall be provided at intervals specified.

## **2.04 Restraints**

- A. Fittings unless otherwise shown or specified shall be restrained with EBAA Iron 1100, series Mega lug mechanical joint restraint, or Sigma.
- B. The ductile iron joints shall be restrained with EBAA Iron 1700, series bell harness, or Sigma.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. Piping runs shown on the drawings shall be installed to the horizontal and vertical layouts as shown on the plans. Proposed deviations shall be submitted in accordance with Section 01300 – Submittals.
- B. Pipe shall be installed in accordance with AWWA C600. Cuts on DIP pipe shall be coated with an acceptable bituminous material. Cut ends on lined pipes shall be coated in accordance with the approved/specified coating manufacturer's recommendations.
- C. Connections to existing structures and manholes shall be made so that the finished work will conform as nearly as practicable to the requirements specified for the new manholes, including necessary concrete work, cutting and shaping. Concrete mortar shaping within any structure and manhole shall be as specified.
- D. The maximum allowable angular deflection at the joints shall be 75 percent of the manufacturer's recommendation for push-on and mechanical joints.
- E. The Contractor shall conduct the tests in the presence of the Construction Manager.

### **3.02 Connections**

#### **A. General**

- 1. Utilize flanged or grooved-end connections to the fullest extent possible for all field connections. If field grooving is required for extraordinary reasons the Contractor shall document the reasons for review and approval by the Engineer. Contractor shall supply and utilize additional grooved fittings over and above those shown on the drawings as required for field fit up at no additional cost to the Owner.
- 2. Grooved couplings shall be installed in accordance with the coupling manufacturer's installation recommendations.

#### **B. Flanged:**

- 1. Pipe cutting, threading and jointing shall conform to the requirements of ANSI B31.1, and the fitting manufacturer's installation recommendations.
- 2. Where a metallic nonferrous pipe or appurtenance is connected to ferrous pipe or appurtenance, an insulating section shall be provided as specified.
- 3. Welding of flanges shall be made prior to applying lining.

#### **C. Mechanical Couplings:**

- 1. Mechanical couplings shall be installed in accordance with the coupling manufacturer's installation recommendations.
- 2. Where required for resistance to pressure, mechanical couplings shall be restrained.
- 3. Sleeve Type Couplings

- a. Sleeve type couplings shall be employed where shown on the drawings, as takedown couplings on large diameter pipelines, to provide flexibility in buried piping systems at connections to structures, and as a general pipe coupling where required or permitted by Section 15055. Unless otherwise provided by the requirements of Section 15055, buried sleeve-type mechanical pipe couplings shall be field coated in accordance with AWWA C210 and 16.2.7 of AWWA Manual M11.

#### 4. Plain or Grooved End Couplings

- a. Plain or grooved end couplings shall be employed where shown and elsewhere at the Contractor's option consistent with the restrictions set forth in the Specifications. Unless specifically indicated or specified to the contrary, plain or grooved end pipe couplings shall be of the flexible type. Where indicated on the drawings, couplings shall be the grooved end flexible type. Rigid type grooved end pipe couplings shall be employed at all valves or connections to mechanical equipment. Plain or grooved end pipe couplings shall not be employed for buried piping or piping encased in concrete or in suspended ceilings.

#### 5. Flexibility Coupling:

- a. Piping 2 inches in diameter and larger passing from concrete to earth shall be provided with flexible joints as specified
  - 1) within 2 feet of the structure and
  - 2) within 3 feet of the first joint.

#### 6. Expansion Joint

- a. Elastomer Bellows, reinforced molded wide arch type:
  - 1) Flanged, drilled to match pipe with split galvanized steel retaining rings.
  - 2) Washers over retaining rings to help provide leak-proof joint under test pressure.
  - 3) Control rods at all installations to protect the bellows from overextension.
  - 4) Bellows Arch Lining: Buna-N, nitrile, or butyl.
  - 5) Rated Temperature: 250 degrees F.
  - 6) Rated Deflection and Pressure: 1.5" at 110 psig
  - 7) Proco model RC 221, RC 231, or approved Equal.

#### 7. Takedown Couplings:

- a. Shall be screwed unions, flanged or grooved end mechanical coupling type joints.
- b. Flanged or grooved end joints shall be employed on pipelines 2-1/2 inches in diameter and larger.
- c. Where the piping passes through walls, takedown couplings shall be provided regardless of whether or not it is shown on the drawing. The location shall be within 3 feet of the wall or as shown on the Contract Drawings.
- d. A union or flanged connection shall be provided within 2 feet of each threaded end valve.

#### D. Joints

1. Provide restrained joints as indicated or as required to develop full joint restraint to withstand all working and test pressures.
2. Joints encased in concrete below structures need not be restrained type providing Contractor can show that the concrete encasement will provide the necessary restraint for the piping system.

#### E. Insulating Sections

1. Where a metallic nonferrous pipe or appurtenance is connected to ferrous pipe or appurtenance, an insulating section of rubber or plastic pipe shall be provided.
2. Each insulating section shall have a length of 2- to 4-inches.

#### **3.03 Anchorage**

- A. Anchorage shall be provided as specified. Calculations and drawings for proposed alternative anchorage shall be submitted.

#### **3.04 Acceptance Testing**

- A. Hydrostatic pressure and leakage tests shall be conducted and acceptability determined in accordance with AWWA C600 as modified by Section 15000 – Piping Materials and Components and Section 15060 – Piping Systems.

**\*\* END OF SECTION \*\***

## SECTION 15064 PVC PIPE

### PART 1 - GENERAL

#### 1.01 Summary

A. This section specifies polyvinylchloride (PVC) for pressurized and non-pressurized systems.

#### 1.02 References

A. This section contains references to some or all of the following documents, most recent edition. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM D1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120
ASTM D2241	Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2665	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2466	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fitting, Schedule 40
ASTM D2467	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2665	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe Fittings
ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

**Reference**

AWWA M23

**Title**

Manual of Water Supply Practices PVC Pipe – Design and Installation

**1.03 Drinking Water System Components**

- A. All water system components with wetted parts in contact with drinking water shall be in conformance with the U.S. Safe Drinking Water Act, the California State Waterworks Standards, and local Health Department Standards, including the requirements stated in the latest or most current version of NSF/ANSI 61 Annex G, NSF/ANSI 372 for “lead free” plumbing.

**1.04 Submittals**

- A. The following shall be submitted by the Contractor in accordance with the requirements in Section 01300 – Submittals.
1. Alignment/ Layout drawings
  2. Manufacturer's certificates shall be provided with each delivery. This certifies that each pipe section complies with this specification.
  3. Manufacturers' Affidavits of compliance with applicable references
  4. Descriptive literature showing pipe dimensions, joints, couplings and other details for each size of pipe indicated.

**1.05 Quality Assurance**

- A. The pipe, joints and fittings shall be tested in accordance with the requirements of this specification and as specified in the reference standards. The Contractor shall submit the test results to the Owner's Representative.
- B. Additional sampling may be requested of any material for testing by the Owner at the Owner's expense. The additional samples shall be furnished by the Contractor at no additional cost to the Owner.

**1.06 Delivery, Storage and Handling**

- A. Delivery
1. Pipe shipment should be carefully inspected by the Contractor upon arrival for defects or damage during delivery.
  2. The Manufacturer shall mark the nominal pipe diameter, pressure class, manufacturer's name, date of extrusion, ASTM designation and PVC Cell Classification on the pipe.
- B. Storage
1. Pipe shall be stored in such a way as to prevent sagging, compression or bending.
  2. Pipe shall be protected from direct sunlight by covering with an opaque material while permitting air circulation.
  3. Gaskets should be stored in a cool, dark place out of direct sunlight.
- C. Handling

1. Handling of the PVC pipe shall be done in accordance with manufacturer's instructions to insure that the pipe is not damaged in any manner during storage, transit, loading, unloading, and installation.
2. Any length of pipe having a gouge, scratch, or other permanent indentation more than 10 percent of the wall thickness in depth shall be rejected.
3. Defective, damaged or rejected pipe shall be immediately removed from the working area and replaced by the contractor at no additional cost to the owner.

### **1.07 Warranty**

- A. The pipe shall be warranted to be free of defects in material for a period of one year from substantial completion.

## **PART 2 - PRODUCTS**

### **2.01 Material**

- A. PVC material for pipes and fitting shall comply with Cell Classification 12454-B or better, in accordance with ASTM D1784.
- B. PVC shall be normal impact unless otherwise specified
- C. Pipe Color shall be based on application as follows:
  1. Blue: potable water
  2. Brown: drains
  3. Green: sanitary sewer, sewer force mains, scum, sludge, waste activated sludge

### **2.02 PVC Non-Pressure Pipe**

- A. SDR 26 and 35
  1. Pipe shall meet the requirements of ASTM D2241, ASTM D3034 and ASTM F679.
  2. Fittings and Joints
    - a. Push-on:
      - 1) ASTM D3034
      - 2) Gaskets: ASTM F477
- B. Schedule 40 and 80
  1. Pipe shall meet the requirements of ASTM D1785.
  2. Fittings and Joints:
    - a. Socket type:
      - 1) Schedule 40: ASTM D2665
      - 2) Schedule 80: ASTM D2467
      - 3) Solvent weld cement for socket type connections: ASTM D2564.

### **2.03 PVC Pressure Pipe**

- A. Schedule 40 and 80
  1. Pipe shall meet the requirements of ASTM D1785.

## 2. Fittings and Joints:

### a. Socket type:

- 1) Schedule 40: ASTM D2466
- 2) Schedule 80: ASTM D2467
- 3) Solvent weld cement for socket type connections: ASTM D2564.

### b. Threaded:

- 1) Schedule 80: ASTM D2464

### c. Flanged:

- 1) Flanged shall be used for transitions between PVC pipe and pipe of different material
- 2) Schedule 40/80: See Section 15055, 2.01.
- 3) Flange bolts for submerged or wet conditions shall be 316 stainless steel.
- 4) PVC flanges shall be Class 300 conforming to ANSI B16.5 made of material similar to pipe.

## B. C900:

1. Not Used.

## **PART 3 - EXECUTION**

### **3.01 General**

- A. All installation, jointing, tests for defects and leakage shall be performed in the presence of the Owner's Representative and shall be subject to his approval before acceptance.
- B. All material found to have defects will be rejected and the Contractor shall promptly remove such defective materials from the work site.
- C. Installation shall conform to the requirements of the following standard practices, instructions furnished by the pipe manufacturer, and to the supplementary requirements or modifications specified in this section. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.
  1. ASTM D2321: SDR 26
  2. ASTM D2855 and F402: Solvent welding joining procedure
- D. Unless otherwise specified, paint PVC piping exposed to direct sunlight as specified in Section 09900 – Protective Coating Systems.

### **3.02 Trenching and Backfill**

- A. Trench excavation and backfill shall conform to all requirements detailed in Section 02200 – Earthwork and all necessary provisions described under Section 9.2 of the City of Folsom Standard Construction Specifications.

### **3.03 Installation**

#### A. General:

1. Pipe and fittings shall be of the sizes indicated.

2. Proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the Contractor for safe and efficient execution of the Work.
3. The interior of the pipe shall be cleaned of all foreign matter before installing.
4. The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe shall be repaired or replaced.
5. All pipe, fittings, valves, and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings.
6. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
7. While laying pipe is NOT in progress, the open ends of the installed pipe shall be closed to prevent trench water from entering into the interior of the pipe. Adequate backfill shall be deposited on pipe to prevent floating of pipe. Any pipe that has floated shall be removed from the trench, cleaned, and re-laid in an acceptable manner. The use of burlap, wood, or other similar temporary plugs will not be permitted.
8. No pipe shall be laid when, in the opinion of the Owner's Representative, the trench conditions or the weather are unsuitable for such work.

#### B. Field Cutting Pipe

1. Cutting and machining of the pipe shall be accomplished in accordance with the pipe manufacturer's standard procedures for this operation.
2. Pipe shall NOT be cut with a cold chisel, standard iron pipe cutter, wedge type roll cutter or any other method that may fracture the pipe or will produce ragged, uneven edges.
3. Pipe shall be square cut with fine tooth saw or other cutter or knife designed for use with plastic pipe.
4. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander or abrasive disc. Remove burrs by smoothing edges with a knife, file, or sandpaper.

#### C. Field Joining Pipe Joints and Fittings:

1. Pipe shall be jointed in compliance with manufacturer's printed instructions.
2. All pressure pipe shall be suitably restrained by use of thrust blocks or other means as approved by the Engineer.
3. Solvent Weld Joint Type Pipe
  - a. Test fit dry pipe and fittings before applying cement. Pipe should enter socket without forcing at least one-third but not more than two-thirds the depth of socket. Fittings that are looser or tighter shall not be used.
  - b. Thoroughly clean and dry the pipe end and socket of fittings prior to application of solvent.
  - c. Before applying cement, apply primer evenly to outside surface and end of pipe and inside surface of socket.
  - d. Apply cement evenly to outside surface and end of pipe and inside surface of socket. Avoid excess application of cement but insure complete coverage of all bonding surfaces.
  - e. Mark depth of socket on pipe to guide application of cement and insure full insertion of pipe.

- f. Insert pipe in socket, twisting pipe or fitting approximately 1/2 turn as pipe is being seated in socket. Make sure pipe is fully seated providing a bond between end of pipe and shoulder of socket.
  - g. Immediately wipe excess cement from pipe leaving no more than a 1/8 inch fillet at fitting end. Hold assembled joint in place for approximately 15 seconds and allow to set for 30 minutes before moving. Avoid rough handling for 48 hours. Longer periods may be required in cold or wet weather.
4. Mechanical Joints
- a. Cut off and remove bevel end of pipe before installing in mechanical joint.
5. Bends, Tees, and Reducers
- a. Ductile-iron and/or PVC fittings shall be installed utilizing standard installation procedures.
  - b. Cable, rope, or other devices used for lowering fittings into trench shall be attached around the exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fitting's interior for handling.

### **3.04 Compaction of Pipe Bedding and Backfill**

- A. Compaction of pipe bedding and backfill material shall conform to the requirements of Section 02200 – Earthwork.

### **3.05 Testing**

- A. Field testing of gravity sewer pipe shall be conducted and acceptability determined in accordance with of Section 15000 – Piping Materials and Components and Section 15060 – Piping Systems.

**\*\* END OF SECTION \*\***

**SECTION 15066  
COPPER PIPE**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

A. This section specifies copper piping, tubing, couplings and fittings.

**1.02 REFERENCES**

A. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ANSI B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes
ASTM B 32	Solder Metal
ASTM B 88	Seamless Copper Water Tube

**PART 2 - PRODUCTS**

**2.01 COPPER TUBING**

A. Copper tubing shall be seamless copper, conforming to ASTM B88. Unless otherwise specified, copper tubing shall be Type L, drawn, where used in exposed service and Type K, annealed or drawn for buried service.

**2.02 COUPLINGS AND FITTINGS FOR COPPER TUBING**

A. Unless otherwise specified, couplings and fittings for copper tubing 1/2-inch and smaller nominal diameter shall be compression type, brass or bronze, capable of holding the full bursting strength of the tubing; shall meet the requirements of ANSI B16.26; and shall be Swagelok, Gyrolok, or equal. Couplings and fittings for copper tubing larger than 1/2-inch nominal diameter shall be wrought copper or bronze, solder joint pressure fittings and shall conform to ANSI B16.22.

**2.03 SOLDER**

A. Solder to be used in copper piping shall be ASTM B32, Alloy Grade 50B.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

A. All buried copper piping shall be encased within a 8-mil polyethylene sleeve. Sleeves shall be color coded to match service application of pipe.

**3.02 SOLDER JOINTS**

A. All pipe and fittings to be jointed with solder shall be free from all burrs and wire brushed or steel wool cleaned. After cleaning, a paste flux shall be evenly and sparingly applied to the surfaces to

be joined. Solder shall then be applied and flame passed toward the center of the fitting until the solder disappears. All excess solder shall be removed while it is still plastic. No acid flux or acid wipe shall be used in making solder joints.

### **3.03 DIELECTRIC PROTECTION**

- A. Copper tubing or fittings shall not be permitted to come in contact with steel piping, reinforcing steel, or other steel at any location. Electrical checks shall be made to assure no contact is made between copper tubing and steel elements. Wherever electrical contact is demonstrated by such tests, the Contractor shall provide dielectric protection.

**\*\* END OF SECTION \*\***

**SECTION 15100  
VALVES AND MISCELLANEOUS COMPONENTS**

**PART 1 - GENERAL**

**1.01 Summary**

- A. This Section specifies the requirements for furnishing and installing valves and miscellaneous components.
- B. References
1. This section contains references to the following documents. They are a part this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<b><u>Reference</u></b>	<b><u>Title</u></b>
AWWA C213	Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C504	Rubber-Seated Butterfly Valves
AWWA C509	Resilient-Seated Gate Valves for Water Supply Service
AWWA C512	Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
AWWA C550	Protective Interior Coatings for Valves and Hydrants
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. – 60 In.
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A436	Standard Specification for Austenitic Gray Iron Castings
ASTM A536	Standard Specification for Ductile Iron Castings

**1.02 Submittals**

- A. Product Data, Shop Drawings, Samples: The following information shall be submitted in accordance with the requirements of Section 01300- Submittals:
1. Butterfly Valves: Annotated Product Bulletins
  2. Gate Valves: Annotated Product Bulletins
  3. Ball Valves: Annotated Product Bulletins
  4. Hose Valves: Annotated Product Bulletins
  5. Pump Control Valves: Annotated Product Bulletins
  6. Combination Air/Vacuum Release Valves: Annotated Product Bulletins
  7. Pressure/ Vacuum Gauges: Annotated Product Bulletins
  8. Mechanical/ Flexible Pipe Couplings: Annotated Product Bulletins

9. Flexible Expansion Joint: Annotated Product Bulletins

B. Operation and Maintenance Data: Installation, operating and maintenance data in accordance with Section 01360 – Operating and Maintenance Information.

### **1.03 Delivery, Storage and Handling**

A. All valves and miscellaneous items shall be packed, shipped, stored and handled in accordance with Section 11000 – General Requirements for Equipment.

### **1.04 Project/Site Conditions**

A. All items will be located in an exterior area. Temperature is expected to vary from 30° F to 115° F. Relative humidity is expected to vary from 10% to 100%.

## **PART 2 - PRODUCTS**

### **2.01 Drinking Water System Components**

A. All water system components with wetted parts in contact with drinking water shall be in conformance with the U.S. Safe Drinking Water Act, the California State Waterworks Standards, and local Health Department Standards, including the requirements stated in the latest or most current version of NSF/ANSI 61 Annex G, NSF/ANSI 372 for “lead free” plumbing.

### **2.02 Manufacturers**

A. Butterfly Valves:

1. Clow Series 4500, Pratt Groundhog or approved equal.

B. Resilient-Seat Gate Valves:

1. American Flow Control AWWA C515
2. Mueller 2360 (3” thru 10”)
3. M&H Valve AWWA C509 (3” thru 12”)
4. Approved equal.

C. Ball Valves:

1. Flow Tek NSF 61, or
2. Approved equal.

D. Hose Valve:

1. Nibco
2. Approved Equal

E. Pump Control Valve:

1. Cla-Val model 60-BT or
2. Approved equal.

F. Combination Air/Vacuum Release Valves (CAV):

1. ARI Model D-020,
2. APCO Series 140C, or
3. Approved equal.

- G. Pressure/Vacuum Gauges:
  - 1. Vacuum Ashcroft 4", or
  - 2. Approved equal.
- H. Mechanical/Flexible Pipe Couplings
  - 1. Romac Industries, or
  - 2. Smith-Blair,
  - 3. Approved equal.
- I. Flexible Expansion Joints
  - 1. Proco Products, Inc
  - 2. Approved equal.

**2.03 Butterfly Valves**

- A. Per the City of Folsom Standard Construction Specifications, butterfly valves shall be used for pipe sizes 12-inches and larger.
- B. Valves shall be resilient rubber seated, tight closing type. Butterfly valves and all accessories, including operators, shall meet the requirements of AWWA C504, except as otherwise specified. Valve bodies shall be short- or long-body flanged type, lug type with drilled and tapped bolt holes, or mechanical joint-end type, as shown or specified. Wafer body type valves without lugs are not acceptable.
- C. Provide gear operator, wrench nut and valve box on all buried butterfly valves.
- D. Butterfly valve pressure classes shall exceed the test pressure for the pipeline in which the valve is installed, or shall be as specified, whichever is greater.
- E. Valves shall be constructed of materials resistant to corrosion for the required service. Valve exterior and interior shall be epoxy coated per AWWA C550. Valve materials shall be as specified below or as required for the service:

<u>Valve Component</u>	<u>Manufacture Material</u>	<u>Standards</u>
Body	Ductile Iron	ASTM A126 CLASS B OR ASTM A536 GRADE 65-45-12
Shafts	Stainless Steel	18-8, Type 304 or 316
Discs	Cast Iron	ASTM A48 CLASS 40
	Ductile Iron	ASTM A536 GRADE 65-45-12
	Alloy Cast Iron	ASTM A436 TYPE 1
	Bronze	Accordance with AWWA C504
Mating Seat Surface	Stainless Steel or Bronze	ASTM A276 18-8
Seats	Natural Rubber	

- F. If stub shafts are furnished, the shafts shall extend a minimum of 1-1/2 diameters into the discs and the clearance between the shaft and the discs shall not exceed the following:

<u>Shaft Diameter, inches</u>	<u>Maximum Radial Clearance, inches</u>
1/2 to 1-1/2	0.002
2 to 4	0.0025

G. Testing

1. Butterfly valves 24” and larger shall have a coating thickness test once pressure tested and cleaned for filling.

**2.04 Resilient-Seat Gate Valves**

- A. Gate valves shall be used for pipe sizes 10-inches and smaller.
- B. Valves shall be full-port, iron-body, bronze-mounted, resilient-seated solid-wedge.
- C. Gate valves shall comply with AWWA C515, including applicable hydrostatic testing.
- D. Provide wrench nut and valve box for all buried gate valves.
- E. Features:
  1. Design Working Pressure: 175 psig min
  2. Coatings and Linings:
    - a. Conform to AWWA C550 fusion bonded epoxy.
    - b. For potable water applications, epoxy lining shall be NSF 61 approved.

F. Materials of construction shall be as follows:

<b>Components</b>	<b>Material</b>
Body	Ductile Iron
Wedge	Ductile Iron, rubber encapsulated
Mounting	Bronze
Stem	Bronze, AWWA C500, Section 3.12
Seat rings	Bronze, Grade A, AWWA C500, Section 3.8
Coating	Fusion Epoxy

G. Construction:

1. Exposed gate valves shall be rising stem type. Buried or submerged gate valves shall be of the nonrising stem type. Rising stem valves shall be provided with a stem collar stuffing box and packing gland with Teflon braid packing. Nonrising stem valves shall be provided with O-ring stem seals. The body shall be provided with screwed-on seat rings.
2. Gate valve end connections in exposed pipelines shall be flanged or threaded as specified. Threaded ends shall not be provided on gate valves with end connections larger than 2 inches. End flanges shall be integral with the gate valve body and be faced and drilled in accordance with ANSI B16.1 for 125-pound flanges. Gate valves in buried pipelines 4-inches and larger shall be flanged or mechanical joint.
3. Unless specified otherwise, valves less than 6-inch size shall be provided with handwheels and valves 6 inches and larger shall be provided with geared operators with handwheels.

**2.05 Ball Valves**

- A. Valves shall have manual operators with lever or handwheel.
- B. Ball valves up to 1-1/2 inches in size shall have bronze or forged brass 2- or 3-piece bodies with ends threaded and shall be designed for a pressure rating of not less than 175 psi. Valves 2-inch

to 4-inch in size shall have bronze forged brass or steel 2-or 3-piece bodies with flanged ends and shall be designed for a pressure rating of 175 psi.

- C. The balls shall be fabricated of solid brass, chrome plated bronze, or Type 316 stainless steel, with full openings.
- D. The valve stems shall be of the blow-out proof design, and fabricated of bronze or Type 316 stainless steel and shall include reinforced Teflon seals.

## 2.06 Hose Valves

- A. Hose valves shall be brass, composition disc. One-inch valves shall have hose thread outlet.

## 2.07 Pump Control Valve

- A. Materials of construction shall be as follows:

<u>Component</u>	<u>Material</u>
Body	Ductile Iron, ASTM A536
Disc Guide, Trim & Seat	Stainless Steel, Type 304
Diaphragm	Buna-N with nylon inserts
Disc	Buna-N
Pilot Control Valve	Bronze with Stainless Steel trim
Coating	Fusion epoxy

- B. Flow control shall be accomplished without cycling, hunting, or chattering. Motion of parts shall be smooth and nonsticking. All moving parts normally requiring lubrication shall have means provided for such lubrication and shall be adequately lubricated prior to delivery.
- C. Provide pilot line shutoff cocks; pilot line strainers; and open and closed speed controls on all valves.
- D. Control Valve Schedule
  1. Pump Control Valve shall be a flanged, globe-style, full-port Cla-Val Model 60-BT. The valve body and cover shall be ductile ASTM A536 and shall be designed to withstand a pressure of 175 psi minimum.
  2. Valve shall be fitted with check feature to automatically close the valve to prevent flow reversal.

## 2.08 Combination Air Release and Vacuum Relief Valves

- A. Provide valves with the inlet and orifice sizes indicated. If the orifice sizes are not indicated, propose an orifice size suitable for the proposed operating conditions for each valve as part of the submittal.
- B. Operating pressures: 175 psi minimum. Provide valves with higher pressure ratings where indicated or as necessary to meet test pressure.
- C. Provide valves of the type, and size, and in the location indicated.
- D. Combination Air Valves (1" to 3") shall be single body, with a water diffuser and air throttling device to prevent excess water discharge during pump startup. Inlet/Outlet shall be NPT or flanged.
- E. Automatic combination air release valves shall be float operated, rolling seal or simple lever type designed to automatically exhaust air from piping under pressure and during filling and allow air to

enter pipeline during draining. Valves shall be designed to withstand a working pressure of 175 psig. The air vent shall close drop tight, incorporating an easily renewable seat.

F. Materials of construction shall be as follows:

<b><u>Component</u></b>	<b><u>Material</u></b>
Body and Cover	Cast Iron ASTM A48 150 Class
Linkage	Stainless Steel
Valve	Buna-N
Seat	Stainless Steel
Float	Stainless Steel
Gasket	Armstrong

G. Testing

1. Hydrostatically test air release valves and air vacuum release valves per AWWA C512.

## **2.09 Pressure/Vacuum Gauges**

- A. Pressure Gauges: Gauges shall be mounted on diaphragm seals.
- B. All gauges shall have internal or external pulsation dampeners or snubbers. Gauges shall be 4-inch premium grade, glycerin filled units of the bourdon tube element type. They shall have 270-degree milled stainless steel movements, phenolic cases, shatterproof glass windows, and 1/2-inch npt process connections. Uncertainty shall be no greater than 1 percent of span. All exposed metal parts shall be 300 series stainless steel.
- C. Diaphragm Seals: Diaphragm type chemical seals shall consist of a 316 stainless steel body with the diaphragm material to be determined by the manufacturer for the specific application. Seals shall be of the thread attached type and shall be provided with a purge connection.
- D. Pressure Sensors (Tubular Chemical Seals): Pressure sensors (tubular chemical seals) shall be of the full line-size type with an ANSI flanged or wafer type cast iron or steel body and flexible liner suitable for the service intended. A liquid filled cavity between the liner and the body shall transmit the line pressure to a diaphragm seal attached by a threaded nipple. The sensing medium shall be equal parts of ethylene glycol and water and shall be factory installed.
- E. Gauge Taps: Unless otherwise shown or specified, gauge taps shall be provided on the suction and discharge of all pumps having inlet and outlet piping larger than 2 inches in diameter and on the suction and discharge of all vacuum pumps, and air and gas blowers. All gauge taps shall consist of 1/4-inch gauge cock attached by a threaded nipple to the pipeline. The exposed threads of each gauge cock shall be protected by a brass plug.

## **2.10 Mechanical/Flexible Pipe Couplings**

- A. Sleeve-Type Couplings: Unless otherwise indicated, flexible type mechanical pipe couplings not intended to take tension shall be Rockwell Type 411, Dresser Style 38, or equal, with the stop removed from the middle ring. Couplings for connecting steel pipe to ductile iron pipe shall be Rockwell Type 413, Dresser Style 62, or approved equal. Flanged coupling adapters shall be Smith Blair style 920 or 911, Romac FCA, or approved equal. Gaskets shall be suitable for exposure to petroleum products, solvents and temperature up to 230 degrees F.

## **2.11 Flexible Expansion Joints**

- A. Provide elastomeric expansion joints as manufactured by Proco, or equal. Expansion joints shall allow expansion and control vibration when connecting rigid pipes. Expansion joints shall be

suitable and certified for service in potable water systems and capable of performing to a maximum pressure of 185 psi. Expansion joints shall be suitable for outdoor service and exposure to the elements. All expansion joints provided must be regularly manufactured and stocked by the manufacturer.

## **2.12 Valve Operators**

- A. All valves, except check valves, shall be provided with manual operators unless otherwise specified. The direction of rotation of the handwheel or lever to open the valve shall be counterclockwise. Each valve body shall have cast thereon the word OPEN and an arrow indicating the direction to open.
- B. Manual valve operators shall meet the requirements of Section 15000- Piping Material and Components.

## **2.13 Valve Boxes**

- A. Valve boxes extending to the finished or established ground or paved surfaces shall be provided for all buried valves. Valve boxes shall be H-20 traffic rated. Provide for all buried valves, C900 PVC extension sleeve with Christy G5 boxes (Brooks or equal) and cast iron traffic covers.
- B. Valve boxes outside of street or traffic locations shall be installed with a 6-inch wide by 6-inch deep concrete collar with a #4 rebar reinforcing ring.
- C. All valve box lids shall be marked Water unless otherwise stated on the Plans.
- D. Operator nut shall be within 30-inches of final surface grade.
- E. All gate valves shall be centered in a one-piece riser stock with the use of a riser aligner or approved equal.

## **PART 3 - EXECUTION**

### **3.01 Installation**

- A. General: Valves shall be installed in accordance with the manufacturer's instructions. Valves shall be independently supported to prevent stressed on pipe.
- B. Access: Valves shall be installed to provide easy access for operation, removal and maintenance and to prevent interferences between the valve operators and structural members or other obstructions.
- C. Identification: All valves, pipes, and appurtenances shall be labelled per Section 15000 of these Specifications.

### **3.02 Coating**

- A. Exposed valves shall receive final field coating as specified or in accordance with Section 09900 – Protective Coating Systems to match adjacent piping.

### **3.03 Manufacturer's Field Services**

- A. The services of a qualified representative of the manufacturer of the control valves be provided to inspect the installation of the equipment, make any necessary adjustments, test and place the equipment in satisfactory operating condition.
- B. Provide minimum of 8 hours instruction, exclusive of startup services, to cover all the control valves including operation, components, maintenance, and troubleshooting. The training may be

videotaped by the Owner. The training session time and date will be scheduled with the Owner through the Construction Manager.

**\*\* END OF SECTION \*\***

## **SECTION 16010 GENERAL ELECTRICAL PROVISIONS**

### **PART 1 - GENERAL**

#### **1.01 Summary**

- A. This division includes the provisions for all material, labor, tools, equipment, testing and services necessary to provide a complete and operable electrical system.
- B. The provisions of this Section shall apply to all electrical items specified in the various sections of Division 16 (Electrical), Division 17 (Instrumentation) and all other Divisions specifying electrical items of these Specifications, except where otherwise specified or shown on the Contract Documents.
- C. Furnish all necessary labor, materials, equipment and incidentals required to install a complete and operational electrical system according to the intent of this specification and the accompanying Drawings, whether itemized or not.
- D. Examine the specification and Drawings for mechanical equipment and provide all starters, circuit breakers, switches, pushbuttons and appurtenances, which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.
- E. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contractor's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction; ensure that adequate protection from these atmospheres is provided that is acceptable to the Owner's Representative. Cap conduit runs during construction. Energize all space heaters furnished with equipment.
- F. Interpretation of Drawings:
  - 1. Any error or omissions of detail in either the Drawings or the Specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical system.
  - 2. The Contractor shall inspect the site and verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between work shown on the Drawings and measurements at the site.
  - 3. The electrical drawings are diagrammatic, but shall be followed as closely as existing conditions and work of other Contractors will permit. All deviations from the Drawings required to make the work conform to structures as constructed, and to the work of others, shall be made at the Contractor's expense.
  - 4. The Contractor shall examine the architectural, structural, mechanical and manufacturer's drawings for the various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.
  - 5. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.

6. Existing Conditions:

- a. After award of Contract, confer with Engineer/Owner's Representative to verify at each area of construction activity the location of existing underground utilities. Protect all existing underground utilities during construction.
- b. Prior to starting any underground work the Contractor shall obtain all the information of the underground utilities or obstructions from the City and take proper precautions to locate the utilities by potholing or other approved means in accordance with Special Provisions.

7. Work Provided By Power Company:

- a. Contractor shall coordinate with Sacramento Municipal Utility District (SMUD) and use SMUD Design Drawings to install power transformer, transformer pad, grounding, conduits, and cables.
- b. Refer to Sections 16300 and 16400 for detailed specifications.

8. Work Provided by Contractor:

- a. Refer to Sections 16300 and 16400.

G. Substitutions

1. The Contract Documents were developed using the first named manufacturer to determine physical space requirements, conduit and wiring requirements, capacities/ratings and implementation of the Contract electrical and instrumentation control strategies. When indicated in the Contract Document, the Contractor may elect to use one of the other named manufacturers, where allowed, to provide equivalent previously unnamed manufacturers. Any deviations from the Contract Document that result from using a manufacturer other than the first named manufacturer are the responsibility of the Contractor.
2. Specific brand names and catalog numbers are used to describe materials in order to establish standards of performance and quality.
3. The decision of the Engineer shall govern as to what is equal to the item specified. Equality will be judged on the basis of the following:
  - a. Conformance with description or performance required
  - b. Equal in quality
  - c. Comparable in appearance and artistic effect where these are considerations
  - d. Comparable operation, maintenance and performance
  - e. Equal in longevity and service under conditions of climate and usage
  - f. Conformance with space allocations and requirements for operations from mechanical or electrical services provided without necessitating changes in details and construction or related work
4. If the Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Engineer.
5. Any material, article, or method judged by the Engineer equal to that specified will be approved, provided the Contractor submits a single written request to the Owner / Engineer, per Special Provisions Section, with the following information for each item:
  - a. Name of manufacturer or supplier
  - b. Trade or brand name

- c. Type, model, style, and/or catalog number
  - d. Specifications including size and all ratings
6. The Contractor assumes full responsibility for including complete, correct data in this one request and shall also attach completely referenced diagrams descriptive and technical data sheets for the Engineer's determination of equality or suitability of appearance of any substitution item. Only one such request may be submitted. The Engineer's rejection of any substitute shall automatically require the Contractor to furnish the specified item without further discussion or delay.

**1.02 Related Sections**

- A. All specification sections are a part of these Specifications and shall be referred to by the Contractor for the execution of this Contract. Where there are differences between Specifications for the same product or work in other Divisions and Divisions 16 and 17, the conflict shall be conveyed to the Engineer and resolved at the sole discretion of the ENGINEER.

**1.03 REFERENCES**

- A. Electrical work, including connection to electrical equipment integral with mechanical equipment described elsewhere in these Specifications, shall be performed in accordance with the latest published regulations of the following codes and standards:

<u>Reference</u>	<u>Title</u>
	Federal Standards
	State Codes and Ordinances and Inspecting Authorities
	Local Codes and Ordinances and Inspecting Authorities
	The National Board of Fire Underwriters
NFPA	National Fire Protection Association
UL	Underwriters Laboratories
NEMA	National Electrical Manufacturers' Association
ANSI	American National Standards Institute
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
Cal OSHA	State Department of Industrial Safety
OSHA	Department of Industrial Safety
	State Public Utilities Commission
NEC	National Electrical Code (NEC) for all items not specifically covered the state and local ordinance.
NFPA 79	Electrical Standard for Industrial Machinery
NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
Sacramento Municipal Utility District (SMUD)	SMUD Engineering Specification T004, Latest Edition

<u>Reference</u>	<u>Title</u>
City of Folsom	Design Standards, Standard Construction Specifications and Authority Having Jurisdiction (AHJ)

- B. Nothing in these special provisions or on the Drawings shall be interpreted as permission or direction to violate any governing code or ordinance.
- C. Materials and equipment used in the performance of the electrical construction shall be fully UL approved for the class of service for which they are intended prior to submittal of shop drawings.
- D. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the applicable requirements of the National Electric Code (NEC); provided, that where a state or local code or ordinance is in conflict with the NEC, the provisions of said local code ordinance shall take precedence.
- E. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the Cal OSHA Safety orders (Title 8, CCR), State Building Standards, and applicable local codes and regulations

#### **1.04 System Description**

- A. The electrical systems and work shall be as indicated in the Drawings. The general extent of the electrical work includes, among others, furnishing of the following items:
  1. Complete circuiting and connections for all motors, including their remote control and indicating devices
  2. Complete general lighting and small power installation, fixtures, receptacle outlets, switching and circuits
  3. All supports, bases, anchors, sleeves, hangers, conduit seals, and the like, all electrical work shown and/or specified, not particularly mentioned above
  4. Complete grounding systems
  5. Instruction, maintenance and overhaul manuals
  6. Control and alarm wiring
  7. Coordination for connection of power with utility company
  8. Electrical Service Equipment
  9. Main Switchboard
  10. Motor Control Center
  11. Surge Protective Devices
  12. Panelboards
  13. Transformers – Dry Type
  14. Reduced Voltage Soft Start programming
  15. Power Monitor and power monitor programming
  16. Uninterruptible Power Supply
  17. Control Panel
  18. Installation of vendor supplied panels

19. Installation of conduit and conductors between vendor supplied field equipment and vendor supplied panels including termination of conductors within the vendor-supplied panels based on vendor-supplied documentation
  20. Conduit, wire, cable terminations, and equipment mounting associated with the Instrumentation System
  21. Interconnection wiring diagrams
  22. Hardware, software and programming at the pump station to allow the pump station to transmit and receive data, alarms and commands from the Owner's existing SCADA system.
  23. Programmable controller and programming
  24. Operator Interface Terminal and programming
  25. Conduit, wire, cable, terminations and equipment mounting associated with the telemetry and programming
  26. Power, control, alarm and instrumentation wiring for all equipment specified in other specifications
  27. Electrical connections to all Mechanical equipment and instruments
  28. Electrical Tests
  29. Site Acceptance Testing and Commissioning
- B. Manufacturer's Directions: Manufacturer's directions shall be followed in all cases where manufacturers furnish instructions covering points not shown on the Drawings or herein specified.
- C. Service for Electrical Power
1. Coordinate with utility company for a new incoming electrical service 480 volt, three phase, four wire service to site as shown on Drawings with the Owner.

### **1.05 Submittals**

- A. General: Submittals for all electrical equipment provided under this project manual shall be prepared and submitted within 60 work days after notice to proceed. Submittals shall comply with these requirements as well as those in Section 01300.
- B. Materials and Equipment Schedules: The Contractor shall deliver to the Engineer a complete list of all materials, equipment, apparatus, and fixtures which it proposes to use. The list shall include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.
- C. The submittal package for each individual equipment or groups of related equipment shall be complete and in accordance with this Section. The Submittal file shall have PDF bookmarks or active page links within the Table of Contents for ease of navigation. As a condition precedent to the review of submittals and with the requirements of Special Provisions, the Contractor shall furnish the manufacturer's statements accepting unit responsibility. The purpose of this provision is to ensure compatibility of all components specified under the specific technical specification and to provide sole source responsibility for system performance and maintenance. Notwithstanding these provisions, however, the Contractor is not relieved of his responsibility for the indicated portions of the work. The following, as a minimum, shall be submitted:
1. Manufacturer and manufacturer's type and designation
  2. Manufacturer's catalog data indicating rated capacity, efficiency, rated output and other characteristics

3. Any exception to these Specifications along with justification for each exception shall be clearly stated on the first page of the submittal
  4. Shop drawings
  5. Parts list with material of construction
  6. Installation requirements, showing various clearances required
  7. Details of all appurtenances to be furnished with the specified item
- D. Shop drawings are required for materials and equipment listed in this and other sections. Shop drawings shall provide sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications. The following shall be included:
1. Front, side, and rear elevations, footprints and top views, with dimensions
  2. Location and size of conduit entrances and access plates
  3. Component data
  4. Connection diagrams, terminal diagrams, schematic wiring diagrams, conductor size, and type, etc.
  5. Method of anchoring and embedded structural members; weight
  6. Finish
  7. Nameplates
  8. Temperature limitations, as applicable
  9. Rating of equipment as per Specifications and Drawings
  10. NEMA rating of enclosures
  11. Approved listing
- E. Catalog data shall be submitted to supplement all shop drawings. Catalog cuts, bulletins, brochures, or the like or photocopies of applicable pages thereof shall be submitted for mass produced, non-custom manufactured material. These catalog data sheets shall be stamped to indicate the project name, applicable Specification section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the stamp.
- F. Record Drawings: In addition to the Record Drawings as a part of the record drawing requirements specified in the General Requirements, the Contractor shall show depths and routing of all concealed below-grade electrical installations. Said set of record Drawings shall be available to the Engineer and the Inspector during construction. After final inspection, the Contractor shall transfer all record drawing information to a set of reproducible vellums which shall then be delivered to the Engineer. In addition, the Record Drawings shall show all variations between the work as actually constructed and as originally shown on the Drawings, based upon information supplied by the Contractor.
- G. Manufacturer's Drawings: One set of equipment manufacturer's drawings shall be submitted to the Engineer for its records.
- H. The Contractor shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of spare parts of the General Requirements. After approval, Contractor shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. Contractor shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the Owner, only. Any spare parts which the Engineer permits the Contractor to use for startup

activities shall be replaced by the Contractor prior to the Owner's acceptance of beneficial use of the equipment.

1. During the term of this Contract the Contractor shall notify the Engineer in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the Engineer determines that the modified parts are no longer applicable to the supplied equipment, the Contractor at its expense shall provide applicable spare parts.

## **1.06 Quality Assurance**

### **A. Performance and Design Requirements**

1. **Manufacturer's Qualifications:** The equipment furnished under this division shall be the product of firms regularly engaged in the design and manufacture of the type of item specified, possessing the required technical competence, skill, resources and ability to complete the work specified herein with the requisite degree of quality in a timely and efficient manner. The Contractor shall be prepared to adequately document the qualifications of the manufacturers nominated to provide the equipment specified under this division. All documentation shall be submitted to the Owner's Representative prior to design fabrication and shipment of any component specified herein. Nothing contained within these provisions shall be construed as relieving the Contractor of his responsibility for any portion of the work covered by this Section.
2. **Arrangement:** The Drawings are generally diagrammatic and the location of outlets and equipment terminals are approximate unless detailed or dimensioned. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences and the location of electrical terminations on equipment.
3. The Contractor shall examine the structural and mechanical plans and shop drawings for the various equipment to determine exact routing and final terminations for all raceways and cables. Conduits shall be stubbed up as near as possible to equipment terminals and shall be within the concrete base for the equipment or a separate concrete curb.
4. All conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, the Contractor shall submit proposed locations to the Engineer for review. Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to the Owner.
5. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.
6. Allowance has been made in the design for the number of raceways, cables and conductors considered adequate for feeding the various drives and equipment. These circuits and diagrams are based on available data pertaining to the particular design of equipment and portray the systems, which the owner has chosen to effect the required operation and level of control. Equipment provided by the Contractor (even though of the make and model specified) may differ in detail, arrangement, or connections from that shown. If the Contractor uses equipment which differs from the equipment shown in major aspects and requires modifications to power, control or other electrical service, the Owner's acceptance of the equipment will be based upon the Contractor providing the modifications required, and they shall be of the same quality as shown and shall be provided at no additional cost to the Owner.

7. Protection of Equipment and Materials: The Contractor shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the work and until acceptable by the Engineer and the Inspector.
8. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.
9. The Contractor shall replace or have refinished by the manufacturer, all damaged materials or equipment, including face plates of panels and switchboard sections, at no expense to the Owner.
10. Tests: The Contractor shall make all tests required by the Engineer or the Inspector or other authorities having jurisdictions as per applicable standards.. All such tests shall be performed in the presence of the Engineer or the Inspector. The Contractor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation. Operational testing shall be performed on all equipment furnished and/or connected in other Sections of Division 16. Electrical and all other divisions specifying electrical items including furnishing of support labor for testing.
11. Standard test reports for mass-produced equipment shall be submitted along with the shop drawing for such equipment. Test reports on testing specifically required for individual pieces of equipment shall be submitted to the Engineer and the Inspector for review prior to final acceptance of the project.
12. Any test failure shall be corrected in a manner satisfactory to the Engineer and Inspector.
13. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in these particular Specifications or shown on the Drawings.
14. The Contractor shall apply and pay for all permits required by any of the legally constituted public authorities for the installation or construction of the work included under this Division. The Contractor shall arrange and pay for any inspections or examinations so required and deliver certificates of all such inspections to the Owner's Representative. When these Specifications call for materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of the Specifications shall take precedence.

B. Operating Requirements:

1. Permits: The Contractor shall pay for permits, inspections and other costs incidental to providing electrical installations.
2. Contractor's Record Drawings: The Contractor shall maintain a neatly marked set of record drawings showing the installed location and routing of conduits, trays, cables, junction boxes, pull boxes, outlets, and interconnection circuits, etc., and the current status of control circuits as reflected on the control diagrams to the satisfaction of the Owner's Representative.
3. Inspection: The Contractor shall cooperate with the Owner's Representative and shall provide assistance at all times for the inspection of the electrical work performed under this Contract. The Contractor shall remove covers, operate machinery, or perform any reasonable work which, in the opinion of the Owner's Representative, is necessary to determine the quality and adequacy of the work.

C. Quality of Materials

1. All electrical materials used on this project shall be new and free from defects.

2. All electrical materials used on this project shall conform where applicable, to the following standards, unless otherwise noted:
  - a. NEMA - National Electrical Manufacturers Association
  - b. ANSI - American National Standards Institute
  - c. UL - Underwriters Laboratories, Inc
3. Each type of material shall be of the same manufacturer and quality throughout the work.

### **1.07 Delivery, Storage, and Handling**

- A. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturer's recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in indoor locations that are clean and dry. Items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls store in clean, dry, indoor, heated locations. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not bare space heaters.
- B. Shipment: The major equipment items listed in this provision and furnished under this Contract shall be shipped in sealed, weather-tight, enclosed conveyances in a manner designed to protect the equipment against damaging stresses during transport.
- C. Inspection
  1. The Contractor shall cooperate with the Owner's Representative and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate machinery, or perform any reasonable work which, in the opinion of the Owner's Representative, will be necessary to determine the quality or adequacy of the work.
  2. If any material does not conform to these Specifications the Contractor shall, within three days after being notified by the Owner's Representative, remove the materials from the premises.
  3. Work shall not be closed in or covered before inspection and approval by the Owner's Representative. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor.
- D. Supervision and Workmanship
  1. The Contractor shall employ a competent electrical foreman with good English communication skills on the job throughout the entire period of construction to see that his work is carried on without delay and completed as rapidly as possible.
- E. Cooperative Work with Others
  1. The Contractor shall cooperate with others, with due regard to their work, towards promotion of rapid completion of project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provision in time by Contractor, then he shall bear expense of such changes as necessary to be made in work of others.
  2. Labor and materials, including templates, sleeves, anchors, concrete inserts and the like shall be furnished in ample quantities at such times as necessary to ensure uninterrupted progress of work.
  3. Contractor shall cease work at any particular point temporarily and transfer his operations to such points or execute such portions of work as directed, when in the judgment of the Owner's Representative it is necessary to do so.

## F. Cleanup

1. In addition to the requirements of Special Provisions, in all parts of the materials and equipment shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. All oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners scraped out.
2. During the progress of the work, the Contractor shall clean the premises and shall leave the premises and all portions of the site free of debris

## 1.08 Project / Site Conditions

A. General: For purposes of delineating electrical enclosure and electrical installation requirements of this project, certain areas have been classified in the Contract Documents as defined below. Electrical installations within these areas shall conform to the referenced code requirements for the area involved.

### B. Seismic Consideration

1. All structures shall be designed in accordance with the requirements for Seismic Hazards as identified in the California Geological seismic maps identifying areas in East Sacramento County that may be prone to seismic hazards, in the event of an earthquake.
2. Before any concrete pours associated with electrical equipment anchoring can begin, seismic calculations and submittals shall be approved by the Engineer.
3. Each piece of equipment installed shall be anchored as required in the UBC for Seismic identified in the California Geological seismic maps.
4. No equipment shall be anchored to vertical structural elements without written approval of the Engineer.
5. Vibration isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4 inch.
6. All raceways, ductwork, accessories, and appurtenances, furnished with equipment shall be anchored to resist a lateral seismic force of 40 percent of its operating weight without excessive deflection. This force shall be considered acting at the center of gravity of the piece under consideration.
7. Calculations and shop drawings shall be submitted for all anchorage details. All calculations shall be made and signed by a registered structural engineer in California. In as much as all anchorage of equipment is to be made of cast-in-place concrete elements, it is imperative that types of anchorage be coordinated with the concrete Contractor so that anchorage may be installed at the time of concrete placement. If calculations and anchorage details are not submitted prior to placement of the concrete, the Contractor shall be responsible for any strengthening of concrete elements because of superimposed seismic loading.

### C. Unclassified Field Locations

1. Field equipment located in interior areas which have not been classified as hazardous locations as defined by the National Electrical Code, Article 500, may be subjected to ambient temperatures varying from 50 degrees F and 90 degrees F and relative humidity ranging from 20 to 50 percent.
2. In exterior areas, ambient temperatures may vary from 30 degrees F and 115 degrees F with strong direct radiation from the sun. Relative humidity in all exterior field areas will vary from 10

to 100 percent with condensation and icing occurring. All areas may have trace quantities of wind blown dust, sand, hail, and rain occurring.

3. In exterior locations, exposed conduits shall be PVC coated Rigid Steel, threaded for connections, and fittings shall have gasketed covers. Provisions shall be made to drain the fitting or conduit system. Threaded fastening hardware shall be stainless steel. Mounting brackets shall be galvanized. Attachments or welded assemblies shall be galvanized after fabrication.
  4. In exterior locations, all panels shall be "Weatherproof NEMA Type 3R." Enclosures shall be mounted 1/4-inch from walls to provide an air space, unless specifically shown otherwise.
- D. Damp Location: Locations which are indoors and 2 feet below grade elevation or which are classified as damp locations on the Drawings shall have electrical installations which conform to the requirements for outdoor locations; except, that the air space from walls may be less than 1/4-inch and enclosures shall be NEMA Type 2. "Damp locations" shall include pipe galleries, tunnels, and basements. All rooms housing liquid handling equipment are also classified as damp locations regardless of grade elevation.
- E. Splash Locations: Areas shown as splash-proof shall have electrical installations as described for "outdoor locations"; except, that NEMA Type 4 enclosures shall be provided for instruments and controls, panels, switchboards, and motor control centers.
- F. Classified Field Locations
1. Field equipment located in hazardous areas shall comply with the National Electrical Code, Article 500.
  2. Hazardous Locations: Areas shown as hazardous shall have electrical installations suitable for Class 1, Division 1, Group C and D locations as required under NFPA 820 and Cal/OSHA Safety orders (Title 8, CCR). Enclosures shall be NEMA type 7.
  3. For this project, hazardous areas of the water facility are as follows:
    - a. None designated
- G. Corrosive Locations
1. Field equipment located in areas subject to ammonia, corrosive fumes, or liquid chemical spills shall utilize materials and equipment specifically for corrosive areas.
  2. Corrosive locations shall have stainless steel threaded hardware; all other electrical hardware, fittings, and raceway systems shall be PVC-coated. Enclosures shall be of fiberglass reinforced polyester or 316 stainless steel and meet NEMA Type 4X requirements.
  3. For this project, the following areas are classified as corrosive:
    - a. None designated
- H. Electrical Equipment Enclosures
1. Remote electrical units located in electrical equipment enclosures will be subjected to environmental conditions where temperatures may vary from 10 degrees F and 115 degrees F; relative humidity may range from 10 to 100 percent; and dust and trace quantities of chlorine may be present.
  2. In exterior areas, ambient temperatures may vary from 30 degrees F and 115 degrees F with strong direct radiation from the sun. Relative humidity in all exterior field areas will vary from 10 to 100 percent with condensation and icing occurring. All areas may have wind blown dust, sand, hail, and rain occurring

## **1.09 Sequencing and Scheduling**

A. Sequencing and scheduling plan shall be provided that minimizes construction delays. For additional requirements refer to the Special Provisions.

## **1.10 Warranty**

A. Refer to Section 17506 for requirements

## **1.11 Maintenance**

A. Information to be provided:

1. The Contractor shall provide the following additional information for each item of equipment in the operation and maintenance manual required in Section 01300:
  - a. Wiring and interconnection diagrams which show terminal blocks of all distribution and control assemblies; all power, control and signal raceways; junction and pull boxes; all devices; and all interconnecting wiring. Diagrams shall show conductor tag numbers, control wire color code as applicable and power wire and cable sizes.
  - b. The outgoing power and control wires shall be run as single lines representing the raceways and shall show any junction boxes or ancillary control devices that may be located in the raceway system or tapped off the raceway along the route. All raceways shall be appropriately identified showing the proposed tag inscription. Wires are to be fanned out and labeled at each point showing the terminal number of the wire and typical wire tags. For factory wired equipment, both the factory terminal numbers as well as the terminal numbers shown on the Contract control diagrams shall be shown. If additional space is required, more than one sheet may be used for the connection diagram.
  - c. Operation and maintenance data
  - d. Maintenance manuals
  - e. Installation certificates

## **PART 2 - PRODUCTS**

### **2.01 Equipment and Materials**

- A. All material and equipment shall be new, free from defects, of current manufacture, and of the quality specified or shown, and shall be listed by the Underwriters Laboratories Inc. (UL) for the purpose for which it is to be used where such listing has been applied by UL to similar products. Each type of material shall be of the same manufacture and quality throughout the work.
- B. Where more than one unit of the same class of material or equipment are required, provide products of a single manufacture. Component parts of materials or equipment of the same manufacturer are preferred.
- C. All electrical equipment shall be approved by a testing laboratory recognized by the Engineer and shall conform to all applicable requirements of the latest edition of the California Building Code. In lieu of such approval, the Contractor must submit the equipment for approval to the independent NETA certified electrical testing laboratory. This shall include the plant preferred list of equipment and components specified in the plans and Specifications. Contractor shall also include in his delivery schedule the approval time required by the independent NETA certified electrical testing laboratory for equipment without UL listing.

- D. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers' latest standard design that conforms to these Specifications.
- E. Equipment Finish: Provide materials and equipment with manufacturers' standard finish system, in accordance with Division 9 of these Contract Specifications. Provide manufacturers' standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in accordance with Division 9 of these Contract Specifications with ANSI No. 61, light gray color.

## **2.02 Fabrication**

### **A. Corrosion Protection**

1. Unless otherwise noted, all equipment and appurtenances provided under this section shall be treated with zinc phosphate, bonderized or otherwise given a rust-preventive treatment, then primed and painted with a durable enamel finish. Minimum dry film thickness shall be 3 mils. The Contractor shall ensure that all panels or enclosures specified to be painted in this section shall match in color ANSI 61 gray on all exterior surfaces and flat white on all interior surfaces. Nonconforming panels shall be repainted.
  2. Field painting of all equipment shall conform to the procedure or outline in applicable sections of the Specifications that specify painting and finishing.
  3. Galvanizing, where specified, shall conform to the applicable division of the Specifications. Galvanized equipment and appurtenances shall not be shop primed or painted but shall be field painted and touched up as specified and directed by the Owner's Representative.
- B. Special Tools: The Contractor shall provide all special tools required for operation and maintenance of the equipment. The tools shall be considered as part of the product and become the property of the Owner.

## **2.03 Source Quality Control**

- A. Hazardous Locations: Provide materials and equipment acceptable to the regulatory authority having jurisdiction for the Class, Division, and Group of hazardous area indicated.

## **PART 3 - EXECUTION**

### **3.01 Preparation**

- A. Maintain continuity of electric service to all functioning portions of the process or buildings during hours they are normally in use during construction, testing, and commissioning. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work.

### **3.02 Installation**

- A. For all areas designed as hazardous areas, install all materials and equipment in a manner acceptable to the regulatory authority have jurisdiction for the Class, Division and Group of hazardous area indicated.
- B. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between the manufacturers' instructions, codes and regulations, and these Contract Documents, follow Engineer's decision. Keep copy of manufacturers' installation instructions on the jobsite available for review at all times.

- C. Use appropriate conduit and conductor entry fittings with enclosures which maintain the specified enclosure environmental capability after proper installation.
- D. Relocation or Removal of Materials and Equipment:
  - 1. Materials and equipment that are no longer used such as studs, straps, conduits and wire shall be removed.
  - 2. Repair affected surfaces to conform to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner. Follow any specific instructions given under Division 9 of these Contract Specifications. Utilize skilled craftsmen of the trades involved.
- E. Cutting and Patching
  - 1. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of Engineer or the Inspector. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to original condition. Utilize skilled craftsmen of the trades involved.

### **3.03 Field Quality Control**

- A. Each item of equipment provided as a part of this project shall be installed, aligned and tested by skilled workmen to the tolerances recommended by the equipment manufacturer. Provide work which has a neat and finished appearance. Carry out work in accordance with NECA Standard of Installation unless otherwise specified.
- B. Allow materials, equipment, and workmanship to be inspected at any time by the Engineer or the Owner's Representative. Correct work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a manner satisfactory to the Engineer and the Owner's Representative.
- C. Testing and Start-Up
  - 1. General
    - a. The Contractor shall furnish all labor, materials, instruments and tools to make all connections for testing as described herein and in Section 16030. All electric power, fuel, water, supplies, and utilities required for all tests shall be provided by the Contractor.
    - b. During checkout and startup of the various plant systems, provide a crew of skilled craftsmen to be available for checkout and troubleshooting activities as required by the ENGINEER. Since coordination with other crafts and Contractors will often be required, the craftsmen assigned to checkout must be available outside normal working hours when necessary.
    - c. All equipment shall be demonstrated as operating properly prior to the acceptance of the work.
    - d. These tests shall be made in the presence of the Owner's Representative and the results will be recorded by the Owner's Representative. All deficiencies or unsatisfactory conditions, as determined by the Owner's Representative or inspecting authorities, shall be corrected by the Contractor in a satisfactory manner at the Contractor's expense.
  - 2. Protective Devices: All protective devices shall be properly set and operative during the testing period. Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment.

3. Inspection of Joints: Joints and connections in conductors No. 6 AWG and larger shall be inspected by the Owner's Representative after the joints have been made and prior to application of any tape.
4. Preliminary Testing: After the visual inspection of joints and connections and the application of tape and other insulating materials, all sections of the complete system of wiring shall be thoroughly tested for shorts and grounds. The Contractor shall correct all defects.
5. Insulation Resistance Tests:
  - a. Wire and Cable: All wires and cables to be used as feeders, branch circuit wiring, control circuits and other wiring shall be tested with an insulation resistance tester rated 1000 volts D.C. and capable of measuring 2000 megohms. Single-conductor wires and cable shall have a resistance to ground not less than 200 megohms, and conductors of multiple-conductor cables shall have a resistance to ground not less than 100 meg-ohm. Solid state device circuits shall not be meggered directly. Solid state devices shall be disconnected prior to resistance tests.
  - b. Tests: The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured for the following:
    - 1) Motor feeders shall be measured with the motor disconnected.
    - 2) Control circuits shall be measured with pushbuttons, interlocking relays, instruments, overcurrent devices, and the like connected.
    - 3) Lighting feeders to panelboards shall be measured with the branch circuit breakers open.
    - 4) The test shall be made with the branch breakers closed, and with receptacles and fixtures mounted, but before lamping.
    - 5) Power feeders shall be measured with switches and circuit breakers in place.
6. Equipment Tests
  - a. Motor Control Centers/Switchboards -The following tests shall be performed
    - 1) The main bus and all power and control circuits shall be meggered.
    - 2) The wire terminals shall be checked and the connections shall be cleaned.
    - 3) All control switches, alarm devices, and indicating instruments shall be checked for proper operation under normal and simulated abnormal conditions.
    - 4) The thermal-overload heaters and the reset mechanism for each motor shall be checked.
    - 5) The motor nameplate full-load current shall be checked as the basis for checking the heater selection.
    - 6) The thermal-overload heaters shall be in accordance with the starter manufacturer's heater tables for motor enclosure and starter enclosure.
  - b. SVSS Testing shall be per manufacturers requirements and by the manufacturer's representative as required by the extended warranty requirements.
7. Phase Rotation: The connections of all equipment shall be checked for correct phase rotation. Coordinate motor phasing checks with the Engineer/Owner's Representative and the Contractor responsible for the driven equipment. Submit a written report to the Engineer for each motor verifying that phasing has been checked and corrected.
8. Circuit Breakers: The following tests shall be performed:
  - a. Inspect each circuit breaker.
  - b. Check for loose connections.

- c. Operate each circuit breaker manually.
  - d. Set the adjustable trips to the values specified.
9. Motor Insulation Testing: Each polyphase motor shall have its insulation resistance to ground measured with 1000 volt "Megger" prior to connection. Values of resistance of less than 100 megohms shall be cause for equipment rejection.
10. O/L Protective Devices where applicable
11. Thermal RTD Protective Devices
12. Vibration Protective Ddevices
- a. For each motor, the Contractor shall compile the following data in neatly tabulated form. Data shall be obtained from the equipment provided on the job:
    - 1) Equipment driven
    - 2) Nameplate amperes
    - 3) Service factor
    - 4) Overload device catalog number where applicable. Overload device current range and setting.

### **3.04 Adjusting / Cleaning / Protection**

- A. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.
- B. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturers' recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.
- C. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contractor's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided that is acceptable to the Engineer and the Inspector. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.
- D. Cleaning and Touchup Painting: Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove all materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish. If extensive damage is done to equipment paint surfaces, refinish the entire equipment in a manner that provides a finish equal to or better than the factory finish, that meets the requirements of the Specifications, and that is acceptable to the Engineer and the Inspector.

**\*\*END OF SECTION\*\***

# SECTION 16110 RACEWAYS, FITTINGS AND SUPPORTS

## PART 1 - GENERAL

### 1.01 Summary

- A. Scope: This section provides specifications for all raceways, wire ways, raceway supports, cable trays and concrete encased ducts.
- B. Type:
1. All conduits shall be polyvinyl chloride (PVC), Schedule 40 for under concrete slabs and raceway duck banks.
  2. All direct buried conduits in earth shall be polyvinyl chloride (PVC), Schedule 80.
  3. All conduits installed exposed in electrical rooms and non-corrosive areas shall be Galvanized Rigid Steel (GRS).
  4. All conduits installed in corrosive areas shall be PVC coated Rigid Steel Conduit (PVC-RSC).
  5. All conduits for VFD power feeders and VFD controlled motors, where VFD type cable is not used, shall be either RSC or PVC-RSC as specified above.
  6. All conduits installed exposed outside shall be PVC-RSC.
  7. Raceway for the utility (SMUD) electric service point to the power transformer shall be pre SMUD's Construction Drawings and Standards.

### 1.02 Related Sections

- A. All specification sections are a part of these Specifications and shall be referred to by the Contractor for the execution of this Contract. Where there are differences between Specifications for the same product or work in other Divisions and Divisions 16 and 17, the conflict shall be conveyed to the Engineer and resolved at the sole discretion of the ENGINEER.

### 1.03 References

- A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

<u>Reference</u>	<u>Title</u>
ANSI C80.1	Electrical Rigid Steel Conduit
UL 1	Flexible Metal Conduit
UL 5	Surface Metal Raceway and Fittings
UL 6	Electrical Rigid Metal Conduit – Steel
UL 514B	Conduit, Tubing and Cable Fittings
UL 651	Schedule 40 and 80 Rigid PVC Conduit and Fittings
NEMA RNI-2005	PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC-2-2003	Electrical PVC Tubing and Conduit

<u>Reference</u>	<u>Title</u>
NEMA TC-3-2004	PVC Fittings for Use With Rigid PVC Conduit and Tubing
ANSI/UL 467	Grounding and Bonding Equipment
NEC	National Electric Code, latest edition

#### **1.04 Submittals**

- A. Submittals shall comply with the provisions set forth in Sections 01300 and 16010. Submittals shall include the following data, drawings, and description of materials.
1. Manufacturer and manufacturer's type and designations for each equipment item
  2. List of construction material for all conduits, fittings, supports and accessories
  3. The Contractor shall furnish copies of the manufacturer's certified test reports for the material being supplied to establish compliance with NEMA RN-1.
  4. All catalog cut sheets and data sheets shall be current and legible in PDF format.

#### **1.05 Quality Assurance**

- A. Performance and Design Requirements: The conduits and fittings shall be premium quality and suitable for installation in wastewater facilities. The PVC used for Schedule 40 and 80 conduits and the PVC coating on rigid steel conduit shall be made from virgin material.
- B. Inspection: All raceway duct banks shall be inspected by the Engineer prior to backfill. The Engineer shall inspect for drainage slope, spacers, conduit condition, and joints.
- C. All equipment furnished by the Contractor shall be listed by and bear the label of Underwriters' Laboratories, (UL) or of an independent testing laboratory acceptable to the Owner.

#### **1.06 Delivery, Storage, and Handling**

- A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable with Site Engineer, and secure from weather or accidental damage.

#### **1.07 Project / Site Conditions**

- A. The raceways, fittings, and supports will be installed either exposed, concealed, or in duct banks in a water facility and may be subjected to dust and moisture. Ambient temperatures are expected to range between 30° F and 115° F. Relative humidity should range from 10% to 10%.

### **PART 2 - PRODUCTS**

#### **2.01 Manufacturers**

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with Section 01600 – Material and Equipment Substitution.

#### **2.02 Equipment and Materials**

- A. All raceways shall be as specified in Section 1.01B.

- B. Flexible metal conduit shall be employed for connections to lighting fixtures. Final raceway runs to electrical equipment on machinery requiring flexibility or that is subject to vibration shall be liquid-tight flexible metal conduit.
- C. All fittings and supports shall match the conduit types specified in Section 1.01B.
- D. Minimum size of all conduits shall be 3/4-inch.
- E. Rigid Steel Conduit
  - 1. Comply with Underwriter's Laboratories UL-6 specification, ANSI C80.1-77 and Federal specification WW-C-581E (77 APR 04) or latest revisions. Rigid steel conduit shall be zinc coated both inside and outside after fabrication by hot-dip galvanizing. The threads shall also be hot-dip galvanized.
  - 2. Use rigid steel conduit, including bushings, couplings, elbows, nipples, and other fittings, galvanized by hot-dipping, and meeting the requirements of ANSI C80.1 and ANSI C80.4, UL.
  - 3. Do not use setscrew type couplings, bushings, bends, nipples, and other fittings, unless approved by the ENGINEER or the INSPECTOR. Factory bends are not permitted unless approved by the ENGINEER or the INSPECTOR. Conduit bending radius shall not be less than the minimum cable bending radius of the cable to be installed.
- F. PVC Conduit:
  - 1. Nonmetallic conduit shall be high impact polyvinyl chloride (PVC), Schedule 40 or 80 as specified. The nonmetallic conduit shall be corrosion resistant. Minimum tensile strength shall be 6000 psi, and minimum compressive strength shall be 9000 psi. The material shall have a smoke emission rate of not more than 5.1 grams/100 grams by the Arapahoe smoke chamber test.
  - 2. Use rigid PVC Schedule 40 conduit, UL listed for concrete-encased and under concrete slabs.
  - 3. Use rigid PVC Schedule 80 conduit, UL listed for underground direct burial for use with conductors having 90 degrees C insulation.
  - 4. Use conduits, couplings, bushings, elbows, nipples, and other fittings meeting the requirements of NEMA TC 2 and TC 3, Federal Specification W-C-1094, UL, NEC, and ASTM specified tests for the intended use.
- G. PVC Coated Rigid Steel
  - 1. PVC coated conduit shall be hot-dip galvanized including the threads. The interior and exterior surfaces shall be coated with 2 mils thick urethane. The exterior of the conduit shall be PVC coated to a minimum 40-mil thickness. The PVC coating shall be permanently bonded to the conduit. The coating shall have a minimum tensile strength of 3500 psi. The interior shall be coated with a urethane coating no more than 7 mils thick.
  - 2. A PVC coated coupling shall be furnished with each length of conduit. The PVC sleeve of the coupling shall equal the outside diameter of the coated conduit and shall extend 1-1/2 inches from each end of the coupling.
  - 3. Prior to coating, the galvanized conduits and fittings shall be UL listed. Use PVC coated fittings with the same interior and exterior coating requirements. PVC coated fittings and sleeves shall be completely watertight to prevent moisture from penetrating the interior of the conduits and fittings.
  - 4. The PVC coating shall be resistant to ultra-violet rays when installed outdoors. The conduit and fittings shall meet all the requirements of NEMA RN-1 1989.
- H. Flexible Metal Conduit

1. Flexible metal conduit shall be formed from spirally wound galvanized steel strip with successive convolutions that are securely interlocked. Minimum size of the flexible metal conduit shall be 3/4 inch. Fittings shall be of the compression type. Lengths shall not exceed 60 inches. Flexible metal tubing shall include a code size insulated green ground conductor.

I. Flexible Metal Conduit, Liquid-Tight

1. Use UL listed liquid-tight flexible metal conduit consisting of galvanized steel flexible conduit covered with an extruded PVC jacket and terminated with nylon bushings or bushings with steel or malleable iron body and insulated throat and sealing O-ring.
2. Provide external grounding connector and appropriately sized grounding conductor to assure ground continuity.
3. Minimum size shall match the connecting non-flexible conduit.

J. Wireways

1. All wireways and auxiliary gutters shall be JIC sectional flange oil-tight type with hinged covers. Minimum size shall be 8 inches by 8 inches unless otherwise noted. All wireways shall be painted.
2. Provide outdoor, rain-tight steel-enclosed wireway and auxiliary gutter where indicated. Utilize wireways and fittings that are UL listed, and have a cover that can easily be removed. Manufacturers and types: Square D Square-Duct; General Electric Type HS; or equal.

## 2.03 Components and Accessories

- A. Fittings in Hazardous Areas: In hazardous areas, use only fittings approved for the atmosphere involved.
- B. Use cable sealing fittings forming a watertight nonslip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor OD. For conductors with OD's of 1/2-inch or less, provide a neoprene bushing where the conductor enters the connector. Use Crouse-Hinds CGBS, Appleton CG Series, or equal, cable sealing fittings.
- C. Fittings for Rigid Steel
1. Fittings used with rigid galvanized steel conduit shall be hot-dip galvanized. Locknuts shall be extra heavy galvanized steel for sizes through 2 inches. Locknuts larger than 2 inches shall be galvanized malleable iron. Bushings shall be galvanized malleable iron with insulating collar. Grounding bushings shall be of the locking type and shall be provided with feed-through compression lugs for securing the ground cable. Unions shall be galvanized ferrous alloy types UNF or UNY. Thread-less fittings shall not be utilized with rigid galvanized steel conduits.
  2. Expansion fittings in embedded runs shall be of the watertight type and shall be provided with an internal bonding jumper. The expansion material shall be neoprene and shall allow for 3/4-inch movement in any direction.
  3. Use insulated throat bushings of metal with integral plastic bushings rated for 105 degrees C.
  4. For insulated throat bushings for rigid steel conduit, use Thomas & Betts Nylon Insulated Metallic Bushings, or O.Z. Gedney Type B, or equal.
  5. Use Myers Scru-Tite, or equal hubs for rigid steel conduit.
  6. Use conduit bodies for rigid steel conduit of metal and sized as required by the NEC (NFPA 70-2008). Use Appleton Form 35 threaded Unilets; Crouse-Hinds Mark 9 or Form 7 threaded condulets; Killark Series O Electrolets; or equal, for normal conduit bodies for rigid steel conduit. Where conduit bodies for rigid steel conduit are required to be approved for

hazardous (classified) locations, use conduit bodies manufactured by Appleton, Crouse-Hinds, or Killark, or equal.

7. Use only couplings for rigid steel conduit supplied by the conduit manufacturer.
8. Use Appleton Type EYF, EYM, or ESU; Crouse-Hinds Type EYS or EZS; Killark Type EY or EYS; or equal, sealing fittings for rigid steel conduit. Where condensate may collect on top of a seal, provide a drain by using Appleton Type SF Crouse-Hinds Type EYD or EZD, or equal Drain Seal.
9. Use Appleton Type ECDB, Crouse-Hinds ECD, or equal drain fittings for rigid steel conduit.

#### D. Fittings for PVC Conduit

1. Fittings used with PVC conduits shall be of the PVC solvent-weld type and shall be of the same material as the conduit.
2. Expansion fittings shall be provided as recommended by the manufacturer.

#### E. Fittings for PVC Coated Rigid Steel Conduit

1. Fittings with PVC coated rigid steel conduit shall be PVC coated in a manner similar to the conduit. The exterior of the fittings shall be coated with 2-mil thick urethane prior to the application of the 40-mil exterior PVC coat. Interior of the fittings shall have a 2-mil urethane finish. The fittings shall have ribbed finish to assist in the installation of fittings.
2. Thread-less fittings shall not be used with PVC coated rigid steel conduit.
3. Bushings and ground bushings shall be as specified for rigid galvanized steel conduits.

#### F. Fittings for Flexible Metal Conduit

1. Fittings used with flexible metal conduit shall be compression type, cadmium-plated malleable iron body with locknut and bushing
2. Where applicable, 45- and 90-degree fittings shall be used

#### G. Fittings for Liquid-Tight Flexible Conduit

1. Fittings used with liquid-tight conduit shall have cadmium-plated malleable iron body and gland-nut, brass grounding ferrule threaded to engage conduit. These fittings shall also use spiral and "O" ring seals around the conduit, the box connection and insulated throat. The insulated throat connectors for liquid-tight flexible metal conduit of metal will have an integral plastic bushing rated for 105 degrees C, and of the long design type extending outside of the box or other device at least 2-inches.
2. Use Thomas & Betts Super-Tite Nylon Insulated Connectors or equal
3. Where applicable, 45- and 90-degree fittings shall be used

#### H. Raceway Supports

1. General: Raceway support systems shall be designed to provide a factor of safety of no less than five.
2. Conduit Supports: Conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. When used with PVC coated rigid steel conduit, the conduit supports shall be 40 mils thick PVC coated.
3. Ceiling Hangers: Ceiling hangers shall be adjustable galvanized carbon steel, PVC coated 40 mils thick, pipe hangers. Straps or hangers of plumber's perforated type will not be acceptable. Hanger rods shall be 2-inch minimum galvanized all-thread rod and shall meet or exceed ASTM A193-B7 and ASME Boiler and Pressure Vessel Code specifications. Trapeze,

rod type hangers shall not be loaded in excess of 700 pounds per rod. Where loading exceeds this value, rigid frames shall be provided.

4. Racks: Racks shall be constructed from framing channel. Channels and all associated hardware shall be steel, hot-dip galvanized after fabrication of the channel. Field cuts shall be painted with zinc-rich paint. Channels attached directly to building surfaces shall be 14-gage minimum material 1-5/8 inches wide by 13/16 inch deep. All other channels shall be 12-gage minimum material 1-5/8 inch wide by 1-5/8 inch minimum depth. Racks shall be designed to limit deflection to 1/360 of span. All exposed ends of framing channel shall be covered with manufacturer's standard plastic inserts. The racks shall be PVC coated to 40 mil thickness.

#### I. Raceway Tags

1. Provide permanent, nonferrous metal markers with raceway designations pressure stamped, embossed, or engraved onto the tag.
2. Tags relying on adhesives or taped-on markers are not acceptable.
3. Attach tags to raceways with noncorrosive wire.

#### J. Warning Tape:

1. Provide heavy-gauge, yellow plastic tape of 6 -inch minimum width for use in trenches containing electric circuits. Utilize tape made of material resistant to corrosive soil. Use tape with printed warning that an electric circuit is located below the tape. Manufacturers and types: ITT Blackburn Type YT or RT; Griffolyn Co. Terra-Tape; or equal

## **PART 3 - EXECUTION**

### **3.01 Preparation**

- A. In addition to the provisions of the Division 1 – General Requirements, and Section 16010 "Electrical General Provisions," prior to installation, store all products specified in this section in a dry location.
- B. Preparation for pulling in conductors:
  1. Do not install crushed or deformed raceways. Avoid traps in raceways where possible. Take care to prevent the lodging of plaster, concrete, dirt, or trash in raceways, boxes, fittings, and equipment during the course of construction. Make raceways entirely free of obstructions or replace them. Ream all raceways, remove burrs, and clean raceway interior before introducing conductors or pull wires.
  2. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals until the time for pulling in conductors.

### **3.02 Installation**

- A. Each conduit shall be identified at each end with a permanent non-corrosive metal marker. Designation shall be pressure stamped into the tag. The conduit identification shall be the designated conduit number as shown.
  1. Final Connection to Certain Equipment
    - a. Make final connection to motors, wall or ceiling mounted fans and unit heaters, dry type transformers, valves, local instrumentation, and other equipment where flexible connection is required to minimize vibration or where required to facilitate removal or adjustment of equipment, with 36-inch maximum length liquid-tight, PVC-jacketed, flexible steel conduit.

b. The flexible conduit shall be long enough to allow the item to which it is connected to be withdrawn or moved off its base. Use liquid-tight flexible metal conduit in outside areas, process areas exposed to moisture, and areas required to be oil free and dust-tight.

2. Special Locations:

a. Use rigid steel conduit:

- 1) Where conduit changes from underground and/or concrete embedded to exposed
- 2) Under equipment mounting pads
- 3) In exterior light pole foundations

3. Communication and Instrumentation Conduits:

a. GRS for above grade indoor locations.

b. PVC-RSC for exposed outdoors and corrosive environments.

B. Location, Routing, and Grouping:

1. Conceal or expose raceways as indicated. Group raceways in same area together. Locate raceways at least 12-inches away from parallel runs of heated piping for other utility systems.
2. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes to provide a neat appearance. Follow surface contours as much as possible. Conduit supports spaced not more than 8 feet apart.
3. No conduit shall approach closer than 6 inches to any object operating above the rated temperature of its cable temperature.
4. Conduit supported directly from the concrete structure shall be spaced out at least 1/4 inch using one-hole hot-dip galvanized malleable iron straps with nesting backs or, if three or more conduits are located in a parallel run, they shall be spaced out from the wall approximately 5/8 inch to 1 inch by means of framing channel. Runs of individual conduit suspended from the ceiling shall be supported with galvanized wrought steel pipe hangers. Where three or more conduits are suspended from the ceiling, suitable steel racks shall be constructed subject to submittal to the Engineer for review.
5. Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors in accordance with the structural section of these specifications. Individual conduit supports may be similar to cast-in-place anchors, die-cast, rustproof alloy expansion shields or cast flush anchors. Wooden plugs, plastic inserts or gunpowder-driven inserts shall not be used as a base to secure conduit supports.
6. All conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating bushing constructed over the conduit end. All conduit entering NEMA 12 boxes shall be terminated with a rain-tight hub having an insulated liner. All surface mounted cast boxes and plastic enclosures shall have threaded hubs. All joints shall be made with standard threaded couplings or specified unions. Metal parts of plastic control stations and coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of all conduits shall be cut square, reamed and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Male threads on rigid steel conduit shall be coated with electrically conductive zinc rich paint. Threading shall be done with dies, with the guide sleeve bored out to allow for increased diameter or the PVC coated conduit. Conduit shall be made with the next larger bend or next larger shoe bushed for proper fit.

7. Avoid obstruction of passageways. Run concealed raceways with a minimum of bends in the shortest practical distance considering the building construction and other systems.
8. In block walls, do not run raceways in the same horizontal course with reinforcing steel.
9. In outdoor, underground, or wet locations, use watertight couplings and connections in raceways. Install and equip boxes and fittings so as to prevent water from entering the raceway.
10. Paint all threads of galvanized conduits with UL approved zinc-rich paint or liquid galvanizing compound before assembling. Touch up after assembly to cover nicks or scars.
11. Do not notch or penetrate structural members for passage of raceways except with prior approval of the Engineer or the Inspector.
12. Do not run raceways in equipment base foundations.
13. Locate above ground raceways concealed in poured concrete so that the minimum concrete covering is not less than 1-1/2-inches.
14. Except at raceway crossings, separate raceways in slabs not less than six times the raceway outside diameter
15. Raceways installed under slab floors shall lie completely under the slab with no part of the horizontal run of the raceway embedded within the slab.
16. Install concealed, embedded, and buried raceways so that they emerge at right angles to the surface. Provide support during pouring of concrete to ensure that raceways remain in position.
17. Allow a minimum of 7 feet headroom for conduit passing over walkways.
18. Communication and instrumentation conduits crossing power circuits shall be separated from such circuits by the minimum distance stipulated by the IEEE standards.
19. Welding, brazing or otherwise heating of the conduit is not allowed. Plumber's perforated tape shall not be used for any purpose.
20. Where required for ease of pulling and as necessary to meet code, the Contractor shall provide cast junction or pullboxes even though not shown on the drawings. The Contractor shall limit the number of equivalent 90-degree bends to three in any run between pull boxes. Runs shall be limited to 400 feet, less 100 feet for each equivalent 90-degree bend in the run. Bends and offsets shall be avoided where possible, but where necessary, shall be made with an approved hickey or conduit bending machine, or shall be factory preformed bends.
21. All conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating bushing constructed over the conduit end. All conduit entering NEMA 12 boxes shall be terminated with a rain-tight hub having an insulated liner. All surface mounted cast boxes and plastic enclosures shall have threaded hubs. All joints shall be made with standard threaded couplings or specified unions. Metal parts of plastic control stations and coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of all conduits shall be cut square, reamed and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Male threads on rigid steel conduit shall be coated with electrically conductive zinc rich paint. Threading shall be done with dies, with the guide sleeve bored out to allow for increased diameter or the PVC coated conduit. Conduit shall be made with the next larger bend or next larger shoe bushed for proper fit.
22. Conduit constructed in concrete slabs or walls shall be placed in the middle third of the slab or wall. Conduit rising through a slab shall be protected by a formed concrete pad approximately

6 inches in diameter and 4 inches above the finished floor or the conduit shall come up through the equipment pad. Clearances equal to the conduit trade diameter, but not less than 1-1/2 inches, shall be maintained between conduits encased in slabs. Clearances of less than 1-1/2 inches at conduit crossing and terminating locations may be allowed at the discretion of the Engineer.

23. Flexible conduit shall not be used as a general purpose raceway but shall be provided in locations requiring flexibility with the approval of the Engineer.
24. Liquid-tight conduit shall be used for all motor connections as detailed. Where flexibility is required for electrical raceways on equipment, liquid-tight conduit shall be used in accordance with JIC standards, these specifications, and the local codes. The maximum length of flexible, liquid tight conduit shall be 36-inches. The terminating fitting and sealing shall be as shown in the motor details.
25. The Contractor shall exercise the necessary precautions to prevent the lodging of dirt, concrete or trash in the conduit, fittings and boxes during the course of construction.

#### C. Support:

1. Support raceways at intervals not exceeding NEC requirements unless otherwise indicated. Support multiple raceways adjacent to each other by ceiling trapeze. Support individual raceways by wall brackets, strap hangers, or ceiling trapeze, fastened by toggle bolts on hollow masonry units, expansion shields on concrete or brick, and machine screws or welded thread studs on steelwork.
2. Threaded studs driven in by a powder charge shall not be accepted.
3. Support all raceways from building structural members only.
4. Do not use nails anywhere or wooden plugs inserted in concrete or masonry as a base for raceway or box fastenings. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.

#### D. Bends:

1. Make changes in direction of runs with symmetrical bends. Make bends and offsets of the longest practical radius. Do not heat metal raceways to facilitate bending.
2. Make bends in parallel or banked runs of raceways from the same center or centerline so that bends are parallel and of neat appearance. Make field bends in parallel runs.
3. For PVC conduits, use factory made elbows for all bends 30 degrees or larger. Use acceptable heating methods for forming smaller bends.
4. Make no bends in flexible conduit that exceed 90 degrees or allowable bending radius of the cable to be installed or that significantly restricts the conduits flexibility.

#### E. Bushing and Insulating Sleeves:

1. Where metallic conduit enters metal equipment enclosures through conduit openings, install a bonding bushing on the end of each conduit. Install a bonding jumper from the bushing to any equipment ground bus or ground pad.
2. If neither exists, connect the jumper to a threaded bolt connection to the metallic enclosure.
3. Use manufacturer's standard insulating sleeves in all metallic conduits or insulated bushings terminating at an enclosure.

#### F. Expansion Joints:

1. Provide suitable expansion fittings for raceways crossing expansion joints in structures or concrete slabs, or provide other suitable means to compensate for expansion and contraction.

2. Provide for the high rate of thermal expansion and contraction of PVC conduit by providing PVC expansion joints as recommended by the manufacturer and as required.

G. PVC Conduit:

1. Solvent weld PVC conduit joints with solvent recommended by the conduit manufacturer. Follow manufacturer's solvent welding instructions and provide watertight joints.
2. Use acceptable PVC terminal adapters when joining PVC conduit to metallic fittings.
3. Use acceptable PVC female adapters when joining PVC conduit to rigid metal conduit.

H. PVC Coated Rigid Steel Conduit:

1. Install in strict accordance with the manufacturer's Instructions.
2. Touch up any damage to the coating with conduit manufacturer acceptable patching compound.
3. PVC boot shall cover all threads.
4. Where belled conduits are used, bevel the un-belled end of the joint before joining. Leave no metallic threads uncovered.
5. PVC coated conduit shall be tightened, with strap wrenches, and the plastic overlap shall be coated and sealed in accordance with the manufacturer's recommendations. Pipe wrenches and channel locks shall not be used for tightening plastic coated conduits. All damaged areas shall be patched, using manufacturer's recommended material. The area to be patched shall be built up to the full thickness of the coating. Joints in multiple conduit runs shall be staggered.

6. Threading:

- a. Plasti-Bond can be threaded with any standard threading tool. Larger model power threaders with open die heads require no modification beyond optional grip inserts for PVC coated conduit.
- b. If a threader with a tight-fitting die head is to be used, like many hand-held models, it is necessary to machine out the interior diameter of the stationary guide approximately 12/100ths of an inch to allow for clearance of the PVC coating. Prior to machining the pipe guide take note of the sequence in which the dies are removed; then replace dies in the proper sequence.
- c. If conduit is to be threaded manually it must be pencil cut before threading to enable the die teeth on the threader to engage the conduit. In the same manner as sharpening a pencil with a knife, cut away 1/4" of the exterior coating from the end to be threaded. This allows the pipe guide to ride up and over the PVC coating enabling the removal of the coating and threading in one operation.
- d. Before threading, by any method, a series of cuts should be made in the PVC coating along the longitudinal axis of the conduit. The thread protector attached to one end of the conduit can be used to gauge the length of the cuts. Make a slit up one side of the thread protector with a knife and remove it from the conduit. Push the thread protector over the cut end of the conduit to be threaded and place a mark on the PVC coating at the end of the protector. With a knife, cut around the circumference of the conduit at the mark, through the PVC coating, to the metal. This cut will indicate the starting point for the longitudinal cuts and it will give an even ending to the PVC coating removed during threading. The longitudinal cuts will allow the PVC coating to be removed in small pieces instead of long strips that can foul the die head causing the conduit to collapse.

e. Use a good quality thread cutting oil to flush away the metal and PVC chips. After threading use a degreasing spray to thoroughly clean the threads and the interior of the pipe. Use care not to contaminate the cutting oil with the degreasing spray. Degreasing is important in order to insure that the touch up compound will adhere to the unprotected steel. Bare steel is the most vulnerable area to corrosion in any conduit system, therefore, touch up compound must be used on all field cut threads and internal reams. These specially formulated interior and thread touch-up compounds are available in 4 ounce and quart cans. When an access fitting or coupling is attached to the newly threaded conduit a colored band red for Plasti-Bond), will form at the end of the sleeve. This indicates proper installation procedures have been followed

I. Penetrations:

1. Seal the interior of all raceways entering structures at the first box or outlet with electrical duct sealant per NEC 505.17, (D)(2) to prevent the entrance into the structure of gases, liquids, or rodents.
2. Dry pack with non-shrink grout around raceways that penetrate concrete walls, floors, or ceilings aboveground, or use one of the methods specified for underground penetrations.
3. Where an underground conduit enters a structure through a concrete roof or a membrane waterproofed wall or floor, provide an acceptable, malleable iron, watertight, entrance sealing device. When there is no raceway concrete encasement specified or indicated, provide such a device having a gland type sealing assembly at each end with pressure bushings which may be tightened at any time. When there is raceway concrete encasement specified or indicated, provide such a device with a gland type sealing assembly on the accessible side. Securely anchor all such devices into the masonry construction with one or more integral flanges. Secure membrane waterproofing to such devices in a permanently watertight manner.
4. Wherever conduits penetrate concrete wall panels to outdoors or as shown, the Contractor shall detail the required mountings. He shall locate and use a galvanized pipe sleeve for passage of the conduit. A compression type seal shall be used to form a complete watertight installation. The installation design shall be submitted to the Engineer.
5. Where an underground raceway without concrete encasement enters a structure through a non-waterproofed wall or floor, install a sleeve made of Schedule 40 galvanized pipe. Fill the space between the conduit and sleeve with a suitable plastic expandable compound, or an oakum and lead joint, on each side of the wall or floor in such a manner as to prevent entrance of moisture. A watertight entrance sealing device as specified may be used in lieu of the sleeve.
6. Where raceways penetrate fire-rated walls, floors, or ceilings, fire stop openings around electrical penetrations to maintain the fire-resistance rating
7. Raceways passing through roofs shall be flashed.
8. Provide conduit seals where required by Article 500 of the NEC.

J. Underground Conduits, Direct Burial raceways:

1. Unless otherwise indicated, all underground conduits shall PVC coated rigid steel.
2. Coordinate installation of underground raceways with other outside and building construction work. Maintain existing outside utilities in operation unless otherwise authorized by the Engineer.
3. Remove entirely and properly reinstall all raceway installations not in compliance with these requirements.
4. Do not use union type fittings underground.

5. Provide a minimum cover of 2-feet over all underground raceways unless otherwise indicated. Warning tape as specified in Article 2.11A shall be placed no less than 12 inches above conduit and duct bank.
6. Do not backfill underground direct burial raceways until they have been inspected by the Engineer.
7. Warning Tapes: Bury warning tapes approximately 8-inches below grade and above all underground conduit runs or duct banks. Align parallel to and within 12-inches of the centerline of runs.
8. When the contract drawings indicate underground PVC conduits then a transition shall be provided. The transition shall be made from PVC Schedule 80 conduit to PVC coated rigid galvanized steel conduit at all stub-ups and when entering equipment. The transition shall consist of a PVC coated rigid galvanized conduit. Conduits shall be laid with a minimum grade of 2 inches per 100 feet from structure to manhole or from high point to manholes.
9. Ducts shall be of the dimensions and materials and with reinforcing as shown. They shall have a uniform continuous slope with no low points to entrap water. All duct runs shall be placed on an undisturbed excavated soil base wherever possible. Where duct runs pass through backfilled areas, the soil base shall be a backfill of loam, placed in layers. Each layer shall be solidly tamped or rolled, as required, to obtain complete compaction to the elevation and pitch of the bottom of the duct run shown. The compaction shall be as specified in the structural section of these specifications.
10. Plastic spacers shall be manufactured by the conduit supplier and shall be located 5 feet on centers. Wire ties shall be made at each spacer location and shall be securely anchored. Duct runs shall be watertight. When the termination of duct is not detailed on the duct run drawing, a coupling shall be installed.
11. The ends of all conduits shall be suitably plugged, capped and protected from damage during construction. Ends of conduits which are not to be used for long periods shall be protected from dirt, rodents, etc., by plugging at the ends with manufactured plugs. A non-setting compound may be used on the plug to make it adhere to the conduit end. A 1/4-inch hole shall be drilled in the lower portion of the plug to provide drainage of the plugged conduit.
12. A No. 5/8 mule tape shall be pulled through each high voltage, 480-volt power feeder, and branch feeder conduits as the conduit sections are laid and the tape shall be securely fastened at each end of the finished duct run. When ducts are reserved for future use, the mule tape shall also be used and secured.
13. A mule tape shall always be attached to the rear end of the swab or mandrel to replace the wire being pulled out. When not in use, this tape shall be securely fastened at both ends of the duct.
14. Each conduit in a manhole, handhole, or pull box shall be identified with a stamped aluminum or brass tag bearing the conduit number. The tags shall be permanently attached to conduits by means of 316 stainless steel or nylon tie wrap. Install conduit couplings and cap ends of all spare underground conduits at each handhole/manhole.
15. Each conduit shall be identified at each end with a permanent non-corrosive metal marker. Designation shall be pressure stamped into the tag. The conduit identification shall be the designated conduit number as shown.
16. Separation and Support:
  - a. Separate parallel runs of two or more raceways in a single trench with preformed, nonmetallic spacers designed for the purpose. Install spacers at intervals not greater than

that specified in the NEC for support of the type raceways used, and in no case greater than 10-feet.

- b. Support raceways installed in fill areas to prevent accidental bending until backfilling is complete. Tie raceways to supports, and raceways and supports to the ground, so that raceways will not be displaced when concrete encasement or earth backfill is placed.

#### 17. Arrangement and Routing:

- a. Arrange multiple conduit runs substantially in accordance with any details shown on the Drawings. Locate underground conduits where indicated on the Drawings.
- b. Make minor changes in location or cross-section as necessary to avoid obstructions or conflicts. Where raceway runs cannot be installed substantially as shown because of conditions not discoverable prior to digging of trenches, refer the condition to the Engineer for instructions before further work is done.
- c. Where other utility piping systems are encountered or being installed along a raceway route, maintain a 12-inch minimum vertical separation between raceways and other systems at crossings. Maintain a 12-inch minimum separation between raceways and other systems in parallel runs. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the Engineer for instructions before further work is done.
- d. Provide insulated grounding bushings on all metallic raceways entering manholes. Provide bell-ends flush with manhole walls on all nonmetallic raceways entering manholes.
- e. In multiple conduit runs, stagger raceway coupling locations so that couplings in adjacent raceways are not in the same transverse line.
- f. Provide markers at grade to indicate the direction of underground conduits provided under this Contract. Provide markers consisting of double-ended arrows, straight for straight runs and bent at locations where runs change direction. Provide markers at all bends and at intervals not exceeding 100-feet in straight runs. Use markers made of sheet bronze not less than 1/4-inch thick embedded in and secured to the top of concrete posts. Use markers not less than 10-inches long and 3/4-inch wide and marked ELECTRIC CABLES in letters 1/4-inch high incised into the bronze to a depth of 3/32-inch.
- g. All conduits shall enter maintenance holes and structures at right angles.

#### 18. Raceway Coating:

- a. At couplings and joints, coat metallic underground direct-burial conduits with Koppers Bitumastic No. 505 or equal, or wrap with Scotchwrap No. 51, or equal plastic tape with 1/2-inch overlap.

#### 19. Direct Earth Burial Conduit Zone Backfill Installation:

- a. Backfill material for the conduit zone of direct burial conduit trenches may be selected from the excavated material if it is free from roots, foreign material, and oversized particles.
- b. Use material with 3/4-inch maximum particle size and suitable gradation for satisfactory compaction. Remove material if necessary to meet these requirements.
- c. Imported 3/4-inch minus gravel or sand may be used in lieu of material from the excavation.
- d. After conduits have been properly installed, backfill the trench with specified material placed around the conduits and carefully tamped around and over them with hand tampers. Final, tamped conduit cover shall be 4-inches minimum.

#### 20. Backfill Installation above Conduit Zone of Direct Burial Conduit:

- a. Unless otherwise required in Section 0200 "Earthwork", Backfill material above the conduit zone of direct burial conduit may be selected from the excavated material, if it contains no particles larger than 3-inches in diameter and is free from roots or debris. Imported material meeting these same requirements may be used in lieu of material from the excavation. Compact backfill in maximum 12-inch layers to at least 95 percent of the maximum density at optimum moisture content as determined by ASTM D 1557.

K. Wireways:

1. Mount wireways securely in accordance with the LAEC and manufacturer's instructions. Locate removable cover or hinged cover on accessible vertical face of wireway unless otherwise indicated.

L. Empty Raceways

1. Certain raceways will have no conductors pulled in as part of this Contract. Identify with tags at each end and at any intermediate pull point the origin and destination of each such empty raceway. Where a raceway has been identified with a name (number) in the Raceway Schedule, use that name on the tag in lieu of origin and destination. Provide a removable permanent cap over each end of each empty raceway. Mandrel and provide a nylon pull cord in each empty raceway.

M. Firestops:

1. The Contractor shall furnish adequate firestops and seals for cables, conduits, trays, and wireways, etc., passing through building floors or wall openings.
2. Products which utilize intumescent compounds capable of being leached out by water shall not be used.
3. Flamenastic 71A, Vimasco No. 1-A, or equal, shall be used for this purpose and shall be applied in accordance with manufacturer's recommendations.

N. Painting

1. Paint raceway systems in accordance with and as specified in Section 09900 - Protective Coating Systems.

### 3.03 Field Quality Control

- A. Provide raceway systems meeting or exceeding the requirements of the NEC.

### 3.04 Adjusting / Cleaning / Protection

- A. Following installation, protect products from the effects of moisture, corrosion, and physical damage during construction. Keep openings in conduit and tubing capped with manufactured seals during construction.

**\*\*END OF SECTION\*\***

**SECTION 16115  
JUNCTION AND DEVICE BOXES AND FITTINGS**

**PART 1 - GENERAL**

**1.01 Summary**

- A. Scope: This section provides specifications for all electrical junction boxes, device boxes, fixture support boxes, floor boxes, terminal cabinets and fittings.
- B. Type: Unless otherwise listed, all junction boxes, device boxes, fittings, etc., shall be hot-dip galvanized cast ferrous alloy type. All exposed boxes and fittings shall be PVC coated.

**1.02 Related Sections**

- A. All specification sections are a part of these Specifications and shall be referred to by the Contractor for the execution of this Contract. Where there are differences between Specifications for the same product or work in other Divisions and Divisions 16 and 17, the conflict shall be conveyed to the Engineer and resolved at the sole discretion of the ENGINEER.

**1.03 References**

- A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

<u>Reference</u>	<u>Title</u>
ANSI C80.1	Electrical Rigid Steel Conduit
UL 1	Flexible Metal Conduit
UL 5	Surface Metal Raceway and Fittings
UL 6	Electrical Rigid Metal Conduit – Steel
UL 514B	Conduit, Tubing and Cable Fittings
UL 651	Schedule 40 and 80 Rigid PVC Conduit and Fittings
NEMA RNI-2005	PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC-2-2003	Electrical PVC Tubing and Conduit
NEMA TC-3-2004	PVC Fittings for Use With Rigid PVC Conduit and Tubing

**1.04 Submittals**

- A. Submittals shall comply with the provisions set forth in Sections 01300 and 16010.

**1.05 Quality Assurance**

- A. The boxes and fittings shall be premium quality suitable for installation in a Water Facility.

**1.06 Project / Site Conditions**

- A. The boxes and fittings will be installed in a Water Facility. Ambient temperatures are expected to range between 30° F and 115° F. Relative humidity may be expected to fluctuate between 10% and 100%.

## **PART 2 - PRODUCTS**

### **2.01 Equipment and Materials**

- A. Junction boxes; device boxes; fixture support boxes; and oblong, round and rectangular conduit fittings shall be hot-dip galvanized cast ferrous alloy.
  - 1. Integrally cast threaded hubs or bosses shall be provided for all conduit entrances and shall provide for full 5-thread contact on tightening. Drilling and threading shall be done before galvanizing.
  - 2. The cover plate shall be of similar hot-dip galvanized cast ferrous alloy material. A full body neoprene gasket and Type 316 stainless steel screws shall be provided for all covers.
  - 3. Hubs for connection of conduit to sheet steel junction, device or terminal boxes shall be made of cast ferrous alloy, electroplated with zinc, and shall have insulating bushings. The hubs shall utilize a neoprene "O"-ring and shall provide a watertight connection.
- B. Outlet and Switch Boxes: Outlet and switch boxes shall be FS or FD boxes as manufactured by Crouse-Hinds, Appleton, or equal. Boxes shall be provided with blank covers for all unused openings.
- C. Ganged Boxes: Outlet and device boxes shall be ganged where two or more devices are located together. Device covers shall be ganged for gang boxes and shall be gasketed with suitable neoprene gaskets to fit the devices and box used.
- D. Sheet Steel Boxes: Boxes larger than FD boxes shall be fabricated from code gage steel, finished inside and out as specified for terminal cabinets. Before finish is applied, a grounding pad drilled for two bolted grounding lugs or a grounding stud shall be welded to the inside of the box. All hardware shall be Type 316 stainless steel. Boxes shall, as a minimum, meet NEMA 12 and JIC requirements and shall be NEMA 4 where exposed to the weather or dripping water. Boxes in wet locations shall be PVC or PVC coated cast steel with threaded hubs.
- E. Boxes in Corrosive Areas: Boxes and fittings located in corrosive areas shall be NEMA 4X. This material shall be fiberglass reinforced polyester with minimum properties as follows:
  - 1. Compressive strength: 28,000 psi
  - 2. Flexural strength: 15,000 psi per ASTM D790 and D675
  - 3. Tensile strength: 12,000 psi per ASTM D638
  - 4. Flame-resistant and self-extinguishing per ASTM D635
- F. All conduit entries shall use ferrous alloy hubs with 40 mil epoxy coating. All conduit entering plastic boxes and any exposed metal on plastic boxes which is not isolated from the interior of the box shall be bonded together with a suitable grounding conductor. Corrosive areas shall be as noted in Section 16010 and/or as shown on the drawings.

## **PART 3 - EXECUTION**

### **3.01 Installation**

- A. Outlet and switch boxes shall be located to provide ample clearance between fixtures and pipes, beams and ducts. The location shall be verified on the job to avoid conflict with other work. Boxes shall be accurately placed and shall be independently and securely supported. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes nor shall welding or brazing be used for attachment. Boxes shall be secured by galvanized brackets, expansion bolts, toggle bolts, or machine or wooden screws depending on the type of construction. Unless otherwise indicated, receptacle boxes shall be mounted 12 inches above the

floor in offices and similar areas and 48 inches above the floor in all other areas. Switch boxes shall be mounted 48 inches above the floor.

**\*\*END OF SECTION\*\***

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**SECTION 16120  
WIRE AND CABLE, 600 VOLTS AND BELOW**

**PART 1 - GENERAL**

**1.01 Summary**

- A. Scope: This section provides specifications for all wire and cable used for electrical conductors, except for the electrical service component that shall be per Sacramento Municipality Utility District's (SMUD) Construction Drawings and Standards.
- B. Refer to Conduit and Cable Schedule Drawing for the size and number of wires.
- C. Unless SMUD requires different type and size of cable for the electric service feeders, the size and rating shall be as indicated in the Conduit and Cable Schedule Drawing. The feeders shall be Okoguard-Okoseal Type MV-105, 15KV Shielded Power Cable, One OKopact (Stranded) Copper Conductor, 105°C, 100% Rating, and 133% Insulation Level, or equal.

**1.02 Related Sections**

- A. All specification sections are a part of these Specifications and shall be referred to by the Contractor for the execution of this Contract. Where there are differences between Specifications for the same product or work in other Divisions and Divisions 16 and 17, the conflict shall be conveyed to the Engineer and resolved at the sole discretion of the ENGINEER

**1.03 References**

- A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

<b><u>Reference</u></b>	<b><u>Title</u></b>
ICEA S-61-402/NEMA WC-5	Thermoplastic - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
ICEA S-19/NEMA WC-3	Rubber - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
S-68-524/NEMA WC-7	Cross Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
S-68-516/NEMA WC-8	Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NFPA	National Fire Protection Association
UL 62	Flexible Cord and Fixture Wire
UL 83	Insulated Wires and Cables
UL 486A	Wire Connectors and Soldering Lugs for use with Copper Conductors
UL 486B	Wire Connectors for use with Aluminum Conductors
UL 510	Insulating Tape

<b><u>Reference</u></b>	<b><u>Title</u></b>
UL 1277	Electric Power and Control Tray Cables with Optical Fiber Members
UL 1449	Safety Transient Voltage Surge Suppressors
NEMA WC-55	Instrumentation Cables and Thermocouple Wire
NEMA WC-57	Control Cables
ASTM B8	Standard Specifications from Concentric Lay Standard Copper Conductors, Hard, Medium-Hard or Soft
Title 8	Industrial Relations, Subchapter 5, Electrical Safety Orders, California Code of Regulations

#### 1.04 Definitions

- A. Cable: Multi-conductor, insulated, with outer sheath.
  - 1. May contain either building wire or instrumentation wire
- B. Instrumentation Cable: Multiple conductors, insulated, twisted with outer sheath, intended for transmission and distribution of low current (4-20 mA DC) or low voltage (0-10 V DC) analog signals, No. 16 AWG and smaller. Commonly used types are defined in the following:
  - 1. TWP: Twisted pair without shield.
  - 2. TWSP or TSP: Twisted shielded pair.
  - 3. TWST: Twisted-shielded triad.
- C. Wire: Single conductor, insulated, with or without outer jacket depending upon type

#### 1.05 Submittals

- A. The Submittals shall comply with the provisions set forth in Sections 01300 and 16010.
- B. Shop Drawings shall include:
  - 1. Product technical data including:
    - a. Acknowledgement that submitted products meet requirements of standards
    - b. Current catalog cuts and other brochures depicting conductor characteristics
    - c. Manufacturer's recommended splicing, testing, and installation procedures and practices and Manufacturer's installation instructions
  - 2. Manufacturer's certified test records, factory test procedures and test Reports.
  - 3. Samples, if requested by the Engineer.
- C. Field testing using attached Cable Test Data Form, HI-POT and Megger tests including certified test reports. Also, include splicing personnel qualifications.

#### 1.06 Quality Assurance

- A. The wire and cable shall be of premium quality suitable for installation in Water facilities.
- B. All Conductors furnished by the Contractor shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL).

- C. The construction and installation of all electrical equipment and materials shall comply with all provisions of the CAL OSHA Safety Orders Title 8 CCR, as applicable), State Building Standards, and applicable local codes and regulations

#### 1.07 Delivery, Storage, and Handling

- A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable with Owner's Representative, secure from weather or accidental damage.

#### 1.08 Project / Site Conditions

- A. The wire and cable will be installed in raceways in a water facility. Ambient temperatures are expected to range between 30° F and 115° F. Relative humidity is expected to range from 10% to 100%.

### PART 2 - PRODUCTS

#### 2.01 Manufacturers

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the General Requirements.
- B. Building wire, power and control cable:
  - 1. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
    - a. Alpha Wire Corporation
    - b. American Insulated Wire Corporation
    - c. Belden Wire and Cable
    - d. Carol Cable Company
    - e. General Cable
  - 2. Conform to UL 444, Communications Cable, NEC type CMP, tinned copper conductors, 100 percent shield coverage, single TSP, Teflon insulated with Teflon jacket in all applications except small diameter.
  - 3. Multiple conductor, small diameter instrumentation cable shall be used where existing conduits limit conduit space as called out on drawings:
    - a. Plenum type single or multi paired, twisted pairs, overall shield with drain wire
    - b. FEP or FPR insulation and jacket
    - c. Moisture and flame resistance
    - d. Jacket thickness 0.015 IN minimum
    - e. Maximum outside diameter:
      - 1) 1 PR – 0.125 IN
      - 2) 2 PR – 0.180 IN
  - 4. Telephone cable:
    - a. Solid conductors, tinned copper, No. 24 AWG

- b. 150 volt, vinyl insulated
- c. UL listed 2576

## 2.02 Equipment and Materials

- A. Unless otherwise indicated, provide stranded conductors, except provide solid conductors where No. 10 AWG and No. 12 AWG are designated for branch circuit power wiring in lighting and receptacle circuits.
- B. For all direct burial and aerial conductors and cables, provide conductors with UL labeling "TYPE USE" and RHW insulation with heavy-duty, black, neoprene sheath meeting the physical requirements and minimum thickness requirements of ICEA S-19-81 and NEMA WC 3.
- C. Where flexible cords and cables are specified, provide Type SO, 600-volt, with the number and size of copper conductors indicated.
- D. All conductors for Cathodic Protection shall be as noted on the Civil Drawings per the City Standards.
- E. Insulation
  - 1. All conductors shall be rated at 600 Volts unless noted otherwise within this specification section.
  - 2. All wiring shall be type THWN and rated for 75 degrees C maximum operating temperature unless otherwise noted within this specification section.
  - 3. Smaller than size 1/0, all conductors shall be sized for operation at 60 degrees C maximum.
  - 4. For power conductors, provide all single conductors and individual conductors of multi-conductor power cables with integral insulation pigmentation of the designated colors, except conductors larger than No. 6 AWG may be provided with color coding by applying a heat shrink tube of the appropriate color.
- F. Conductors
  - 1. Unless specifically noted otherwise herein, all conductors for general wiring shall be a minimum of 98% conductivity, stranded, soft drawn copper. Aluminum or aluminum alloys are not acceptable.
  - 2. The minimum size of power conductors shall be No. 12 AWG.
  - 3. 120 Volt control, indicator, signal and metering conductors may be #14 AWG, and shall be stranded.
- G. Instrumentation Signal Cables
  - 1. Instrumentation signal cables shall be of the type used for process control with twisted shielded pairs or triads with polyvinyl jacket an overall shield over the multiple pairs or triads.
  - 2. The instrumentation cable shall be rated 600 Volts at 90 degrees C or better.
  - 3. The size of the instrumentation cable shall be AWG No. 16 with seven strands minimum.
  - 4. All instrumentation cables shall be UL listed. Belden 8719 (Pairs), Belden 8618 (Triads) or equal.
- H. PLC Communications Cables
  - 1. Communication cables for remote I/O connections and for PLC high speed data communications shall be as recommended by the manufacturer of the PLC equipment.
- I. Ethernet Communications Cables
  - 1. Ethernet communication cables shall be Industrial Grade Cat 6, Unshielded Twisted Pair (UTWP) for building interiors, Belden DataTuff or equal

2. Ethernet communication cables shall be Industrial Grade gel filled outdoor rated Cat 6, Unshielded Twisted Pairs for site and building exteriors and no more than 50 feet into building interiors, Belden DataTuff or equal

J. Portable Cable:

1. Cord shall be NEMA Type SOW-A flexible cord rated at -50 deg C to 105 deg C. All cords shall contain an equipment grounding conductor. Cord shall be rated for use as a fully submersible cable.
2. Conductors: Bunch or rope stranded, uncoated annealed copper conforming to UL and CSA requirements. A suitable separator is applied over the conductor.
3. Insulation: Ethylene Propylene (EPDM) conforming to UL Standard 1581 and CSA requirements. Minimum average wall thickness is 45 mils for 14 AWG, 12AWG, and 10 AWG; and 50 mils for sizes 8 AWG through 2 AWG.
4. Color code: Insulation colored as follows:
  - a. 2 Conductors - Black, White
  - b. 3 Conductors - Black, White, Green
  - c. 4 Conductors - Black, White, Red, Green
  - d. 5 Conductors - Black, White, Red, Green and Orange
5. Cable assembly: The applicable number of insulated conductors are cable together with elastomeric fillers, as necessary, and with a suitable lay.
6. Jacket: Black or Yellow special thermosetting compound conforming to UL and CSA requirements.
7. Marking: Jacket surface is printed in accordance with requirements of UL, CSA and MSHA.
8. Portable cord for supply to permanent installations, such as pumps, cranes, hoists and portable equipment shall have a wire mesh cord grip of flexible stainless steel wire to take the tension from the cable termination. Weatherproof strain relief fittings shall be used for all connections. To prevent unnecessary strain on cords, 45-degree and 90-degree connectors shall be used where applicable. Flexible cords feeding submersible non-wicking neoprene construction.
9. Manufacturer shall be American Mustang, York Wire & Cable or equal.

K. VFD Cable (Not Used):

1. The cable shall be 600V/1000V rated, with stranded tinned copper conductors, shielded, suitable for use with Variable Frequency Drives.
2. The insulation shall be rated 90 degrees Celsius Wet/Dry operating temperature.
3. Terminations shall have rating that are at least equal to those of the cable.
4. The conductor shall be annealed stranded tinned copper per ASTM B3, B8 and B33.
5. The insulation shall have a minimum average wall thickness of 30 mils with the insulation material XLPE with a XHHW-2 listing per UL 44. The insulated conductors shall be cabled together with a minimum of one ground wire with a minimum circular mil area equivalent to one circuit conductor. Fillers shall be included as necessary to make the cable round.
6. The cabled assembly shall be shielded with helically two 2-mil copper tapes that provide 100% coverage over the assembly or with a 80% minimum coverage tinned copper braid shield used in conjunction with an Aluminum foil shield tape.
7. All cables shall have a continuous overall outer sheath of polyvinyl chloride suitable for 90 degree Celsius use.

8. Manufacturer shall be Belden VFD cable, Lapp Group Olflex VFD, Lapp Group Olflex VFD Symmetrical or equa.

L. Control Cable:

1. Control cable shall be Type SO extra flexible and shall consist of No. 16 copper conductors insulated for 600 volt service. The overall jacket shall consist of 7/64-inch neoprene minimum. The number of conductors shall be as shown on the drawings.

M. Grounding Wire

1. Ground wires, no. 1/0 AWG or larger tinned stranded bare copper cable. All smaller ground wires shall be insulated with green color insulation.

## 2.03 Components and Accessories

A. Connections

1. Wire nuts for joints, splices and taps for conductors #8 and smaller shall consist of a cone shaped expandable coil spring insert, insulated with a teflon or plastic shell. Threaded or crimp types will not be accepted. Use "Skotchlock", "Hydent", or equal.
2. Terminals for stranded conductors #8 and smaller shall be a pre-insulated crimp type.
3. Lugs and connectors for conductors #6 and larger shall be compression types of one piece tubular construction with flat rectangular tongues. Two hole lugs shall be used for sizes 4/0 and larger. Fittings for copper conductors shall be tin-plated copper.

B. Wire and Cabling Termination and Splicing

1. Subject to compliance with Contract Documents, the following manufacturers are acceptable.
  - a. Burndy Corporation
  - b. Ideal
  - c. Minnesota Mining and Manufacturing Co
  - d. Penn Union
  - e. Thomas and Betts
  - f. Or Equal
2. Splicing of cables and wires in the manholes and handholes shall be kept at a minimum. Where it is possible to pull cables or wires directly through the manholes or handholes, splicing shall be moisture-proof and encapsulated using insulating sealing compound. Splicing kits similar to 3M Company 82A or 8500 Series shall be utilized.

C. Labeling

1. Provide complete power and control conductor identification system so that after installation, circuits can be easily traced from origin to final destination.
2. Conductor labels shall be white PVC tubing with machine printed black marking. Tubing shall be sized to fit conductor insulation. Adhesive strips are not acceptable. Machine printed markings, directly on conductors, will be accepted. Panduit, Thomas & Betts, or equal.
3. Tag conductors using a three-segment conductor numbering scheme which defines the origin of the conductor, the function of the conductor, and the destination of the conductor.
  - a. Example: MCCA-P-MCCB where MCCA is the origin, P is the function identification (P = power, C = control, S = signal, etc.), and MCCB is the destination.

- b. For conductors with one point of origin and two or more destinations, expand the function identification number, e.g., PA, PB, etc.
  - c. Make the origin and destination identification the specific names for the equipment used in the Contract Documents. Make the instrumentation and control identification names exactly as designated, i.e., FT-S-121.
4. Sleeves shall be yellow or white tubing, sized to fit the conductor insulation, with machine printed black marking capable of accepting 24 machine printed character per sleeve label. Adhesive strips are not acceptable.

#### D. Pulling Lubricant

1. All cables shall be properly coated with pulling compound recommended by the cable manufacturer before being pulled into conduits so as to prevent mechanical damage to the cables during installation.
2. Other lubricants to be substituted must be accompanied by a statement from the cable manufacturer as to its acceptable use with the cable being installed.

#### E. Detectable Underground Electrical Tapes

1. Pressure sensitive vinyl
2. Premium grade
3. Heat, cold, moisture, and sunlight resistant
4. UL listed
5. Thickness, depending on use conditions: 7, 8.5. or 10 mil
6. For cold weather or outdoor location, tape must also be all-weather rated
7. Comply with UL 510
8. Red color for underground buried cable and conduit.

### 2.04 Fabrication

- A. Electrical conductors shall be delivered to the job site plainly marked or tagged on 24 inch centers as follows:
1. Underwriters' Label
  2. Gauge
  3. Voltage
  4. Kind of Insulation
  5. Name of Manufacturer
  6. Trade Name

### 2.05 Source Quality Control

- A. Phase A, B, C implies the direction of positive phase rotation.

## PART 3 - EXECUTION

### 3.01 Preparation

- A. Color Coding and Labeling. Provide color coding throughout the entire network of feeders and circuits (600 volts and below) as follows:

<u>DESCRIPTION</u>	<u>PHASE/CODE LETTER</u>	<u>WIRE OR TAPE COLOR</u>
480 V, 3 PHASE	A	BROWN
	B	ORANGE
	C	YELLOW
208/120 V, 3 PHASE, 4 WIRE	A	BLACK
	B	RED
	C	BLUE
240/120V, 3 PHASE. 4 Wire	A	BLACK
	B	ORANGE (if High Leg)
	C	BLUE
240 / 120 V, 1 PHASE	L1	BLACK
	L2	RED
120 VAC UPS POWER	L1	ORANGE
DC CONTROL		LIGHT BLUE
NEUTRAL	N	WHITE
GROUND	G	GREEN
SHIELDED PAIR	+	BLACK
	-	CLEAR
PLC DI AND DO, 120 VAC		BLUE (NOTE 1)
<b>LOW VOLTAGE CONTROL</b>		<b>VIOLET (NOTE 2)</b>

**Note 1** - Low voltage control electrically direct connected to PLC DI or DO points. Only the wire between the PLC DI or DO and its first landing point shall be BLUE. Wire between this point and other terminations or field devices shall be VIOLET.

**Note 2** - Low voltage control not electrically direct connected to PLC DI or DO points. Low voltage includes 120 volts AC or DC and below. Control wiring includes wires, which follow control devices such as switches, or relays and which are not directly connected to power sources, fuses or circuit breakers.

- B. In addition to color coding, all power, control, and alarm wiring shall be numbered and identified by means of wire markers at all service pedestals, motor control centers, panelboards, auxiliary gutters, junction boxes, pull boxes, receptacle outlets, light outlets, manholes, disconnect switches, and circuit breakers. These markers shall correspond to numbers on shop drawings, wiring diagrams and interconnection wiring diagrams. Wire markers shall consist of machine engraved numbers applied by an approved marking device.
- C. Care shall be exercised in pulling wire and cable into conduit or trays so as to avoid kinking, putting undue stress on the cables, or otherwise abrading them. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii. No grease will be permitted in pulling wire or cable. Where pulling compound is used, use only UL listed compound

compatible with the cable outer jacket and with the raceway involved. contractor shall perform and submit pulling calculation per manufacturers recommendation to ascertain that there is no overstrain to the cable. The raceway construction shall be complete and protected from the weather before cable is pulled into it.

- D. Single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations shall be wrapped together by arc and fireproofing tapes, and shall be bundled throughout their exposed length with nylon, self-locking, releasable, cable ties placed at intervals not exceeding 18 inches on centers.
- E. Incoming wire in service pedestals, panels, and motor control centers, No. 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6 inches, and neatly spread into tees and connected to their respective terminals. Sufficient slack shall be allowed in cables for alterations in terminal connections. Lacing shall be done with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for wire runs, lacing is not necessary when the wire is properly installed in the ducts. Slack shall be provided in junction and pull boxes and in handholes and manholes. Amount of slack shall be equal to the largest perimeter dimension of the box.
- F. Wires crossing hinges shall be made up into groups not exceeding 12 and shall be so arranged that they will be protected from chafing when the hinged member is moved.
- G. Electrical Tape Usage:
  - 1. For insulating connections of #8 AWG wire and smaller: 7 mil vinyl tape.
  - 2. For insulating splices and taps of #6 AWG wire or larger: 10 mil vinyl tape.
  - 3. For insulating connections made in cold weather or in outdoor locations: 8.5 mil, all weather vinyl tape.
- H. Pulling:
  - 1. No oil, grease or similar substances shall be used to facilitate the pulling in of conductors. Use a specifically approved wire pulling compound.
  - 2. No wire or cable shall be pulled in until all construction which might damage insulation or fill conduit with foreign material is completed.
  - 3. Wire shall be pulled into conduits with care to prevent damage to insulation, using basket pulling grips to avoid slipping of insulation on conductors. Nylon rope or other "soft" surfaced cable must be used for pulling in conduits other than steel.
- I. Connections:
  - 1. Stranded conductors #8 and smaller shall be terminated with terminals of appropriate size where connected to screw type lugs.
  - 2. Joints, splices and taps in dry locations for conductors #8 and smaller shall be made with twist-on connectors suitably sized for the number and gauge of the conductors.
  - 3. Furnish and install proper lugs in all service pedestals, panelboards, motor control centers and gutters as required to properly terminate every cable. Where paralleled conductors, or conductors of large size are to terminate on a breaker, a short length of copper cable (of capacity of the breaker) shall be connected to the breaker, and the proper compression type lug installed to connect this cable to the feeder cable. The cutting of cable strands to fit the breaker will not be permitted.
  - 4. Only crimping tools approved by the manufacturer of the terminals or lugs shall be used.
  - 5. Uninsulated lugs and wire ends shall be insulated with layers of plastic tape equal to insulation of wire and switchboards, with all irregular surfaces properly padded with insulating putty prior

to application of tape. Wire in service pedestals, panels, cabinets, pullboxes and wiring gutters shall be neatly grouped together and laced with #12 standard lacing twine, or cable ties.

6. In underground location, joints, splices and taps shall be insulated by the "Skotchcast" epoxy-resin method. In-line splices may be insulated by approved waterproof "shrink tube" method.
7. In service pedestals, panels, pull boxes, gutter, etc. conductor shall be neatly fanned out and tagged with wire markers.
8. At outlets, junction boxes, pull-boxes, fittings, etc., conductors shall be looped or pigtailed to extend at least six inches without splice beyond such wiring enclosures, and where used, pigtails added to loops for connection to fixtures or devices shall be at least six inches long.
9. Conduit shall be capped during construction by means of manufactured conduit seals or caps to prevent entrance of water or debris, and shall remain closed until ready for use.

### 3.02 Installation

- A. Install all wiring in raceway unless otherwise indicated on the drawings.
- B. Power Feeder, power branch, control and instrumentation circuits shall be not combined in conduit, wireway, junction or pull boxes; except as permitted in the following:
  1. Where specifically indicated on the drawings or field conditions dictate and written permission is obtained from the Engineer.
    - a. Feeder and branch circuits shall be isolated from each other and from all control and instrumentation circuits.
    - b. Control circuits shall be isolated from feeder, branch and instrumentation circuits.
    - c. 12 VDC, 24 VDC and 48 VDC may utilize a common raceway.
    - d. 125 VDC shall be isolated from all other AC and DC circuits.
    - e. AC control circuits shall be isolated from all DC circuits.
- C. Instrumentation circuits shall be isolated from feeder, branch and control circuits.
- D. Ground the drain wire of shielded cables at one end only.
- E. Maintain electrical continuity of the shield when splicing twisted shielded conductors.
- F. Make splices and taps only at pull or junction boxes.
- G. Terminate instrumentation and control wiring, including spare wires, at control panels and motor control centers on terminal boards mounted inside the equipment.
  1. Contractor shall supply terminal boards as required.
  2. Do not field wire directly to devices.
  3. Ground both ends of spare wires.
- H. All conduits containing conductors shall be sealed as the conduit enters pull boxes and electrical vaults and manholes. Power conductor, control conductors, and instrumentation conductors shall be bundled and supported separately and independently in pullboxes, vaults and manholes.
- I. Cables:
  1. Do not splice without permission of the Engineer or the Owner's Representative. Locate splices, when permitted, only in readily accessible cabinets or junction boxes using terminal strips. Splices will not be permitted unless deemed necessary by approved pulling tension calculations.

2. Where connections of cables installed under this section are to be made under Division Instrumentation and Controls, leave pigtails of adequate length for neat bundled type connections.
3. Instrumentation, computer, and control cables run under infinite access floors in control rooms may be installed under the floor without protection. Run individual wires, pairs, or triads in flex conduit under the floor or grouped into bundles at least ½ inch in diameter.
4. Maintaining the integrity of shielding of instrumentation cables is essential to the operation of the control systems. Take special care in cable installation to ensure that grounds do not occur because of damage to the jacket over the shield.
5. Cables entering manholes, handholes or vaults shall be sealed using an expanding foam product approved for the purpose.

#### J. Conductor Arc and Fireproofing Tapes

1. Use arc and fireproofing tapes on all 600-volt single conductors and cables except those rated Type TC at splices in all maintenance holes, handholes, vaults, cable trays, and other indicated locations. Wrap together as a single cable all conductors entering from each conduit.
2. Follow tape manufacturer's installation instructions. Secure the arc and fireproofing tape at frequent intervals with bands of the specified glass cloth electrical tape. Make each band of at least two wraps of tape directly over each other.
3. Wrap together as far as possible, conductors carrying phases A, B, and C of the same feeder. Do not wrap together conductors carrying only two of the three phases.
4. The cables shall be trained as closely as possible to their final positions.
5. The cables shall be cleaned of all oil, grease, and cable pulling compounds using suitable solvents and cleaners non-injurious to cable and then wiped completely dry.
6. Any projecting surfaces such as fittings, ground connectors or bonding connections shall be covered with an insulating compound to present a smooth continuous surface for taping.
7. Fireproofing tapes shall be submitted as shop drawings for approval. Tapes shall be 3-inch width half-lapped and extend a minimum of 6-inches into the raceway. Use ¾" glass tape at three foot intervals to hold tape in place.

#### K. Labeling

1. Each power and control circuit conductor shall be identified as shown at each terminal to which it is connected with a legible permanent coded marking sleeve. This includes all wiring terminations whether field terminations or interior wiring within switchboards, motor control centers, control panels, equipment, and junction panels and boxes.
2. In each manhole, handhole and pull box, each conductor shall be similarly marked with a split sleeve, machine marked so the identification can be made using groups of letters and numbers.
3. Each wire and conductor shall be labeled with a wire label that corresponds and matches the wire labels shown on the approved interconnect drawings, loop drawings or elementary wiring diagrams.
4. For neutral wires such as jumpers between adjacent relay coil neutral terminal that are less than 7 inches in length, the wire label may be omitted if there isn't sufficient space for the labels.
5. Wire numbering shall be compatible and consistent with existing system and shall be approved by the engineer.
6. For general lighting and 120 volt powered receptacles, the wire labels shall be installed at each device with a label that consists of the panelboard name and the circuit number. For example,

the Circuit Breaker located in the number 1 position of Panelboard "OPL2 would have its associated wiring labeled as "PNLOPL2-L1 (line power) and "PNLOPL2-N1 (Neutral).

#### L. Wire and Cabling Termination and Splicing

1. Power and control conductors shall be terminated in terminal blocks with solderless box lugs. Signal leads shall be terminated in terminal blocks with saddle-type pressure connectors capable of receiving two No. 16 AWG or smaller conductors on each point.
2. Splices in power wiring shall be made with two compression lugs bolted together. Splices in stranded control wiring or lighting circuits may be made with compression connectors. Splices in signal wiring shall be soldered. Splicing shall not be considered as a normal method of construction. Splicing shall be used only when no practical alternative exists to using terminals or point-to-point wiring. When utilized, splicing of 600 V or less insulated wire shall be made only in junction boxes. No splicing shall be permitted in conduit fittings.
3. Solid wire shall not be lugged nor shall electrical spring connectors be used on any wiring. Lugs and connectors shall be installed with a compression tool recommended by the lug manufacturer for the particular lug used. Pulling tensions shall not exceed the cable manufacturer's recommendations.
4. All conductors shall be tagged at each end in motor control centers, control panels, service pedestals and control stations with a legible permanent coded wire-marking sleeve. All conductors shall be identified in each manhole, handhole or pull box. Field conductors shall be similarly tagged at each end, except that each conductor termination shall have its marking sleeve imprinted with terminal identification for both ends of the conductor. A schedule shall be provided with the record drawings correlating these wire markings.
5. All splices and terminations for No. 1/0 AWG cable, and larger, shall be inspected by the Engineer prior to and after insulation is applied. Terminations at polyphase motors shall be made by bolt connecting the lugged conductors and then applying rubber filler tape and two 2-lapped layers of vinyl tape to equal or exceed the thickness of conductor insulation.

#### M. Grounding

1. A grounding system shall be installed in accordance with the National Electrical Code and Specification Section 16450. All grounding surfaces shall be thoroughly cleaned before connecting the grounding electrodes. All conduit shall be grounded directly or through equipment frames and ground buses to the grounding system.
2. In addition to the conduit system, all equipment having 480 volt, 120/208 volt or 120/240 volt supply shall be grounded to the supply source ground bus by a green insulated code sized ground conductor installed in the conduit with the phase cables. Ground conductors for small panels and equipment shall be of same size as associated conductors.

### 3.03 Adjusting / Cleaning / Protection

- A. Tighten all screws and terminal bolts using torque type wrenches and/or drivers to tighten to the inch-pound requirements of the NEC and UL.
- B. All debris and moisture shall be removed from both new and existing raceways, boxes, and cabinets before installing wire or cable

**\*\*END OF SECTION\*\***

## **SECTION 16125 MANHOLES, HANDHOLES, AND PULL BOXES**

### **PART 1 - GENERAL**

#### **1.01 Summary**

- A. Scope: This section provides specifications for all concrete electrical manholes, handholes and pull boxes.
- B. Type: Manholes, handholes and pull boxes shall be cast-in-place or pre-cast concrete sections as shown on the Contract Drawings (Drawings) and specified hereinafter.
- C. Sizing: Manhole, handholes and pull boxes shall be in accordance with NEC Article 370 requirements based on size, quantity of conductors and conduit clearances. Minimum size manholes, handholes and pull boxes are shown on the Drawings, but it's the Contractor's responsibility to verify the sizes with NEC Article 370 requirements based on size, quantity of conductors, and conduit clearances of the installed manholes, handholes and pull boxes.

#### **1.02 Related Sections**

- A. All specification sections are a part of these Specifications and shall be referred to by the Contractor for the execution of this Contract. Where there are differences between Specifications for the same product or work in other Divisions and Divisions 16 and 17, the conflict shall be conveyed to the Engineer and resolved at the sole discretion of the ENGINEER.

#### **1.03 References**

- A. All work specified herein shall conform to or exceed the applicable requirements of the Standards for construction of Manholes, Handholes, and Pullboxes and the provisions of the NEC for sizing all boxes.

#### **1.04 Submittals**

- A. Submittals shall comply with the provisions set forth in Sections 01300 and 16010.

#### **1.05 Project / Site Conditions**

- A. The manholes, handholes and pull boxes will be installed in water facilities. The manholes, handholes and pull boxes may be subject to corrosive soil and moisture.

### **PART 2 - PRODUCTS**

#### **2.01 Manufacturers**

- A. Manufacturers: Christy Concrete Products; Jensen Precast, Inc.; Brooks Products, Inc.; or equal.

#### **2.02 Equipment and Materials**

- A. Concrete
  1. The structural concrete shall conform to the requirements of Division 3 of these specifications.
  2. The aggregate shall be free of deleterious substances causing reaction with hydrogen sulfide.
  3. The cement shall be Portland cement conforming to ASTM C150, Type II. Cement content shall be sufficient to produce a minimum strength of 3000 psi.

## B. Reinforcing Steel

1. All reinforcing steel including welded wire mesh shall be as shown. All reinforcing shall be sufficiently tied to withstand any displacement during placement of concrete. All bars shall be hard grade billet steel conforming to ASTM A15. Bars 1/4-inch round and smaller shall be deformed in accordance with ASTM A305.
  2. Design loads shall consist of dead load, live load, impact and, in addition, loads due to water table and any other loads which may be imposed on the structure.
  3. Live loads shall be for H-20 loading per AASHTO standards for highway and bridges.
- C. Box dimensions shall be the minimum sized as shown on Contract drawings and in accordance with size, quantity of conductors, and conduit clearances per NEC Article 314 requirements.
- D. Manholes: Manholes may be of single- or multiple-section construction. Multiple sections shall be fitted to form watertight joints using tongue and groove joint with flexible plastic adhesive sealing compound.

## 2.03 Components and Accessories

### A. Covers

1. Manholes, handholes and pull boxes shall be provided with cast iron or galvanized steel covers and mounting rings reinforced for H-20 loading.
2. Pull boxes, 4 feet square and less than 4 feet 6 inches deep shall have a two-piece rectangular cover. Pull boxes, 2 feet by 3 feet in size shall have a one-piece rectangular cover. All other pull boxes, manholes, and handholes shall have a 30-inch diameter ring cover as shown. Covers shall be bolted down with recessed bolt heads.
3. Each manhole, handhole and pull box cover shall be identified by a cast in label. The cover shall be inscribed with the cast letters ELECTRICAL for electrical service or SIGNAL for communication or instrumentation. In addition, the identification number of the manhole or pull box shall be installed by means of bead weld in letters not less than 1 inch high.
4. Where located in streets or other heavy traffic bearing areas, covers shall be of the heavy street traffic type. When located in sidewalks or other non-vehicular traffic areas and with the approval of the construction manager covers may be of the parkway type.
5. Utilize heavy-duty type frames and covers made of cast iron, suitable for H-20 loading, and having machined bearing surfaces. Provide indented type covers, solid top design, with two drop handles each. On the upper side of each cover, cast or burned by welder, in integral letters not less than 2-inches high appropriate titles, ELECTRICAL, SIGNAL or TELEPHONE.

### B. Inserts

1. Concrete inserts for cable racks shall be provided in the walls of each manhole and pull box, one in a 4-foot wall and two in a 6-foot or 8-foot wall.
2. Cable pulling eye bolts shall be provided opposite each conduit entry area, and the inserts shall be designed to provide a minimum of 5,000 pounds tensile strength to accommodate all cable pulls.

## 2.04 Fabrication

### A. Conduit Entrances

1. Entries of conduits through walls shall be terminated in a bell flush with the interior wall.
2. Conduit wall penetrations shall be repaired with non-shrink grout.

3. Provide raceway entrances on all four sides. For raceways installed under this Contract, knockout panels or precast individual raceway openings may be used. On sides where no raceways are installed under this Contract, provide knockout panels for future raceway installation.
4. Slope floors toward drain points, leaving no pockets or other non-draining areas.
5. Utilize maintenance hole and handhole hardware of steel, hot-dip galvanized after fabrication

## **2.05 Source Quality Control**

- A. All prefabricated maintenance holes shall be shop inspected before delivery to the site.

## **PART 3 - EXECUTION**

### **3.01 Examination**

- A. The location of pull boxes, manholes and vaults are shown on Contract Drawings to be at their approximate location. The contractor shall adjust these locations to avoid conflicts with other underground utilities.
- B. Limit the number of directional changes to the conduit to total no more that 270 degrees in any run between pull points. Where required to ease pulling and as necessary to meet the NEC requirements, the Contactor shall supply and install pull boxes, manholes or vaults, even though not shown on the Drawings at no additional cost to the Owner.

### **3.02 Preparation**

- A. The pre-cast base section shall be placed on a prepared base of 12 inches of sand or gravel for even distribution of load before leveling. A plastic preformed joint sealant shall be applied between sections. The joint sealant compound shall be impermeable to water, have a high immediate bonding strength, and maintain permanent plasticity. The assembly shall be so located that surrounding paving shall slope up 1 inch above finish to prevent water settling on the cover. In unpaved areas, the slope shall be up 3 inches.
- B. Conduit runs between two vaults, manholes, or pull boxes shall be limited to a maximum of 300 feet or less 50 feet for every 90 degrees of conduit change in direction

### **3.03 Installation**

- A. The location of manholes, handholes, and pull boxes are shown on the Contract Drawing at their approximate location. The Contractor shall adjust the location of these manholes, handholes, and pull boxes to avoid conflict with other underground utilities at no additional cost to the Owner. Provide excavation, shoring, bracing, backfilling, grading, etc., in accordance with requirements specified elsewhere in these Contract Documents.
- B. Make installation so that raceways enter manholes, handholes or pullboxes at nearly right angles and as near as possible to one end of a wall, unless otherwise indicated.
- C. Pull Boxes, Manholes and Vaults shall be installed accurately to match the surrounding building outline, pavement or sidewalk grade. Set pullboxes parallel or perpendicular to adjacent structures.
- D. Install one ground rod in each manhole and handhole. Connect all noncurrent-carrying metal parts in the manholes and any metallic raceway grounding bushings to this ground rod with No. 6 AWG (minimum) copper conductor.

- E. Vault, Manhole and Pull Box Entry: Conduits entering underground pull boxes and vaults shall be horizontal, except when required otherwise by Power or Telephone Utility Standards. Conduit shall not enter through the bottom of boxes unless boxes are located above grade.
- F. Install covers flush within finished paved or concrete surfaces. In unfinished areas, install covers one inch (1") above finished grade.

#### **3.04 Field Quality Control**

- A. Keep boxes, vaults and manholes closed at all times when not being accessed to prevent entry of foreign matter. Cover to protect them against dirt, paint, water, chemical or mechanical damaged products prior to final acceptance.
- B. Clean and remove all debris from maintenance holes and handholes whether new or existing.
- C. At the contractor's discretions and with approval of the Owner's Representative, the Contractor may provide additional manholes, handholes and pull boxes, at no additional cost to the Owner.

**\*\*END OF SECTION\*\***

# SECTION 16130 WIRING DEVICES

## PART 1 - GENERAL

### 1.01 Summary

A. Scope: This section provides specifications for all electrical receptacles, plugs, plug strips, switches, device plates and surface covers.

### 1.02 Related Sections

A. All specification sections are a part of these Specifications and shall be referred to by the Contractor for the execution of this Contract. Where there are differences between Specifications for the same product or work in other Divisions and Divisions 16 and 17, the conflict shall be conveyed to the Engineer and resolved at the sole discretion of the ENGINEER.

### 1.03 References

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

<u>Reference</u>	<u>Title</u>
NEC	National Electrical Code, Latest Edition
NEMA WD1	General Wiring Devices
NEMA WD6	Wiring Devices Dimensional Requirements
UL 498	Attachment Plugs and Receptacles
UL 943	Ground-Fault Circuit-Interruptioners
UL 1449	Safety for Surge Protective Devices
Federal Specification WC596	Connector, Electrical, Power
Federal Specification WC-896	Switches, Toggle (Toggle and Lock), Flush Mounted
NEMA TC-3-2004	PVC Fittings for Use with Rigid PVC Conduit and Tubing

### 1.04 Submittals

A. Submittals shall comply with the provisions set forth in Sections 01300 and 16010.

### 1.05 Quality Assurance

A. All wiring devices shall be premium quality suitable for installation in water facilities and may be subjected to dust and moisture. All wiring devices shall be of the heavy-duty type with ratings as shown on the drawings or as specified.

B. All wiring devices shall be listed by UL or other testing firms that are recognized by the Owner.

C. All wiring devices shall comply with Federal Specification WS 896 and WC 596 for switches and receptacles respectively.

D. All wiring devices shall comply with NEMA configurations and standards for general and special purpose wiring devices.

#### 1.06 **Delivery, Storage, and Handling**

A. Refer to Section 16010, 1.07 for requirements.

#### 1.07 **Project / Site Conditions**

A. The receptacles; plugs, together with all plug strips; switches and device plates will be installed in water facilities and reservoirs where temperature is expected to range from 30° F and 115° F. Relative humidity is expected to range between 10% and 100%.

#### 1.08 **Warranty**

A. Refer to Section 17506 for requirements.

#### 1.09 **Maintenance**

A. Refer to Section 17506 for requirements.

### **PART 2 - PRODUCTS**

#### 2.01 **Manufacturers**

A. Make like items of equipment the end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts and manufacture's service. Wiring devices shall be of the manufacturer and model numbers described in this specification section.

#### 2.02 **Equipment and Materials**

A. General: All wiring devices shall be industrial extra heavy duty specification grade with provisions for back wiring and side wiring with captive-held binding screws. All receptacles shall be of the grounding type.

1. Devices located in areas with suspended ceilings or stud walls shall be ivory finish.
2. Devices located outdoors shall be black.
3. Devices located corrosive environments shall be yellow.

B. Single Phase Receptacles and Plugs:

1. 120V RECEPTACLES: 120V receptacles shall be NEMA 5-20R and shall accept NEMA 5-15p or 5-20p plug caps. These shall be Cooper 5362 Series, Hubbell 5362 Series, Leviton 5362 Series or equal.
2. 120V GFCI Receptacles: 120V GFCI receptacles shall be UL listed and shall have provisions for trip indication, testing and resetting. : 120V GFCI receptacles shall meet or exceed UL 943 (Class A GFCI), UL 498. These shall be Copper VGF20V Series, Hubbell GFR5362SG Series, Leviton 7899-SG Series or equal.
3. Locking 250 volt, 3 phase receptacles shall be NEMA L15-20 or L15-30 as applicable.
  - a. Receptacles rated for 20 amps shall be Cooper CRL152OR Series, Hubbell HBL2425SW Series or equal.
  - b. Receptacles rated for 30 amps shall be Cooper CWL153OR Series, Hubbell HBL2725SW Series or equal.

4. Corrosion-Resistant Receptacles: Receptacles called out "corrosion-resistant" shall be of yellow nylon construction with all metal parts of monel or cupro-nickel complying with Federal Specification W-C-596d. Corrosion resistant receptacles shall be Cooper 5362GR Series, Hubbell HBL53CM62 Series, or equal.
5. Weatherproof UL listed While-In-Use Covers: Weatherproof While-In-Use Covers will be provide with corrosion-resistance receptacles shall be designed so that the watertight integrity of the plug-receptacle is maintained when the units are plugged together and the live parts are equally protected when the plug is removed and when the cover is in place. The units shall consist of oil-resistant metal cover assemblies with a corrosion-resistant polycarbonate receptacle bodies. Plug caps shall match the receptacle and shall be of the same manufacturer. Metal Cover closed cell neoprene form gasket. These shall be Cooper WIUMV-1, Hubbell WP8MH or equal.
6. Plug Caps: Except for Corrosive Environments, Plug caps shall be industrial grade, of the cord grip type with black and white nylon housing, Hubbell HBL5266C, Leviton 5266C or equal. For Corrosion Environments, plug caps shall be corrosion resistant yellow nylon housing, Hubbell HBL52CM66C, Leviton 52CM-66C or equal and shall be of the same configuration and manufacture as the receptacle. One plug shall be supplied for each four receptacles, installed of a given configuration, figured to the next larger standard carton. Plugs shall be delivered in original sealed cartons to the Resident Engineer.
7. Plug Strips: Plug strips shall be of steel sheet metal or special stainless steel where called for. The dimensions of the plug strips shall be such that standard duplex receptacles and devices can be mounted in the cover section of the plug strip, with sufficient space behind the device for ten No. 12 AWG circuit conductors in accordance with NEC space rules. Plug strips shall be Wiremold No. G3000, SnapMark SMS3200, or equal.
8. Special Purpose NEMA Configuration Receptacles: Special purpose NEMA configuration receptacles shall be industrial grade, corrosion resistant and shall be as follows:
  - a. Provide Manufacturer and Model Number, noted below, or approved equal.
  - b. Non-locking 125/250 volt, 20 to 60 ampere ratings shall be NEMA 14-20 through 14-60 series:

<u>Ampere Rating</u>	<u>NEMA Rating</u>	<u>Cooper</u>	<u>Hubbell</u>
20	14-20R	5479	HBL8410
30	14-30R	n/a	HBL9430A
50	14-50R	5759	HBL9450A
60	14-60R	AH5754AP	HBL9460A

- c. Non-locking 250 volt, 3 phase, 15 to 60 ampere ratings shall be NEMA 15-15 through 15-60 series:

<u>Ampere Rating</u>	<u>NEMA Rating</u>	<u>Cooper</u>	<u>Hubbell</u>
15	15-15R	n/a	n/a
20	15-20R	n/a	HBL8420
30	15-30R	8430N	HBL8430A
50	15-50R	8450N	HBL8450A
60	15-60R	8460N	HBL8460A

- d. Locking 120/208 volt, 3 phase, 20 or 30 ampere ratings shall be NEMA L21-20 and L21-30:

<u>Ampere Rating</u>	<u>NEMA Rating</u>	<u>Cooper</u>	<u>Hubbell</u>
20	L21-20R	CWL2120R	HBL2510SW
30	L21-30R	CWL2130R	HBL2610SW

- e. Locking 250 volt, 3 phase receptacles shall be NEMA L15-20 or L15-30 as applicable:

<u>Ampere Rating</u>	<u>NEMA Rating</u>	<u>Cooper</u>	<u>Hubbell</u>
20	L15-20R	CWL1520R	HBL2420SW
30	L15-30R	CWL1530R	HBL2720SW

9. Water Proof Three-Phase Receptacles and Plugs: Three phase receptacles shall be for 3 phase, 4 wire, 480 volt service, with ampere rating as shown, of the type manufactured from high impact thermoplastic housing with an Arc resistant UL94-VO phenolic thermoset inserts. The receptacles and plugs shall be of the grounding type and shall be so designed that the grounding pole is permanently connected to the housing. The grounding prong or pole shall make contact before the line poles are engaged when the plug is connected to the receptacle housing. The plug sleeve shall also make contact with the receptacle housing before the line and load poles make contact. The receptacles and plugs shall be UL listed and CSA certified for circuit interrupting at full rated current. Shrouded contacts shall comply with California Code Title 8, Article 51, S2510.7 (b) for devices exceeding 300 VAC with horsepower ratings per NEC 420-151. The receptacles and plugs shall be moisture resistant per UL 1682 Paragraph 40. Receptacles shall have watertight/flap screw covers, O-rings on all pins and sleeves, interiors and plug shell. The receptacles and plugs shall be watertight even when not engaged. The receptacles and plugs shall meet requirements for NEMA 4, 4x, 6 and IP67. Receptacles and Plugs shall be Russellstoll DuraGard Series, Hubbell Insulgrip or equal.

### C. Switches

1. General Purpose: General-purpose switches shall be quiet AC type, industrial specification grade, UL listed for motor loads up to 80 percent of rated amperage, and shall be installed in

accordance with the required rated capacities. Switches shall match receptacles in color. Switches shall be rated 20 Amps, 120 – 277 volts, and shall be as follows:

- a. Single Pole On-Off Operation: Cooper 2221V, Hubbell HBL1221I or equal.
- b. Double Pole On-off Operation: Cooper 2222V, Hubbell HBL1222I or equal.
- c. Three-Way On-Off Operation: Cooper 2223V, Hubbell HBL1223I or equal.
- d. Four Way On-Off Operation: Cooper 2224V, Hubbell HBL1224I or equal.

2. Weather-Exposed and Corrosive: Maintained contact switches in weather- exposed and corrosive areas or where shown on the drawings shall be the tap action type with weather proof yellow switch plate. Switches shall be rated 20 Amps, 120 – 277 volts, and shall be as follows:

- a. Single Pole On-Off Operation: Cooper 2991V with AH2881, Hubbell HBL1281I with HBL17CM50 or equal.
- b. Double Pole On-off Operation: Cooper 2992V with AH2881, Hubbell HBL 1281I with HBL17CM50 or equal.
- c. Three-Way On-Off Operation: Cooper 2993V with AH2881, Hubbell HBL 1281I with HBL17CM50 or equal.
- d. Four Way On-Off Operation: Cooper 2994V with AH2881, Hubbell HBL 1281I with HBL17CM50 or equal.

3. Tap-Action switches in weather-exposed and corrosive areas shall be mounted in "FS" type mounting boxes with weatherproof Hypalon or neoprene cover plates.

D. Timer Switches: Timer switches shall have a white knob and a brushed aluminum plate with a spiral time scale to provide easy selection of time setting desired. The knob shall be a press on type requiring no screws or other hardware to secure. The timer shall have a UL listed rating of 1 HP 125 VAC, 50/60 Hz. The timer shall be SPDT. The timer shall not have a hold feature and shall have a time cycle of 2 hours. The timer shall be Intermatic Model FF2H, Paragon SWP2H, or equal.

## 2.03 Components and Accessories

### A. Communication Wiring Interface

1. The communication wiring interface shall consist of a six-port wall plate and device box for user connection with telephone and computer networks at the various locations shown on the drawings. The communication wiring interface shall be the Leviton Quickport MOS 3, Hubbell iStation or approved equal to the criteria that follows:

- a. All communication modules shall fully comply with NEC Article 800, be UL listed and meet FCC Part 68 requirements.
- b. Modules shall be of a high-impact, self-extinguishing plastic that is UL 94V-0 rated.
- c. Contacts shall be spring wire with phosphor bronze plated with 50 micro-inches of hard gold over 100 micro-inches of nickel. Jacks shall be Cat 5, Cat 5e, Cat 5e + or Cat 6 as required by the drawings.
- d. Wall plates and jacks shall be provided as follows:
- e. Six-port wall plates shall be flush mounted and field convertible. Wall plates shall house any combination of six (6) eight-conductor keyed jacks. Jacks shall be interchangeable depending on the application.

- f. Two-port wall plates shall have up to two eight conductor keyed jacks using insulation displacement connectors with punch-down caps for installation.
- g. The color key for the jacks shall be as follows:
  - 1) Telephone network: Ivory
  - 2) Data Network – Cat 5: Blue
  - 3) Data Network – Cat 5e: Red
  - 4) Data Network – Cat 6: Yellow
  - 5) Spare: Black

2. Wall plates shall be mounted in a 2” x 4” (minimum device box).

## B. Device Plates

### 1. General

- a. Stainless steel device plates shall be engraved directly with the service legend. Engraving shall be 1/8 inch high with black filling. Cast ferrous metal plates shall be provided with engraved laminated phenolic nameplates with 1/8-inch white characters on black background. Nameplates for switches shall identify the panel and the circuit number and the area served. Nameplates for receptacles shall identify circuit and voltage, if other than 120 volts single phase. Engraving schedule shall be submitted for review prior to engraving.
  - b. Device plates located in areas with suspended ceilings and stud walls shall be Type 302 stainless steel, satin finish, and 0.40-inch minimum thickness. Device plates in all other areas shall be cast ferrous metal with neoprene gasket and corrosion-resistant hardware. Receptacle covers exposed to weather shall be provided with while-in-use covers.
  - c. Device covers for corrosion-resistant applications shall be yellow thermoplastic or aluminum construction with a spring-closed cover for the outlet. The receptacle cover shall be Hubbell 52CM22, or Cooper 7879FSCR or equal.
2. Switch Covers: Switch covers shall be heavy cast aluminum with bat-handle toggle operators and shall be Appleton, Killark or Crouse-Hinds. Stainless steel screws and neoprene gasket shall be provided with each cover. Where scheduled, nameplates shall be phenolic in accordance with the specifications for nameplates, except the lettering shall be 1/8 inch high.
3. Receptacle Covers: Receptacle covers shall be heavy cast copper-free aluminum with a gasketed spring floor cover over each outlet. The receptacle cover shall have all exposed metal surfaces factory coated with a durable epoxy coating. Stainless steel screws and a neoprene gasket shall be provided with each receptacle cover.

## PART 3 - EXECUTION

### 3.01 Preparation

- A. Galvanized brackets, expansion bolts, toggle bolts or machine or wood screws according to the type of construction shall secure boxes. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes.
- B. Finish Plates and Devices: Do not install items until finish painting is complete. Scratched or splattered finish plat and devices shall be replaced at the Contractor’s expense.
- C. GFCI Outlets: One GFCI receptacle may be used to provide GFCI protection to downstream duplex receptacles on the same branch circuit provided the following conditions are met.

1. The downstream receptacles are in the same room as the upstream GFCI duplex receptacles, and.
2. The downstream duplex receptacles are labeled as being protected by an upstream GFCI receptacle in the same room.

### 3.02 Installation

- A. Unless otherwise shown, receptacle boxes shall be mounted 12 inches above the floor in offices, control rooms, and similar areas; shall be mounted 6" above back splash of countertops, and shall be mounted 48 inches above the floors in other locations unless otherwise shown.
- B. Upon installation of wall plates and receptacles, Contractor shall use care regarding their proper and cautious use. At time of substantial completion, replace those items which have been damaged, including those burned or scored by faulty receptacles or cord caps.
- C. Plumb: Install devices and finish plates plumb with building lines and equipment cabinets.
- D. Wall-Mounted Receptacles: Install with long dimension oriented vertically at centerline height shown on the drawings or specified herein.
- E. Vertical Alignment: When more than one outlet is shown on the drawings in close proximity to each other, but at different elevations, align the outlets on a common vertical center line for best appearance. Verify alignment with Construction Manager

### 3.03 Field Quality Control

- A. Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements.
- B. Test receptacles for line to neutral, line to ground and neutral to ground faults.
- C. Test ground-fault circuit interrupter operation according to manufacturer recommendation.
- D. Correct any defective wiring.
- E. Replace damaged or defective components.

### 3.04 Adjusting / Cleaning / Protection

- A. General: Internally clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates or devices.

**\*\*END OF SECTION\*\***

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## **Attachment D – City Standard Specifications**

<https://folsom.prod.govaccess.org/home/showpublisheddocument/390/637466585865470000>

**Attachment E – City Sample Contract**



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

## CITY OF FOLSOM CONSULTANT AND PROFESSIONAL SERVICES AGREEMENT

This Agreement is entered into as of \_\_\_\_\_ 2023 (“Effective Date”) by and between the City of Folsom, a Municipal Corporation, hereinafter referred to as "City" and \_\_\_\_\_, hereinafter referred to as "Consultant."

### WITNESSETH:

WHEREAS, City desires to hire a consultant to provide \_\_\_\_\_ services at various locations throughout the City and on an on-call basis; and,

WHEREAS, Consultant, by reason of its qualifications, experience, and facilities for performing the type of services contemplated herein, has proposed to provide the requested services.

NOW, THEREFORE, in consideration of the mutual promises hereinafter set forth, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged and agreed, City and Consultant agree as follows:

#### **1. Scope of Service**

The scope of service covered by this Agreement includes all consulting services described and contained in Exhibit A, attached hereto and by this reference incorporated into this Agreement. In the event of a conflict between the terms and conditions in this Agreement and the terms and conditions in Exhibit A, the terms and conditions set forth in this Agreement shall prevail.

#### **2. Term of Agreement**

The term of this Agreement shall commence on the Effective Date and shall continue until all services provided for in this Agreement have been performed or for one year, whichever is sooner, unless otherwise terminated as set forth in Paragraph 17 of this Agreement.

#### **3. Schedule for Performance**

City and Consultant agree that time is of the essence in the performance of this work, and Consultant agrees to produce documents in the times stated in the Proposal. Deviations from the time schedule stated in the Proposal may be made with the approval of the \_\_\_\_\_ Director, or his/her authorized representative.

#### **4. Compensation**

Compensation for the services shall be paid on a time-and-materials, not-to-exceed basis. The maximum compensation for the services specified in Exhibit A, including any and all costs or expenses, is \_\_\_\_\_. In the event the cost for services exceeds \_\_\_\_\_, Consultant agrees to complete all services enumerated in Exhibit A at no additional expense to City.

The City shall have the right to review all books and records kept by the Consultant and any subcontractors in connection with the operation and services performed under this Agreement. The City shall withhold payment for any expenditure not substantiated by Consultant's or subcontractor's books and records. In the event the City has made payment for expenditures that are not allowed, as determined by the City's audit, the Consultant shall reimburse the City for the amount of the disallowed expenditures. City shall make no payment for any services not specified in Exhibit A of this Agreement unless such additional services and the price thereof are agreed to in writing and approved by the City prior to the time that such additional services are rendered.

**5. Invoicing, Payment, Notices**

A. Consultant shall submit periodic invoices, not more frequently than monthly, for the services rendered during the preceding period. Invoices shall describe the services performed and costs incurred, the person(s) rendering performed services, the amount of time spent by such person(s), and the applicable hourly rate. Invoices that include charges for services rendered during the month of June shall not include any charges incurred after June 30th. A separate invoice shall be submitted for all services rendered after June 30th.

B. Consultant shall transmit invoices and any notices required by this Agreement, to City as follows:

Project Manager's Name  
\_\_\_\_\_ Department  
City of Folsom  
50 Natoma Street  
Folsom, California 95630

C. City shall transmit payments on invoiced amounts, and any notices required by this Agreement to Consultant as follows:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**6. Professional Services**

Consultant agrees that services shall be performed and completed in the manner and according to the professional standards observed by a competent practitioner of the profession in which Consultant and its subcontractors or agents are engaged. Consultant shall not, either during or after the term of this Agreement, make public any reports or articles, or disclose to any third party any confidential information relative to the work of City or the operations or procedures of the City without the prior written consent of City.

Consultant further agrees that it shall not, during the term of this Agreement, take any action that would affect the appearance of impartiality or professionalism.

**7. Independent Contractor**

A. It is understood and agreed that Consultant (including Consultant's employees) is an independent contractor and that no relationship of employer-employee exists between the parties hereto. Consultant shall be responsible for the payment of all taxes, workers' compensation insurance and unemployment insurance. Should Consultant desire any insurance protection, Consultant is to acquire same at its sole expense.

B. Consultant's assigned personnel shall not be entitled to any benefits payable to employees of City.

C. City is not required to make any deductions or withholdings from the compensation payable to Consultant under the provisions of the Agreement, and is not required to issue W-2 Forms for income and employment tax purposes for any of Consultant's assigned personnel.

D. Consultant, in the performance of its obligation hereunder, is only subject to the control or direction of City as to the designation of tasks to be performed and the results to be accomplished.

E. Any third persons employed by Consultant shall be entirely and exclusively under the direction, supervision, and control of Consultant.

F. Consultant hereby indemnifies and holds City harmless from any and all claims that may be made against City based upon any contention by any third party that an employer-employee relationship exists by reason of this Agreement. In the event Consultant or any employee, agent, or subcontractor of Consultant providing services under this Agreement is determined by a court of competent jurisdiction or the California Public Employees Retirement System (PERS) to be eligible for enrollment in PERS as an employee of the City, Consultant shall further indemnify, protect, defend, and hold harmless the City for the payment of any employee and/or employer contributions for PERS benefits on behalf of Consultant or its employees, agents, or subcontractors, as well as for the payment of any penalties and interest on such contributions, which would otherwise be the responsibility of City.

**8. Authority of Consultant**

Consultant enters into this Agreement as an independent contractor and not as an officer, employee or representative of the City. Accordingly, Consultant shall provide information, recommendation, and advice to City, but shall possess no authority with respect to any City decision and no right to act on behalf of City in any capacity as agent, or to bind City to any obligations whatsoever.

**9. Conflict of Interest**

Consultant certifies that it has disclosed to City any actual, apparent, or potential conflicts of interest that may exist relative to the services to be provided pursuant to this Agreement. Consultant agrees to advise City of any actual, apparent or potential conflicts of interest that may develop subsequent to the date of execution of this Agreement. Consultant further agrees to complete any statements of economic interest required by either City ordinance or State law.

Neither this Agreement, any duties or obligations under this Agreement, nor the intention or expectations of the City will cause the Consultant to be a “public official” as that term is used in California Government Code section 87100. The City and Consultant agree that the Consultant is not a “public official” or “participating in governmental decisions” as those terms are used in section 87100. The City and Consultant also agree that no actions and opinions necessary for the performance of duties under this Agreement will cause the Consultant to be a “public official” or “participating in a governmental decision” as those terms are used in section 87100. Nothing in this Agreement shall be construed to be inconsistent with the Consultant’s status as an independent contractor.

**10. Assignment and Subcontracting**

Consultant's rights, duties and obligations under this Agreement are not assignable or transferable, and Consultant shall not subcontract any work, without the prior written approval of the City.

**11. Ownership of Work Product**

All technical data, evaluations, reports, plans and other work products of Consultant provided hereunder shall become the property of City and shall be delivered to City upon completion of the services authorized hereunder. Consultant may retain copies thereof for its files and internal use. City representatives shall have access to work products for the purpose of inspecting same and determining that the services are being performed in accordance with the terms of the Agreement. Publication of the information derived from work performed or data obtained in connection with services rendered under this Agreement must be approved in writing by City.

Both parties recognize that the City is a public entity subject to the requirements of the California Public Records Act (“PRA”). Consultant understands that the release of any written, printed, graphic, or electronically recorded information and document delivered by Consultant to the City will be governed by the PRA and agrees that the release of such material pursuant to the PRA shall not require Consultant’s prior consent or approval.

**12. Indemnification**

Consultant shall indemnify, protect, defend, save and hold City, its officers, employees, and agents, harmless from any and all claims or causes of action for death or injury to persons, or damage to property resulting from intentional or negligent acts, errors, or omissions of Consultant or Consultant's officers, employees, volunteers, and agents during performance of this Agreement, or from any violation of any federal, state, or municipal law or ordinance, to the extent caused, in whole or in part, by the willful misconduct, negligent acts, or omissions of Consultant or its employees, subcontractors, or agents, or by the quality or character of Consultant's work. It is understood that the duty of Consultant to indemnify and hold harmless includes the duty to defend as set forth in Section 2778 of the California Civil Code. Acceptance by City of insurance certificates and endorsements required under this Agreement does not relieve Consultant from liability under this indemnification and hold harmless clause. This indemnification and hold harmless clause shall apply to any damages or claims for damages whether or not such insurance policies shall have been determined to apply, and shall further survive the expiration or termination of this Agreement. By execution of this Agreement, Consultant acknowledges and agrees to the provisions of this Section and that it is a material element of consideration.

**13. Insurance**

During the term of this Agreement, Consultant shall maintain and provide evidence of insurance coverage as set forth in Exhibit B, attached hereto and incorporated herein by reference, at its own cost and expense.

**14. Employment Practices**

Consultant, by execution of this Agreement, certifies that it does not discriminate against any person upon the basis of race, color, creed, national origin, age, sex, disability or marital status in its employment practices.

**15. Licenses, Permits, Etc.**

Consultant represents and warrants to City that it has all licenses, permits, qualifications and approvals of whatsoever nature legally required for Consultant to practice its profession. Consultant represents and warrants to City that Consultant shall, at its sole cost and expense, obtain and/or keep in effect at all times during the term of this Agreement any licenses, permits, and approvals which are legally required for Consultant to practice its profession at the time the services are performed.

**16. Records**

Consultant shall maintain records, books, documents and other evidence directly pertinent to the performance of work under this Agreement in accordance with generally accepted accounting principles and practices.

**17. Termination**

A. City or Consultant may terminate this Agreement by providing thirty (30) days written notice prior to the effective termination date.

B. In the event of such termination, City shall pay Consultant for all services actually rendered up to and including the date of termination.

C. Consultant shall deliver to City copies of all drawings, reports, analyses, and investigations whether completed or not, prepared or in the process of being prepared under the provisions of this Agreement.

**18. Amendments**

Any modification or amendment of any provision of this agreement shall be in writing and must be executed by both parties hereto.

**19. Incidental Beneficiaries**

It is expressly understood and agreed that the enforcement of these terms and conditions shall be reserved to City and Consultant. Nothing contained in the Agreement shall give or allow any claim or right of action whatsoever by any third person. It is the express intent of the City and Consultant that any such person or entity, other than City and Consultant, receiving services or benefits under this Agreement shall be deemed an incidental beneficiary.

**20. Miscellaneous Provisions**

A. Attorneys' Fees: In the event an action or proceeding is instituted by either party for the breach or enforcement of any provision of this Agreement, the prevailing party shall be entitled to reasonable attorneys' fees according to law.

B. Venue: This Agreement shall be deemed to be made in, and the rights and liabilities of the parties, and the interpretation and construction of the Agreement governed by and construed in accordance with the laws of the State of California. Any legal action arising out of this Agreement shall be filed in and adjudicated by a state court in the County of Sacramento, State of California.

C. Enforceability: If any term or provision of this Agreement is found to be void, voidable, invalid or unenforceable by a court of competent jurisdiction under the laws of the State of California, any and all of the remaining terms and provisions of this Agreement shall remain binding.

D. Time: All times stated herein or in any other contract documents are of the essence.

E. Binding: This Agreement shall bind and inure to the heirs, devisees, assignees and successors in interest of Consultant and to the successors in interest of City in the same manner as if such parties had been expressly named herein.

F. Survivorship: Any responsibility of Consultant for warranties, insurance, indemnity, record keeping or compliance with laws with respect to this Agreement shall not be invalidated due to the expiration, termination or cancellation of this Agreement.

G. Waiver: In the event that either City or Consultant shall at any time or times waive any breach of this Agreement by the other, such waiver shall not constitute a waiver of any other or succeeding breach of this Agreement, whether of the same or any other covenant, condition or obligation. Waiver shall not be deemed effective until and unless signed by the waiving party.

**21. Entire Agreement**

This instrument and any attachments hereto constitute the entire Agreement between the City and Consultant concerning the subject matter hereof and supersedes any and all prior oral and written communications between the parties regarding the subject matter hereof.

**22. Authority to Execute**

The person or persons executing this Agreement on behalf of the parties hereto warrants and represents that he/she/they has/have the authority to execute this Agreement on behalf of their entity and has/have the authority to bind their party to the performance of its obligations hereunder.

**23. Counterparts**

This agreement may be executed in one or more counterparts, each of which shall be deemed an original, and will become effective and binding upon the parties at such time as all of the signatories hereto have signed a counterpart of this Agreement. All counterparts so executed shall constitute one Agreement binding on all of the parties hereto, notwithstanding that all of the parties are not signatory to the same counterpart.

END OF TEXT - SIGNATURE PAGE FOLLOWS



**EXHIBIT A**

(Scope of Work)

See following pages.

**EXHIBIT B**  
**INSURANCE**

NOTE: The word “Consultant” in this Exhibit refers to either “Consultant” or “Contractor” as the term is used in the Agreement/Contract to which this Exhibit is attached.

A. During the term of this Agreement, Consultant shall maintain in full force and effect at all times during the term of the contract, at its sole cost and expense, policies of insurance as set forth herein:

1. General Liability:

- a. General liability insurance including, but not limited to, protection for claims of bodily injury and property damage liability, personal and advertising injury liability and product and completed operations liability.
- b. Coverage shall be at least as broad as Insurance Services Office Commercial General Liability coverage form CG 0001 (occurrence).
- c. Claims-made coverage is not acceptable.
- d. The limits of liability shall not be less than:

Each occurrence:	One Million Dollars (\$1,000,000)
Products & Completed Operations:	One Million Dollars (\$1,000,000)
Personal & Advertising Injury:	One Million Dollars (\$1,000,000)
- e. If a general aggregate limit of liability is used, the minimum general aggregate shall be twice the ‘each occurrence’ limit or the policy shall contain an endorsement stating that the general aggregate limit shall apply separately to the project that is the subject of the contract.
- f. If a products and completed operations aggregate limit of liability is used, the minimum products and completed operation aggregate shall be twice the ‘each occurrence’ limit or the policy shall contain an endorsement stating that the products and completed operations aggregate limit shall apply separately to the project which is the subject of the contract.
- g. If the Consultant maintains higher limits than the minimums shown above, the City requires and shall be entitled to coverage for the higher limits maintained by the Consultant. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City.

2. Automobile Liability:

- a. Automobile liability insurance providing protection against claims of bodily injury and property damage arising out of ownership, operation, maintenance, or use of owned, hired, and non-owned automobiles.
- b. Coverage shall be at least as broad as Insurance Services Office Automobile Liability coverage form CA 0001, symbol 1 (any auto).
- c. The limits of liability per accident shall not be less than:

Combined Single Limit

One Million Dollars (\$1,000,000)

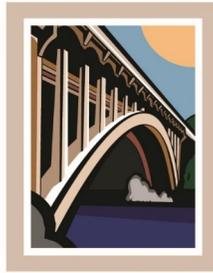
- d. If Automobile Liability coverage, as required above, is provided by the Commercial General Liability form, the General Liability policy shall include an endorsement providing automobile liability as required above.
3. **Workers' Compensation**
  - a. Workers' Compensation Insurance, with coverage as required by the State of California (unless the Consultant is a qualified self-insurer with the State of California), and Employer's Liability coverage.
  - b. Employer's Liability Coverage with a limit not less than \$1,000,000 per accident for bodily injury and disease.
  - c. Consultant shall sign and file with the City department responsible for this Agreement/Contract the Worker's Compensation Certificate contained in the Project Manual.
4. **Insurance Required in the Supplementary Conditions:** Consultant shall be required to comply with all conditions as stipulated in the Standard Construction Specifications, any supplementary conditions and any special provisions as applicable.
5. **Professional Liability Insurance**

If required, errors and omissions, malpractice or professional liability insurance with coverage of not less than \$1,000,000 per claim.
6. **Other Insurance Provisions:**
  - a. The Consultant's General Liability and Automobile Liability policies shall contain, or be endorsed to contain, the following provisions:
    - i. The City, its officials, employees, agents and volunteers shall be covered and specifically named as additional insureds on a separate endorsement as respects liability arising out of activities performed by or on behalf of the Consultant, products and completed operations of the Consultant, premises owned, occupied, or used by the Consultant, or automobiles owned, leased, hired, or borrowed by the Consultant in a form acceptable to the City Attorney.
    - ii. The Endorsement requirement may be satisfied with express provisions in the insurance policy(ies) which identifies any person or entity required to be included as an insured under the policy. A copy of the declarations page identifying the policy number, and pertinent provisions in the policy providing additional insured coverage shall be provided to the City.
    - iii. The policy shall contain no special limitations on the scope of coverage afforded to the City, its officials, employees, agents or volunteers.
  - b. For any claims related to the project, the Consultant's General Liability and Automobile insurance coverage shall be primary insurance in their coverage of the City and its officers, officials, employees, agents, or volunteers, and any insurance or self-insurance maintained by the City, its officers, officials, employees, agents or volunteers shall be excess of the Consultant's insurance and shall not contribute with it.

- c. Any failure to comply with reporting or other provisions of the policies on the part of the Consultant, including breaches of warranties, shall not affect coverage provided to the City, its officers, officials, employees, agents or volunteers.
  - d. The Consultant's Workers Compensation and Employer's Liability policies shall contain an endorsement that waives any rights of subrogation against the City, its officers, officials, employees, agents, and volunteers.
  - e. Each insurance policy shall state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits, non-renewed, or materially changed except after **30 days prior written notice** by certified mail has been given to the City. Ten days prior written notice by certified mail shall be given to the City in the event of cancellation due to nonpayment of premium.
7. Acceptability of Insurers: Insurance is to be placed with insurers with a **Bests' rating of no less than A:VII**.
8. The Consultant shall furnish the City with Certificates of Insurance and endorsements or insurance binders, signed by a person authorized by the insurer to bind coverage on its behalf, evidencing the coverage required by this section, the Standard Specifications, Special Provisions and/or any Supplementary Conditions. **The Consultant shall furnish complete, certified copies of all required insurance policies, including original endorsements specifically required hereunder if requested.**
9. The Consultant shall report, by telephone to the Project Manager within 24 hours, and also report in writing to the City within 48 hours, after Consultant or any Subcontractors or agents have knowledge of, any accident or occurrence involving death of or serious injury to any person or persons, or damage in excess of Ten Thousand Dollars (\$10,000) to property of the City or others, arising out of any work done by or on behalf of the Consultant as part of the contract.
10. Such report shall contain:
- a. the date and time of the occurrence,
  - b. the names and addresses of all persons involved, and
  - c. a description of the accident or occurrence and the nature and extent of the injury or damage.
11. The City, at its discretion, may increase the amounts and types of insurance coverage required hereunder at any time during the term of the contract by giving 30 days written notice.
12. If the Consultant fails to procure or maintain insurance as required by this section, the Standard Specifications, and any Supplementary Conditions, or fails to furnish the City with proof of such insurance, the City, at its discretion, may procure any or all such insurance. Premiums for such insurance procured by the City shall be deducted and retained from any sums due the Consultant under the contract.
13. Failure of the City to obtain such insurance shall in no way relieve the Consultant from any of its responsibilities under the contract.
14. The making of progress payments to the Consultant shall not be construed as relieving the Consultant or its Subcontractors of responsibility for loss or direct

physical loss, damage, or destruction occurring prior to final acceptance by the City.

15. The failure of the City to enforce in a timely manner any of the provisions of this section shall not act as a waiver to enforcement of any of these provisions at any time during the term of the contract.
16. In the event Consultant carries Excess Liability Coverage, the Excess Liability Coverage shall apply to any and all claims related to the project on a primary and non-contributory basis, and the City's insurance or self-insurance coverage shall be excess to the Consultant's Excess Liability Coverage.



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

**Community Facilities District No. 18 Phase 2A Water Improvements  
Construction Management Services Request for Proposals**

**ADDENDUM NO. 1**

**Issued June 24, 2024**

**Attention all prospective respondents to the Request for Proposals (RFP) for the subject project:**

- 1. The Proposal Due Date is amended to July 23, 2024 at 4:00 pm.** The location to submit the proposal remains the same at the City Clerk's office located on the 2<sup>nd</sup> floor of City of Folsom City Hall, located at 50 Natoma Street, Folsom, CA 95630

**Questions Received to Date**

1. Can you tell us what the Engineer's Estimate is for this project?
  - a. \$27,632,000 as of June 2024.

**End of Addendum #1**

Marcus Yasutake, P.E.  
Environmental & Water Resources Director

Rebecca Neves, P.E., QSD/P  
City Engineer