

SANTA ANA WATERSHED PROJECT AUTHORITY (SAWPA)

REQUEST FOR PROPOSALS (RFP)

For

**Inland Empire Brine Line (Brine Line) Reach V (Contract II and III)
Pipeline Condition Study**

Proposal submittals: Responses to this Request for Proposal (RFP) will be submitted to:

Santa Ana Watershed Project Authority
11615 Sterling Avenue
Riverside, California 92503

Telephone: (951) 354-4223
Fax: (951) 785-7076

No later than January 23, 2013 at 4:00 p.m. Seven (7) original copies and one (1) electronic file copy (in PDF format) of the proposal shall be submitted in a sealed envelope and marked: "Proposal for Engineering Services for Pipeline Condition Study." One (1) original copy of the fee proposal shall be submitted in a separate sealed envelope and marked: "Fee proposal". **Proposals received after the above specified date and time WILL NOT be accepted.** A pre-proposal meeting will be held at the SAWPA offices (see address above) at 10:00 a.m. on January 8, 2013. Questions regarding this RFP should be addressed directly to David Ruhl (druhl@sawpa.org).

1. Introduction

Agency Background

The Santa Ana Watershed Project Authority (SAWPA) was formed in 1972 to plan and build facilities to protect water quality in the Santa Ana River Watershed. SAWPA is a Joint Powers Authority (JPA) comprised of five (5) member agencies: Eastern Municipal Water District (EMWD), Inland Empire Utilities Agency (IEUA), Orange County Water District (OCWD), San Bernardino Valley Municipal Water District (SBVMWD), and Western Municipal Water District (WMWD).

SAWPA owns either capacity rights in, or owns outright approximately 93 miles of pipeline referred to as the Inland Empire Brine Line (Brine Line). The Brine Line was initially constructed to provide for highly saline, non-domestic discharges in order to protect the inland water quality in the upper Santa Ana River Watershed. Figure 1 provides a graphic representation of the Brine Line and its various reaches, I through V.

Project Background

The Brine Line Reach V, (formerly known as the Temescal Valley Regional Interceptor) was constructed in 2001 and runs from the intersection with Reach 4B in the City of Corona approximately 22 miles south, to the intersection with EMWD's Brine Line Lateral in the City of Lake Elsinore. EMWD operates the nine (9) mile Brine Line Lateral to collect high saline discharges from a power plant, two (2) desalters and one (1) industrial manufacturer. The Reach V average daily flow is 2.5 million gallons per day

(MGD) and its maximum design capacity is approximately 11.5 MGD. Reach V consists of 24-inch and 30-inch PVC pipe and 26-inch HDPE pipe and was designed as five separate contracts (Contract I – V). See Section 11 of this RFP for instructions on how to download copies of the Reach V record drawings.

The Brine Line Reach V, Contract II and III alignment is entirely within Temescal Canyon Road beginning at Glen Ivy Road in unincorporated Riverside County, northwesterly approximately five miles (25,742 lineal feet) to La Gloria Street in the City of Corona. Reach V, Contract II and III consists entirely of 24-inch PVC pipe.

On October 18, 2011, a brine spill was reported on Reach V (Contract II and III) near the intersection of Temescal Canyon Road and Cabot Road in the City of Corona, see Figure 2. Subsequent excavation and repair of the brine line in this location revealed the pipe is “out of round” or slightly oval. SAWPA has performed extensive investigative work in the area of the spill to determine the quality of the original construction and the structural integrity of the Reach V pipeline.

SAWPA excavated five test pits in the vicinity of the spill to determine the composition and compaction of the soil within the existing Brine Line trench zone and to measure the pipe ovality, see Figure 3. Testing of the soil and visual inspection revealed poor compaction in the pipe bedding and backfill, pipe deflection in the range of 2.7 – 7%, large cobbles in the backfill and no sand in the pipe zone. (See Attachment A for soil compaction results and pipe dimensions)

In September 2012, SAWPA convened a panel of experts to evaluate the data and investigative work completed to date, comment on the possible cause(s) of failure, and evaluate options for rehabilitating or replacing the pipeline. The panel concluded the pipe failure was caused by a variety of factors that combined to develop an over-deflection condition and ultimately a failure at the pipe joint. These factors include the following:

- Poor installation/compaction
- Lack of specified bedding material
- Brine Line constructed in common trench with 42-inch water line
- Poor sidewall support
- Rocks in pipe zone
- Over deflection of pipe
- Failure of joint gasket
- Added roadway fill

The Expert Panel developed a list of recommended actions to help assess the condition of the pipeline and identify other potential high risk areas. These actions include the following:

- Construct four additional test pits to determine limits of poor compaction and pipe deflection (2 of 4 recommended pits are complete);
- Conduct a leak detection survey using “smart ball” technology or similar technology;
- Conduct a risk assessment to identify potential high risk areas;
- Conduct program level condition assessment;
- Perform a Surge Analysis; and

- Pipe rehabilitation/Replacement in over-deflected locations.

A copy of the Expert Panel' Summary Report is included in Attachment B.

SAWPA has completed two of the four recommended test pits. An additional two test pits are scheduled to be constructed in January 2013, see Figure 4. Compaction tests and visual inspection of the soils and pipe have revealed similar results as the initial investigation.

The professional services of an engineering consulting firm are necessary to implement several of the expert panel recommendations and provide a detailed assessment of the condition of Reach V (Contract II and III) and other known areas of concern on Reach V. The attached RFP includes preparation of a pipeline condition study to include a risk assessment, and surge analysis. The study will define the limits of the work and recommend the appropriate repair or replacement method for specific locations along the pipeline alignment, as well as a construction cost estimate. The pipeline condition study will be used as a basis to prepare final plans and specifications for the pipe rehabilitation/replacement.

2. Schedule

December 19, 2012	Issue Request for Proposals
January 8, 2013	Pre-proposal meeting (10:00 am)
January 23, 2013	Proposals due (4:00 pm)
January 30, 2013	Interview panel conducts interview of top proposing firms
February 7, 2013	Recommend award to PA 21 Committee
February 19, 2013	Recommend award to SAWPA Commission
February 26, 2013	Issue Notice to Proceed

3. Proposal Instructions and Conditions

3.1. Pre-Contractual Expenses - Pre-Contractual expenses are defined as expenses incurred by prospective bidders in:

- Preparing a proposal in response to the RFP
- Submitting that proposal to SAWPA
- Negotiating with SAWPA in any matter related to this RFP, proposal, and/or contractual agreement
- Any other expenses incurred by the prospective bidder prior to the date of an executed contract

SAWPA will not, in any event, be liable for any pre-contractual expenses incurred by any prospective bidder. In addition, no prospective bidder shall include any such expenses as part of the price proposed to perform the requested services.

3.2. Authority to Withdraw RFP and/or Not Award Contract – SAWPA reserves the right to withdraw the RFP at any time without prior notice. Further, SAWPA makes no representations that any agreement will be awarded to any prospective bidder responding to this RFP. SAWPA expressly reserves the right

to postpone the opening of proposals for its own convenience and to reject any and all proposals in response to this RFP without indicating any reasons for such rejection(s).

- 3.3. **Selection of Multiple Proposals** – Due to the widely varied geographic area and technical requirements, SAWPA has found teams of consultants to be very effective in providing the technical expertise and personnel required to perform services for the Brine Line. Therefore, SAWPA reserves the right to select more than one prospective firm to provide services for all or part of the proposed scope of work.
- 3.4. **Right to Reject Proposal** - SAWPA reserves the right to reject any or all proposals submitted. Any award made for this engagement will be made to the firm/s, which, in the opinion of SAWPA, is best qualified to perform the services and represents the best value and effectiveness.
- 3.5. **Discrepancies in Proposal Documents** – Should prospective firms find discrepancies in, or omissions from the RFP, or if the intent of the RFP is not clear, and if provisions of the specifications restrict any prospective firm from proposing, they may request in writing that the deficiency(s) be modified. Such request must be received by SAWPA at least ten (10) working days before the proposal due date. All registered firms will be notified by addendum of any approved changes in the request for proposal documents.
- 3.6. **Oral Statements** - SAWPA is not responsible for oral statements made by any of its employees or agents concerning the RFP. If the prospective firm requires specific information, a written request must be submitted to SAWPA.
- 3.7. **Conflict of Interest** – The Consultant shall review their past, current or proposed work with agencies or firms having a significant interest in the Brine Line to verify a conflict of interest or the appearance of a conflict will not occur.

4. **Scope of Work**

The scope of work will include, but not be limited to the following tasks:

4.1. **Project Management**

The Project Management tasks and deliverables will include, at a minimum, the following:

- 4.1.1. **Kick-off Meeting:** Within one (1) week of issuance of the Notice to Proceed (NTP), the Consultant shall coordinate, prepare, and attend a kick-off meeting to be conducted at SAWPA's offices and attended by the Project Manager and other key personnel. The purpose of the meeting will be to meet key team members, discuss project goals, schedule, procedures, anticipated issues, and establishing communication channels between Consultant and SAWPA. The Consultant shall prepare and distribute a meeting agenda prior the meeting. The Consultant shall prepare

summary meeting notes and distribute to all attendees after the meeting.

- 4.1.2. Monthly Invoices: The Consultant shall provide monthly invoices detailing number of hours budgeted for each task and number of hours spent during the month and cumulative for the project. In addition, the monthly invoices shall identify labor, indirect and other project related costs incurred during the month and a brief description of the activities.
- 4.1.3. Schedule: The Consultant shall prepare and submit a schedule including key milestones and all related activities at the Kick-off Meeting. The schedule will be provided in MS Project and will reflect budgeted hours for each task and hours spent by task. Each task will be labeled with a complete description and an estimated duration in days and/or hours, as appropriate. The schedule shall be updated monthly and submitted with the monthly invoice.
- 4.1.4. Progress Reports: The Consultant shall provide brief monthly progress reports. The monthly reports shall include, at a minimum, a narrative status of monthly progress and cost updates. The progress reports shall be submitted with the monthly invoice.
- 4.1.5. Progress Meetings: The Consultant shall prepare for and participate in bi-weekly conference calls to discuss project status, schedule, issues that could impact project progress and/or budget and the following two week activities. The Consultant shall prepare and distribute an agenda prior to the conference call and prepare summary notes to distribute to all attendees after the conference call.
- 4.1.6. Consultant shall participate in SAWPA Commission meetings during the study period that will be led by SAWPA. Consultant participation shall include providing technical information and graphics associated with the project. Reproduction of material will be provided by SAWPA. Consultant will participate in one (1) Commission meetings related to the Study.

4.2. Risk Assessment

- 4.2.1. Review the entire Reach V (Contract II and III) pipeline and two (2) areas of concern (See locations below) and identify areas where a combination of failure modes are present, including poor soil conditions, pipe deflection, deep installation areas, close proximity to EVMWD water line and other utilities, high risk/high cost repair locations and areas with high environmental damage potential. **Note for soil condition and pipe deflection utilize data collected by SAWPA completed Test Pits (Attachment A).**

Areas of Concern:

Contract IV (Station 222+00 – 108+90)

Contract V (Station 173+00 – 197+00)

- 4.2.2. Based on information obtained in Task 4.2.1 perform a risk assessment on Reach V (Contract II and III) and the 2 areas of concern, to include how risks can be mitigated, timeframes to complete repairs/replacement measures and what types of monitoring and inspection should be performed to ensure the recommended measures and timeframes are working.
- 4.2.3. Develop recommendations for additional investigative measures, such as additional test pit locations, additional access points, CCTV Inspection, leak detection surveys (Pure Technologies Smartball). Develop a budget level estimate of costs for recommended measures.
- 4.2.4. Additional Investigative Measures (Field Work). All additional investigative measures (Field Work) will be performed by SAWPA and are not a part of this RFP.

4.3. Surge Analysis

The Consultant shall perform a surge analysis of the entire Reach V pipeline under various operational scenarios to identify locations where improvements are needed to improve the hydraulic performance and protect the integrity of the system. SAWPA can provide the Reach V network as a GIS file (used in InfoSWMM) or exported to an excel spreadsheet. SAWPA can provide invert elevations and pipe diameter.

4.4. Draft and Final Condition Study

The Consultant shall prepare a Draft and Final Condition Study that will be used as the basis for a preliminary and final design (design is not part of this work).

- 4.4.1. Based on information developed in Task 4.2 and 4.3, evaluate the appropriate rehabilitation or replacement strategy for specific locations along the Reach V (Contract II and III) pipeline alignment and the alignment of the 2 areas of concern and define the limits of work. The following factors shall be included in the evaluation.
 - Hydraulics
 - Costs
 - Construction Impacts
 - Adjacent Utilities
 - Upstream Dischargers
 - Traffic
 - Right-of-way
 - Alignment alternatives for replacement locations

- 4.4.2. Identify the appropriate Environmental Documentation to comply with CEQA Regulations.
- 4.4.3. Identify possible alignments for specific locations where replacement is recommended.
- 4.4.4. Identify traffic control requirements and locations, permits and permit requirements, and temporary or permanent construction easements.
- 4.4.5. Identify utilities in critical areas of the project and request record drawings and maps of their facilities from utility owners.
- 4.4.6. Evaluate flow by-passing requirements. Identify and recommend necessary measures to minimize disruption of the Brine Line operations. All unavoidable system interruptions shall be carefully identified.
- 4.4.7. Develop a budget level estimate of costs for recommended measures. Consultant shall submit a draft budget level estimate of costs within 5 weeks from Notice to Proceed. Updates to the budget level estimates shall be provided in the Draft and Final Condition Study.

The Consultant shall submit seven (7) copies and one (1) electronic copy in PDF format of the Draft Condition Study to SAWPA for review. SAWPA will provide comments to the Consultant no later than seven (7) days after receipt of the complete Draft Condition Study. The Consultant shall incorporate SAWPA's comments and shall provide (7) copies and one (1) electronic copy in PDF format of the Final Condition Study within fourteen (14) days after receipt of SAWPA's comments. Consultant shall provide a CD with the electronic files in PDF and Word format and drawings in PDF and AutoCAD format.

5. Project Schedule

The Consultant shall adhere to the following schedule:

Major Milestones	Deadline (In weeks from Notice to Proceed)
Kick-off Meeting	1
Task 4.4.7 (Estimate of Costs)	5
Draft Report	8
Final Report	10

6. Fee proposal requirements

In preparing the fee schedule for the services identified under the scope of work, the Consultant shall take into consideration the following:

- 6.1 Compensation for Consultant direct services provided in completing the tasks shall be based upon an hourly billing rate up to a not-to-exceed amount.
- 6.2 For each task, provide a breakdown of labor hours by employee billing classification together with the cost of non-labor and sub-consultant services. The labor breakdown shall be compiled by project task, and be based on a listing of work tasks that correlates with the Consultant's defined scope of work for the project proposal. For each task sum the total hours and the total cost. The sum of all task hours and task cost shall be provided. This information will be used by SAWPA to evaluate the reasonableness of the fee proposal, and will be used in negotiating the final fee amounts for the contract agreement.
- 6.3 The Consultant shall detail the hours allocated to meetings by meeting type (kickoff, bi-weekly coordination, Commission, etc).
- 6.4 The Consultant's billing rates for all classifications of staff likely to be involved in the project shall be included with the fee proposal, along with the markup rate for any non-labor expenses and sub-consultants.
- 6.5 SAWPA will review the fee proposal of the Consultant deemed most qualified after completing a review of the proposals and conducting interviews. The final scope and fee will be negotiated with the top ranked Consultant.
- 6.6 Reimbursable expenses will not be allowed unless included in the proposal and negotiated prior to a contract. Billing rate escalations during the contract term are disfavored and shall be approved in negotiations prior to execution of a contract.

7. Proposal Requirements

Although no specific format is required by SAWPA, this section is intended to provide guidelines to the Consultant regarding features, which SAWPA will look for and expect to be included in the proposal.

Content and Format

SAWPA requests that submitted proposals are organized, presented in an understandable format, and relevant to the services requested. Consultant's proposals shall be clear, accurate, and comprehensive. Excessive or irrelevant material is not of benefit and will not contribute to overall evaluation.

Proposals should be limited to pertinent information. Proposal should be no more than twenty **(20) typed pages** (based on an 11-point minimum font size, including letter and table of contents). Resumes and page dividers will not count toward the proposal page limit. Resumes should be included in an appendix. The fee proposal, provided in separate cover, should contain information to clearly respond to the information that is requested in the RFP.

The proposal should include the following:

- Cover or transmittal letter
- Table of Contents, page numbering
- Project Approach and Scope of Services

- Project Team and Organization Diagram
- Descriptions of similar projects by key staff to be used on this assignment including scope and complexity of the projects
- Brief resumes of key staff and sub-consultants (In Appendix)
- Relevant and appropriate references
- Project schedule
- Breakdown of total hours by Task. Total hours include Consultant personnel and subconsultants.
- Contract Exceptions, Proof of Insurance
- Fee proposal, billing rates for staff. In addition, the fee proposal shall include a breakdown of hours by type of personnel identified as part of the project team. **(submitted in a separate sealed envelope).**

Some of these areas are described in further detail below:

Cover or Transmittal Letter

An individual authorized to bind the Consultant shall sign the proposal and fee proposal. The proposal shall contain a statement that the proposal and fee are valid for at least a 90-day period.

Project Approach and Scope of Services

A description of the work program that will be undertaken shall be included in this section. It should explain the technical approach, methodology, and specific tasks and activities that will be performed to address the specific issues and work items identified in the RFP. It should also include a discussion of constraints, problems, and issues that should be anticipated during the contract, and suggestions for approaches to resolving them. Any proposed deviations to the scope of work as described herein should be clearly noted.

Project Team and Organization Diagram

The purpose of this section is to describe the organization of the project team including sub-consultants and key staff. A project manager shall be named who shall be the prime contact and be responsible for coordinating all activities with SAWPA. An organizational diagram shall be submitted showing all key team members, their office location, and the relationship between SAWPA, the project manager, key staff, and sub-consultants. There also shall be a brief description of the role and responsibilities of all key staff and sub-consultants identified in the team organization.

Project Schedule

A project schedule shall be included which identifies the timetable for completion of tasks, activities, and phases of the project that correlate with the scope of work for the project. There should be a brief discussion of any key assumptions used in preparing the timetable, and identification of critical tasks and/or events that could impact the overall schedule.

Contract Exceptions, Proof of Insurance

The Consultant shall carefully review the standard agreement and include with the proposal a description of any exceptions requested to the standard contract. If there are no exceptions, a statement to that effect shall be included in the proposal.

The Consultant shall furnish, with the proposal, proof of insurance coverage to the minimum levels identified in Section 8.

Fee Proposal (In Separate Sealed Envelope)

A Fee Proposal shall be submitted per the requirements of Section 6.

8. General Requirements

8.1 Insurance Requirements

The Consultant shall furnish, with the proposal, proof of the following minimum insurance coverage. Full information on insurance requirements is listed in Attachment C. These minimum levels of coverage are to be maintained for the duration of the project:

- a. Obtain a Commercial **General Liability and an Automobile Liability** insurance policy, including contractual coverage, with limits for bodily injury and property damage in an amount of not less than \$2,000,000.00 per occurrence for each such policy. Such policy shall name SAWPA, its officers, employees, agents and volunteers, as an additional insured, with any right to subrogation waived as to SAWPA, its officers, employees, agents and volunteers. If Commercial General Liability Insurance or other form with an aggregate limit is used, either the general aggregate limit shall apply separately to the work assigned by SAWPA under this Agreement or the general aggregate limit shall be at least twice the required occurrence limit. The coverage shall be at least as broad as Insurance Services Office Commercial General Liability Coverage (occurrence Form CG 00 01) and Insurance Services Office Form CA 00 01 covering Automobile Liability, Code 1 (any auto). The Commercial Liability Insurance shall include operations, products and completed operations, as applicable.
- b. Obtain a policy of **Professional Liability** (errors and omissions) insurance appropriate to the Consultant's profession in a minimum amount of \$2,000,000.00 per claim or occurrence to cover any negligent acts or omissions or willful misconduct committed by Consultant, its employees, agents and subcontractors in the performance of any services for SAWPA. Architects' and engineers' coverage shall include contractual liability.
- c. Obtain a policy of **Employer's Liability** insurance in a minimum amount of \$1,000,000.00 per accident for bodily injury and property damage.
- d. Provide **worker's compensation** insurance or a California Department of Insurance-approved self-insurance program in an amount and form required by the State of California and the Employer's Liability Insurance that meets all applicable Labor Code requirements, covering all persons or entities providing services on behalf of the Consultant and all risks to such persons or entities.

The Consultant is encouraged to contact its insurance carriers during the Proposal stage to ensure that the insurance requirements can be met if selected for negotiation of a contract agreement.

8.2 Standard Form of Agreement

The selected Consultant will enter into an agreement with SAWPA based upon the contents of the RFP and the Consultant's proposal. SAWPA's standard form of agreement is included as **Attachment C**. The Consultant shall carefully review the agreement, especially in regard to the indemnity and insurance provisions, and include with the proposal a description of any exceptions requested to the standard contract. If there are no exceptions, a statement to that effect shall be included in the proposal.

8.3 Assigned Representatives

SAWPA will assign a responsible representative to administer the contract and to assist the Consultant in obtaining information. The Consultant also shall assign a project manager who shall be identified in the proposal. The Consultant's representative shall remain in responsible charge of the Consultant's duties from the notice-to-proceed through project completion. SAWPA's representative shall approve any substitution of representatives or sub-consultants identified in the written proposal. SAWPA reserves the right to review and approve/disapprove all key staff and sub-consultant substitution or removal, and may consider such changes not approved to be a breach of contract.

9. Consultant Evaluation and Selection Process

SAWPA's consultant evaluation and selection process is based on comprehensive review of the proposals for professional services. The following criteria will be used in evaluating the proposals:

1. Understanding of the project requirements including identification of critical elements and key issues for successful project implementation.
2. Technical approach and work plan for the project, including innovative approaches
3. Relevant qualifications and experience of the, firm, project manager, other key individuals, and sub-consultants and past performance and experience.
4. Schedule
5. Quality control procedures
6. Results of reference checks
7. Clarity of proposal and compliance with proposal requirements

Firms submitting the best proposals may be invited to an interview conducted by a selection panel made up of representatives from SAWPA member agencies, sub-agencies, and/or SAWPA staff. The number of firms to be invited for interviews is at the discretion of SAWPA. The interview format and details will be included in the interview invitation letter. SAWPA recognizes the significant effort required to respond to this RFP and therefore discourages any firm or team which lacks the required experience to submit a proposal for evaluation.

SAWPA may negotiate a contract with the most qualified firm or firms for the desired consulting services and compensation level, which SAWPA determines is fair and reasonable. Failing a successful negotiation with the best-qualified firm or firms, SAWPA will terminate negotiations and continue the negotiation process with the next most qualified firm(s), in order to obtain the services at a fair and reasonable price, until an agreement is reached, a firm is selected, and an agreement is executed.

10. Attachments

Attachment A – Soil Compaction Results and Pipe Dimensions from SAWPA completed Test Pits

Attachment B – Expert Panel Summary Report

Attachment C - Standard form of Agreement

11. Available Documents

The following reference documents are available for download from SAWPA's FTP site. Please e-mail Regina Patterson at rpatterson@SAWPA.org to receive FTP download instructions.

1. Record drawings of Reach V
 - a. Contract 1
 - b. Contract II and III
 - c. Contract IV
 - d. Contract V
2. Reach V Specifications
3. Reach V Geotechnical Reports

PROPOSAL AUTHORIZATION

(Please provide this document (or exact information) on your letterhead)

I certify I am authorized to submit a binding proposal on behalf of my company, (enter company name), and this proposal conforms to required specifications unless otherwise noted.

Company Name

Proposal Submitted by

Title

Signature

Date

Email

Telephone Number

Facsimile Number

Figure 1. Santa Ana Regional Interceptor (SARI)

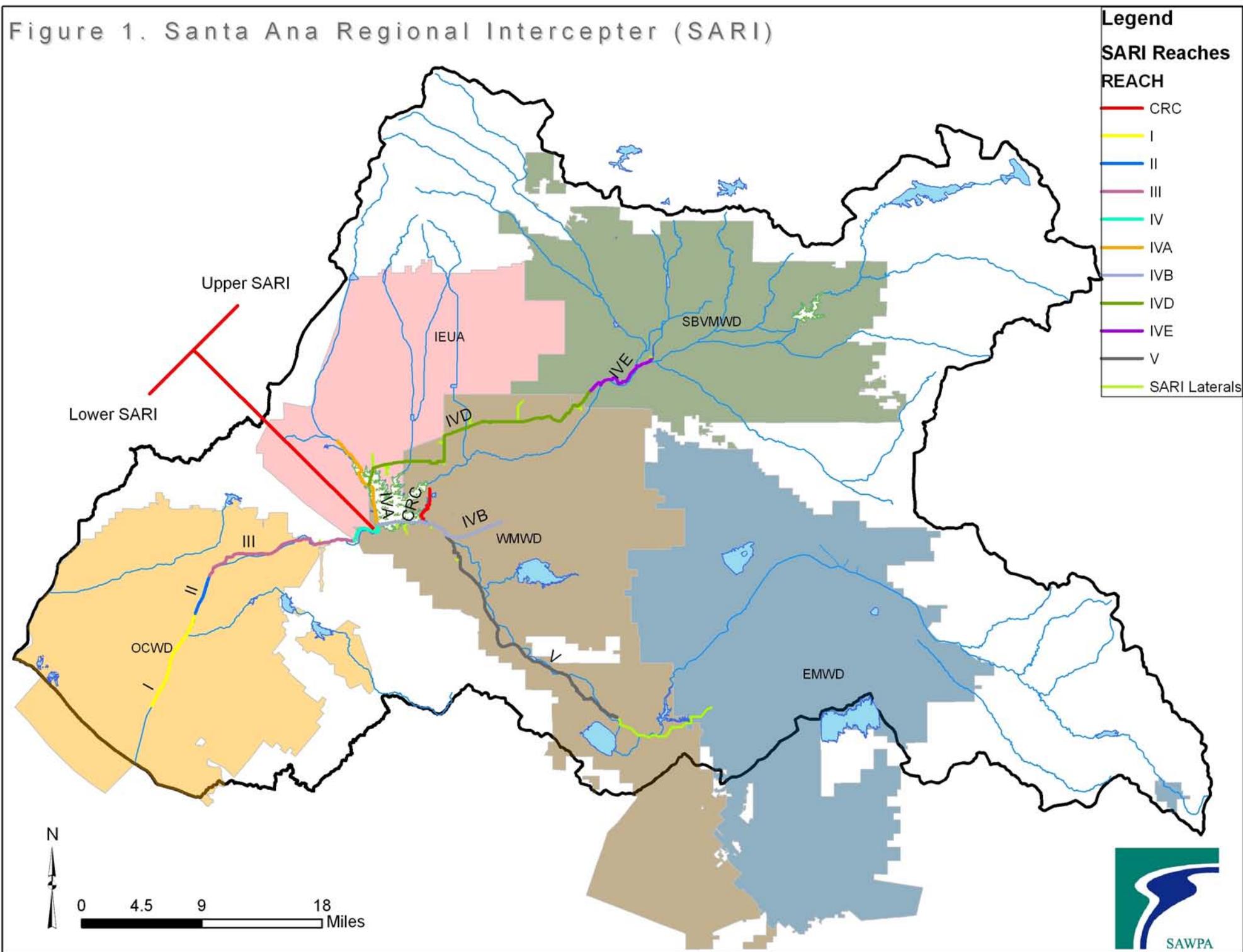
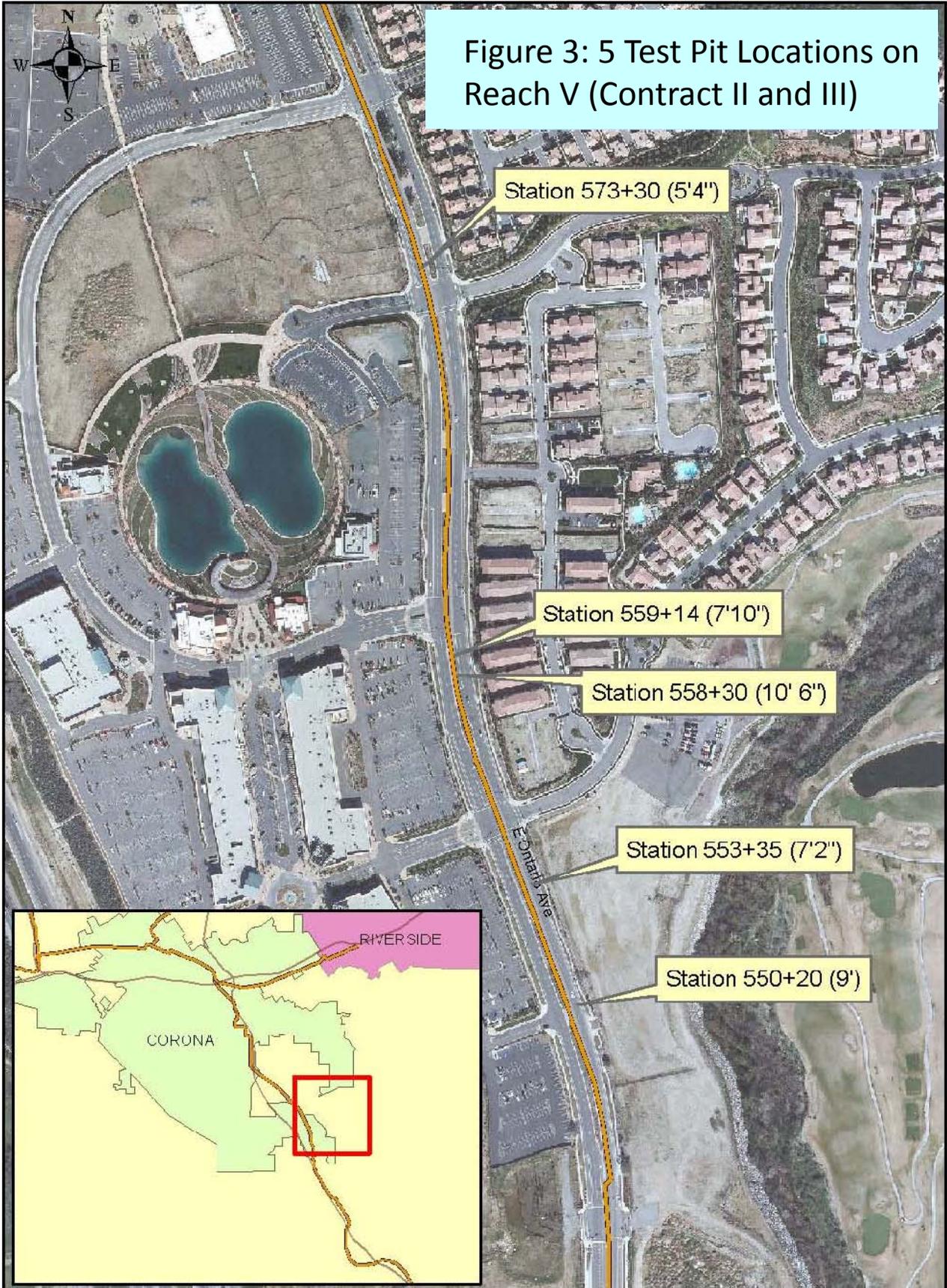
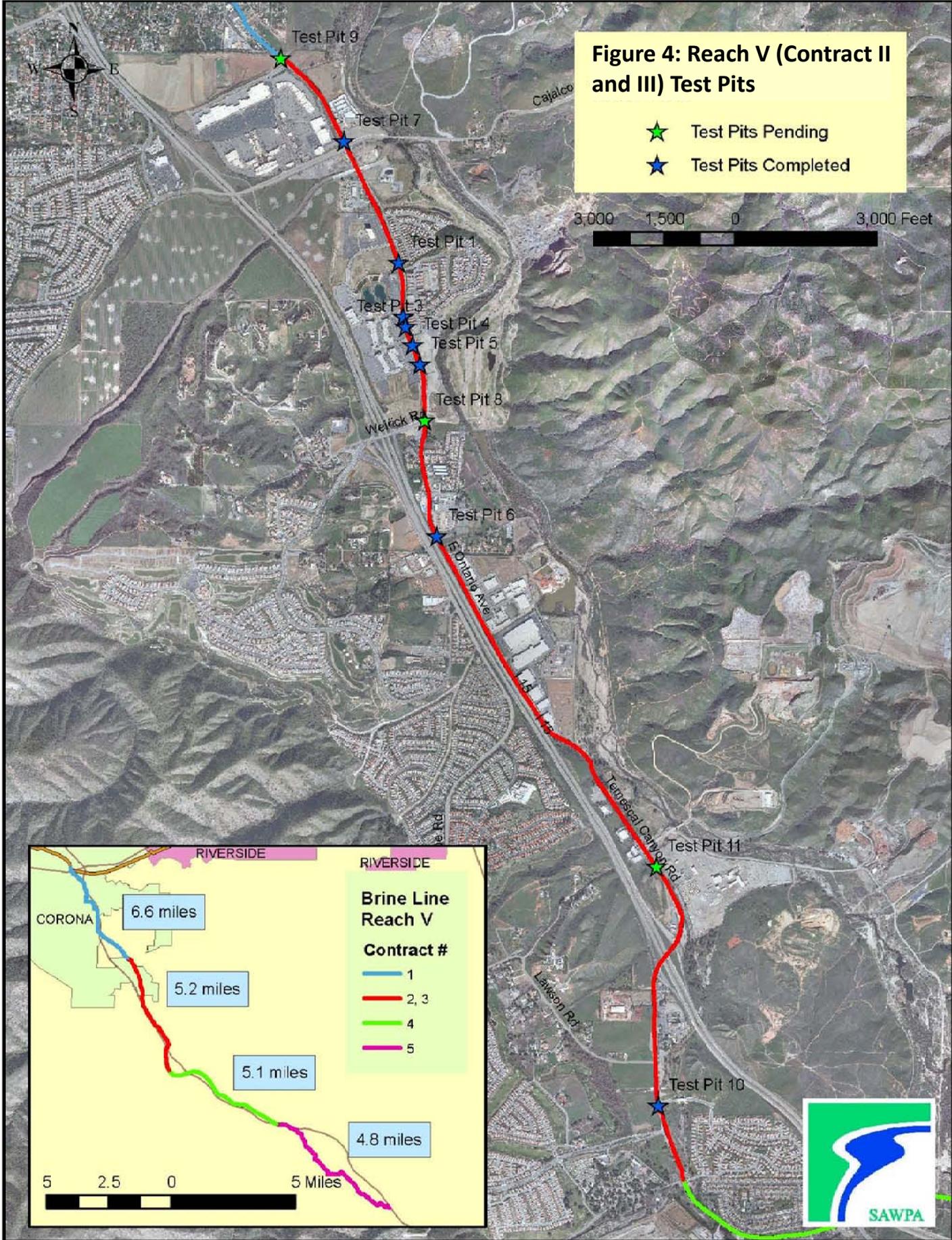


Figure 2: Brine Line SSO

- Streams
- SSO Location
- Brine Line







Attachment A



Mr. Carlos Quintero
Santa Ana Watershed Project Authority
11615 Sterling Avenue
Riverside, CA 92503

Project: 24" Sewer Force Main
Temescal Canyon Road.
Corona, CA
Heider Engineering Services, Inc. Project No.: 120065-2

Reference:

1. Final Compaction Report, Prepared by Heider Engineering Services, Inc., dated May 30, 2012
2. SAWPA Standard Drawing – W-3 (Attached).
3. Standard Earthwork Specifications, Section 02200, dated July 27, 1999. (Attached)

Dear Mr. Quintero,

Heider Engineering Services, Inc. (HESI), was engaged to observe the excavation of 5 separate test pits along Temescal Canyon Road in Corona. Our observation and testing was performed between May 8, 2012 and May 15, 2012. Testing of fill was performed at locations directed by your personnel in these test pits and results of this testing is provided in the Reference No. 1, above. Asphalt thickness was found to range from 8" to 10 3/4" overlying 5 1/2" to 10 3/4" aggregate base. Six separate Maximum Density-Optimum Moisture Tests, ASTM D 1557, were performed on different soils encountered in the backfill soils. The results of these tests are recorded on Table 1, in Reference 1 Report. The in-place density tests performed in the Test Pits were compared to the maximum density tests and the indicated relative compaction was found to range from 72% to 103%. The results of this testing is located on Table 2 – Field Density Results in Reference 1 Report.

We understand that Reference No. 2 & No. 3, above, were governing documents for this project and Reference No. 2, indicates the backfilling requirements.

- The reference indicates that a minimum 90% relative compaction was required in the **Pipe bedding material** and our testing indicates that this was **not achieved** in test Nos. SC-2, SC-6, where only 72% and 69% was determined, respectively.
- **Fill above the Bedding and below 3 feet** was required to be a minimum of 90% relative compaction. This was **not achieved** in Test Nos. SC-5, SC-9, SC-10, SC-12, SC-13, SC-16 and SC-17 where relative compaction ranged from 70% to 83%.
- Lastly, the **backfill in the upper zone**, the three feet below the pavement section, was required to have a minimum relative compaction of 95%. This was **not achieved** in test nos. SC-1, SC-4, SC-8 and SC-11, where the relative compaction of 88%, 80% and 85% was determined.

Ph: (909) 673-0292

FAX: (909) 673-0272

800-A South Rochester Ave., Ontario CA 91761-8171

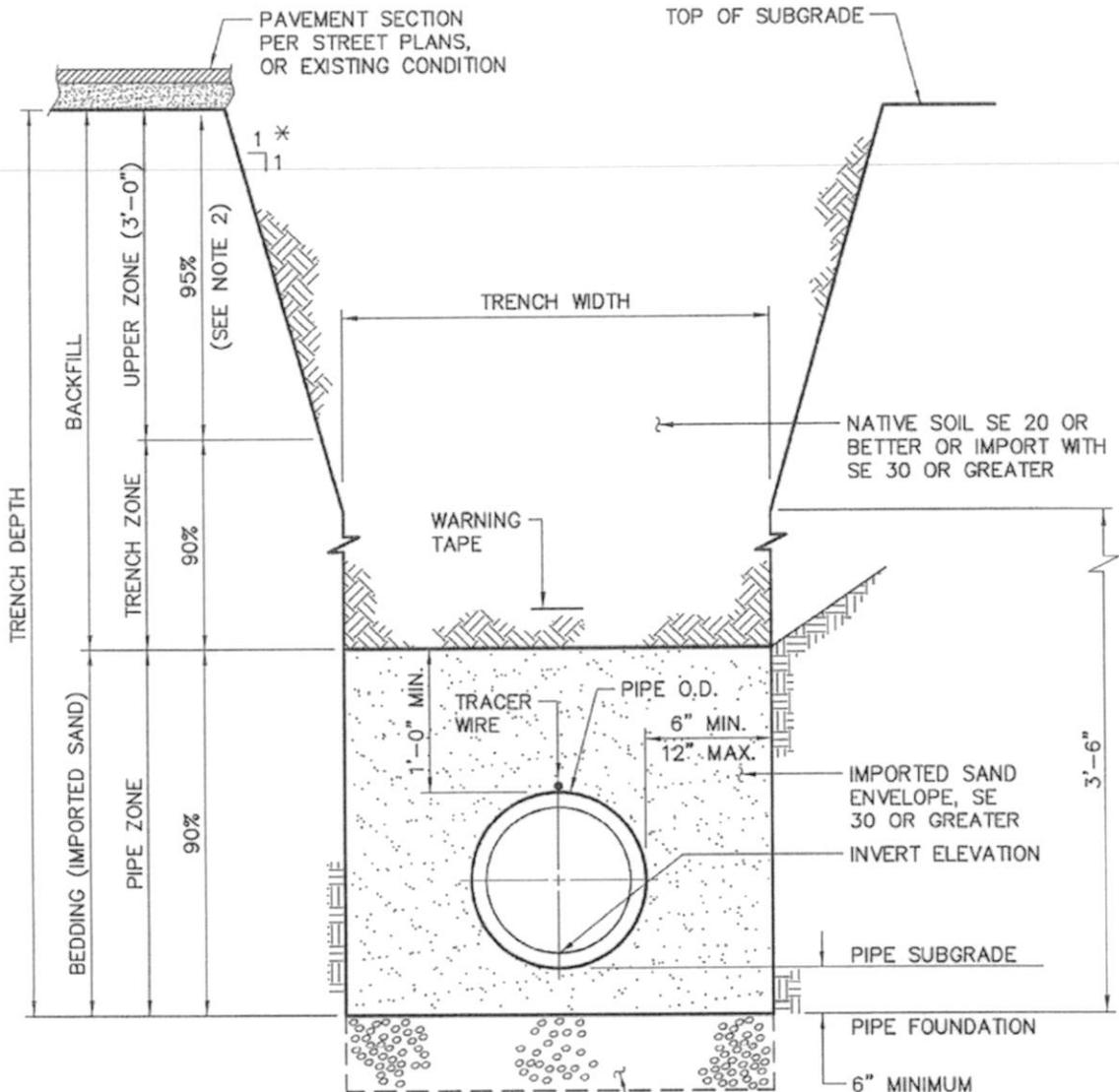
In the Test Pit located at Station 553+35, it was noted that several cobbles up to 8" were encountered in the pipe zone where only imported Sand was to be used. Hand probing in much of the fill investigated in the test pits was generally found to be loose and the density tests reported above supports these observations. We also witnessed pipe diameter measuring performed by others which indicated that the pipe ranged from ¾" to as much as 2" out of round.

In summary, the results of our observations and testing found that the pipe bedding and backfill did not meet the requirements of the Referenced Drawing in the test pits tested and observed by our personnel. If you have any questions or need additional information, please contact us at your convenience.

Respectfully submitted,



Dennis W. Heider, RCE
Principal Engineer



IF UNSUITABLE SOIL IS ENCOUNTERED, GEOTECHNICAL ENGINEER IS TO DETERMINE THE DEPTH OF REMOVAL AND SIZE OF FOUNDATION ROCK AND FILTER FABRIC REQUIREMENTS AND SUBMIT FOR DISTRICT REVIEW

3/4" TO 1-1/2" MAX. CRUSHED ROCK AS DIRECTED
 * LAYBACK SLOPE MUST BE VERIFIED AND/OR RECOMMENDED IN PROJECT GEOTECHNICAL REPORT

NOTES:

1. PAVING DICTATED BY LOCAL JURISDICTION.
2. 95% MAXIMUM DENSITY, MINIMUM AS DETERMINED BY ASTM D1557.
3. MAXIMUM 5' TRENCH DEPTH ALLOWED WITHOUT REQUIRED SAFETY OPERATION PERMIT.
4. CONTRACTOR SHALL BE RESPONSIBLE TO PERFORM ALL TRENCHING AND EXCAVATION IN ACCORDANCE WITH CALIFORNIA CODE OF REGULATIONS, TITLE 8.
5. EXCAVATION, BACKFILL AND COMPACTION SHALL BE IN ACCORDANCE WITH SECTION 02223 OF THE STANDARD SPECIFICATIONS.

REVISION	BY	APPR	DATE



PHILLIP M. MILLER R.C.E. 30580 DATE

WATER PIPE BEDDING AND TRENCH BACKFILL

STD. DWG. NO.

W-3

SECTION 02200 - EARTHWORK

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PART 1 - GENERAL

1.01 DESCRIPTION. Requirements specified in Conditions of the Contract and Division 1 form a part of this Section. Provide labor, equipment, tools, materials, and services needed to accomplish all site preparation, earthwork and incidental appurtenant work as described herein or shown on the Drawings.

A. Work included in this Section. Principal items are:

1. Excavation.
2. Compaction of fills and backfills.
3. Trenching, backfilling, and compaction.
4. Disposal of surplus and/or unsuitable materials.
5. Dust control and drainage control.
6. Cleanup.

B. Definitions.

1. Site. Public right-of-way as shown on the plans.
2. Suitable Material as specified herein shall be any material imported or excavated from the cut areas which, in the opinion of the Soil Engineer, is suitable for use in constructing fills.
3. Waste Excavation. Material from project excavations which is not suitable for use in backfill or compacted fills or is in excess of that required to be used for backfill or to construct fills.

1.02 SITE INVESTIGATION. A geotechnical exploration of the site was performed by American Geotechnical and the findings are contained in a "Geotechnical Study" dated 4/13/99.

In addition, the Contractor shall carefully examine the site and make all inspections necessary in order to determine the full extent of the work required to make the completed Work conform to the drawings and specifications. The Contractor shall satisfy himself as to the nature and location of the Work, conditions, the conformation and condition of the existing ground surface, and the character of equipment and facilities needed prior to and during prosecution of the Work. The Contractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the Drawings, or between the Drawings and Specifications must be brought to the Owner's attention in order to clarify the exact nature of the Work to be performed.

1.03 SAFETY. The Contractor shall familiarize himself with, and shall at all times conform to the regulations of the (OSHA General Industry Occupational Safety and Health Standards, " and "OSHA Safety and Health Regulations for Construction, "and of applicable state and municipal agencies.) ("General Construction Safety Orders" and "Trench Construction Safety Orders" of the State of California, Department of Industrial Relations, Division of Occupational Health and Safety.)

1.04 ENVIRONMENTAL SAFEGUARDS AND REGULATIONS. The Contractor shall

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comply with regulations in force at all times to prevent pollution of air and water.

1.05 QUALITY ASSURANCE.

A. **By Contractor.** Exercise due care to assure procurement, storage and placement of materials from site or offsite sources which will comply with the requirements. Specifications and standards set out herein. The Contractor may have, at his discretion, such tests and inspections as he may desire performed by qualified personnel or independent testing services, for his guidance and control of the Work.

B. **By Engineer.** The Engineer, through his project representative(s) will be the on-site arbiter and judge of the acceptability of the work done, based on such observations and tests he may require or perform.

C. **By Owner.** The Owner may, on the recommendation of the Engineer, provide inspection and testing by his own representatives or by independent testing services, engaged and paid for by the Owner. In this regard, a Soils Engineer will be engaged by the Owner, who shall act as the direct representative of the Owner in soils work, to perform inspection of the removal and replacement of unsuitable materials, all excavations, and the placement and compaction of all fills and backfills within the limits of earthwork on this Project. Costs for all such inspections and tests will be paid by the Owner, except Contractor shall bear the cost of retest and reinspection of reworked faulty work.

D. Applicable Criteria, Tests and Standards.

1. For Trenches. The Owner will provide the services of a qualified Soils Engineer to make tests of prepared trench backfill at the discretion of the Engineer. The Contractor shall give the Engineer twenty-four (24) hours advance notice for testing.
2. For Waste. Material deemed unsuitable by the Soils Engineer from tests or visual inspection, and all material delivered to fill or embankment, which cannot be satisfactorily compacted, shall be wasted in an area, provided by the Contractor, that is acceptable to local authorities.
3. For Clean-up. The Contractor shall remove all rubbish, debris, junk, temporary materials, and any waste excavated materials from the Project Site and dispose of in accordance with all applicable laws, regulations, permits and approvals from owners and property upon which the material will be disposed. The Contractor shall perform restoration of staging and storage areas and temporary roads to the satisfaction of the Owner, as a condition for acceptance and final payment.

4. Standards for Soil Classification, Properties and Tests.

A. **Trench Backfill and Road Embankment Testing**

- (1) Classification - ASTM D2487
- (2) Maximum Density - Standard Proctor ASTM D-1557
- (3) In-place Density - ASTM D-1557
- (4) R-Value for Pavement - ASTM D-2844

1.06 **COMPACTION.** The maximum dry density and optimum moisture content of each soil type used in the controlled compacted fill or trench backfill shall be determined in

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accordance with ASTM D698. Field density tests shall be determined in accordance with ASTM D1557.

1.07 **DEWATERING.** The Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the Work. Dewatering shall be accomplished by methods that will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. For pipelines work, the methods may include sump pumps, deep wells, well points, suitable rock or gravel placed below the required bedding for draining and pumping purposes, temporary pipelines, and other means. The proposed method shall be submitted to the Owner for review.

Dewatering for the pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provision of this Section or other requirements.

Standby pumping equipment shall be on the job site. A minimum of one standby unit (a minimum of one for each ten in the event well points are used) shall be available for immediate installation should any well unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the Work. Drawings or details indicating the proposed dewatering system shall be submitted to the Owner for review.

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 gravel or crushed rock at no cost to the Owner.

No concrete shall be placed in water, nor shall water be allowed to rise over it until the concrete has set at least 24 hours. Water shall not be allowed to rise above pipe bedding during pipe laying operations.

The Contractor shall dispose of the water from the Work in a suitable manner without damage to adjacent property, and in conformance with the requirements of State Water Resources Control Board regulations for National Pollutant Discharge Elimination System (NPDES), including Waiver of Waste Discharge requirements for specific types of discharges, Resolution No. 96-9. Conveyance of the water shall be such as to not interfere with traffic flow or treatment facilities operation. No water shall be drained into the Work built or under construction without prior consent of the Engineer.

1.08 **INTERFERING ROCK.** The Contractor shall review the Project Geotechnical Study to establish the true nature of the subsurface conditions affecting the Work, the difficulties which may be encountered, and the dewatering or other operations which may be required to complete the Work. If solid rock is encountered, it shall be removed below grade in accordance with Section 00700 Article 16 and the excavation backfilled with approved pipe bedding material to provide a compacted foundation cushion with a minimum thickness of 4-inches under the pipe bell. Removal of rock and additional pipe bedding material over and above bedding required in the Contract Documents shall be at the Contractor's expense.

Should cobbles or boulders be encountered at the trench bottom or pipe subgrade, they shall be removed from beneath the pipe and replaced with approved pipe bedding material. These shall be compacted to provide uniform support and a firm foundation, all at the Contractor's expense.

1.09 INSPECTION:

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A. Observation and compaction tests shall be made by the Soil Engineer during the filling, backfilling, and compacting operations so that he can state his opinion that the fill and/or backfill was constructed in accordance with the Specifications.

B. The Soil Engineer shall make field density tests in the compacted materials below the surface where the surface is disturbed. When these tests indicate that the density of any layer of fill or portion thereof is below the specified density, the particular layer or portion shall be reworked until the specified density has been obtained.

PART 2 - PRODUCTS

2.01 MATERIALS.

A. For all work within Caltrans right-of-way, Backfill materials shall conform to Caltrans Standard Specifications Section 19. Bedding materials shall conform to the requirements of the Project Geotechnical Study referenced in paragraph 1.02.

B. For work outside Caltrans right-of-way, With the exception of bedding and pipe zone backfill material for ductile iron pipe, materials shall conform to the requirements of the Project Geotechnical Study as follows:

1. Pipe Bedding and Pipe Zone Materials

a. For the cement mortar-lined coated steel pipe, bedding and pipe zone material shall consist of a compacted free draining sand or clean gravel. All gravel shall conform to the quality standards provided in SSPWC Chapter 200-1. Gravel shall be ¾ inch sized and conform with the gradation presented in Table 200-1.2(a) of the SSPWC. The sand shall have a minimum sand equivalent of 30. Based on classification testing of soil collected from various locations throughout the project, it appears that some of the native soil will conform with the sand equivalent requirements for sand backfill, given in SSPWC Section 306-1.2.1. If it is elected to use on-site sands for backfill, the suitability of these materials will need to be periodically verified during excavation.

b. For ductile iron pipe, bedding and pipe zone material shall consist of sand having a sand equivalent of not less than 30.

c. For the PVC pipe, the bedding and pipe zone material shall consist of Class I (crushed rock with particles 1.5 inches or less), Class II (gravel and/or sand with little or no fines, such as GW, GP, SW or SP soils with less than 12% fines), or Class III (coarse grained soils with fines such as GM, GC, SM, or SC with 12-50% fines) as defined by ASTM D2321-89.

d. For the HDPE pipe, the bedding and pipe zone material shall be at least class III (conforming to ASTM D2321) compacted to a minimum of 90% relative compaction in accordance with ASTM-D1557, as indicated in section 7.2 of the referenced report for PVC pipe.

e. In pavement areas where gravel is used for pipe zone backfill, a filter fabric shall be placed between the pipe zone backfill and trench backfill to help reduce the migration of fines into the gravel which could lead to excessive settlement of the backfill material in roadway areas and pavement failure. The filter fabric shall have an apparent opening size of 70 to 100 (U.S. standard sieve size) such as Miraf 140NS or similar.

2. Trench Zone Backfill Materials

a. The trench backfill materials shall begin at a depth of 12 inches above the

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pipe barrel (i.e., top of pipe zone backfill) and extend to the ground surface. Trench backfill material may consist of on-site soils provided the soil does not contain material over 6 inches in

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diameter.

PART 3 - EXECUTION

3.01 GENERAL

A. The work performed under this Specification shall be constructed to the lines, grades, elevations, slopes and cross sections indicated on the Drawings, specified herein, and/or directed by the Owner.

B. It shall be the Contractor's responsibility (1) to maintain adequate safety measures and working conditions; and (2) to take all measures necessary during the performance of the Work to protect the entire project area, trenches, and adjacent properties which would be affected by this Work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the Owner. It shall be the Contractor's responsibility to maintain completed areas until the entire project area is in satisfactory compliance with the job specifications. Pipe shall be placed only in dry trenches.

C. Utility lines and structures indicated on the Drawings which are to remain in service shall be protected by the Contractor from any damage as a result of his operations. Where utility lines or structures not shown on the Drawings are encountered, the Contractor shall report them to the Owner before proceeding with the Work. The Contractor shall bear the cost of repair or replacement of any utility lines or structures which are broken or damaged by his operations. If, in the opinion of the Owner, any utility must be relocated, the cost will be borne by the Owner. All utilities shall be located in the field prior to trenching by "potholing".

D. With the exception of bedding and pipe zone backfill material for ductile iron pipe, all earthwork shall conform to the recommendations contained in the report of geotechnical exploration referenced in paragraph 1.02 of this Section.

3.02 DUST CONTROL. The Contractor shall take all steps possible to prevent and reduce dust arising from the construction activity. He shall have adequate water trucks on the site at all times and water, as necessary, the areas where dust may arise. He shall cooperate fully with the Owner and water immediately for dust control, when told to do so by the Owner.

3.03 CARE OF DRAINAGE WATER

A. Contractor shall take care of drainage water from the construction operations, and of storm water and wastewater reaching the construction area from any source, so that no damage will be done to the excavation, pipe or structures. The Contractor shall be responsible for any damages to persons or property on or off the construction site due to such drainage water or to the interruption or diversion of such storm water or wastewater on account of his operations.

B. Such grading shall be done as may be necessary to prevent surface water from flowing into excavations, and any water accumulating therein shall be removed by pumping or by other approved methods.

3.04 EXCAVATION

A. General. The Contractor shall perform all excavation necessary or required as shown on the Drawings. The excavation shall include the removal and disposal of materials of whatever nature encountered, which shall include both rock excavation and common excavation when both are present, and shall include the furnishing, placing, and maintaining of shoring and bracing necessary to safely support the sides of the excavations. The work shall

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also include all pumping, ditching and other required measures for the removal or exclusion of water.

B. Trench Excavation

1. The minimum width of pipe trenches, measured at the crown of the pipe, shall not be less than 12 inches greater than the exterior diameter of the pipe, exclusive of bells and the minimum base width of such trench shall be not less than 12 inches greater than the exterior diameter of the pipe, exclusive of special structures or connections, and such minimum width shall be exclusive of all trench supports.

2. The maximum allowable width of trench for all pipelines measured at the top of the pipe shall be the outside diameter of the pipe (exclusive of bells or collars) plus 24 inches, and such maximum shall be inclusive of all timbers. A trench wider than the outside diameter plus 24 inches may be used with written permission of the Owner, without special bedding if the Contractor, at his expense will furnish pipe of the required strength to carry the additional trench load. Such modifications shall be submitted to the Owner and approved in writing.

3. Except by special permission by the Owner, only that amount of pipe construction will be permitted, including excavation, construction of pipeline, and backfilling any one location, which can be completed in one day; however, maximum length of open trench shall never exceed 600 feet. This length includes open excavation, pipe laying and appurtenant construction and backfill which has not been temporarily resurfaced.

4. Temporary trench excavations shall at all times conform to the safety requirements hereinbefore specified in Paragraph entitled "Safety". Loose Cobbles or boulders shall be removed from the sides of the trenches before allowing workmen into the excavation, or the trench slopes must be protected with screening or other methods. Surcharge loads due to construction equipment shall not be permitted within five feet of the top of any excavated slope. If the Contractor elects to shore or otherwise stabilize the trench sides, he shall file with the Owner for review, copies of drawings for same prepared and signed by a Civil Engineer duly registered in the State of California before commencing excavation.

5. If any trench, through the neglect of the Contractor, be excavated below the bottom grade required, it shall be refilled to the bottom grade, at the Contractor's expense for all labor and material, with specified bedding compacted to a firm stable foundation.

6. If during excavation efforts for the proposed pipeline, unstable conditions or soft soils are encountered, it may be necessary to provide trench and/or subgrade stabilization. The contractor, after considering input from the design professionals and owner shall be responsible for design and implementation of trench stabilization techniques. If adverse conditions are encountered, a method consisting of, or similar to the following may be recommended:

- Overexcavation to approximately two (2) to three (3) feet below the pipe invert and replacement with compacted crushed rock or sand-cement slurry.
- A combination of crushed rock and a geo-textile fabric used in the trench bottom.

3.05 BRACING EXCAVATION. The sides of the trenches or excavations shall be supported with sheeting and bracing in such a manner as to prevent caving of the sides of the

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trench or excavation. Space left by withdrawal of sheeting or shoring shall be filled completely with dry granular material blown or rammed in place.

For excavations within Caltrans right-of-way, the Contractor shall submit four sets of shoring plans to Caltrans Permits Office for review and approval. (Structural Division of Caltrans needs approximately four (4) weeks to review and approve the shoring plans.)

3.06 PIPE BEDDING.

A. Bedding. Pipe Bedding material shall conform to paragraph 2.01 of this section.

1. There shall be 6-inches minimum of bedding below the pipe barrel.
2. There shall be 4-inches minimum of bedding below the pipe bells or couplings.
3. Bedding material shall extend to 1 foot above the top of the barrel of the pipe.

B. Groundwater. Where groundwater is encountered, and the native material does not afford a solid foundation for pipe subgrade, the Contractor shall suitably dewater the trench and shall construct a firm, stable base for pipe by excavating any unstable material to a depth below the pipe as Owner decides is necessary, and shall construct a stable base placing specified bedding upon which the pipe can be laid. Quantities of trench excavation and disposal, and of in-place bedding which are in excess to those required for normal bedding will be paid for by the Owner.

C. Bedding Preparation. Before any pipe is lowered in place, the bedding shall be prepared so that each pipe will have a firm and uniform bearing over the entire length of the barrel and a width equal to one-half the outside diameter of the pipe. All adjustments in line and grade shall be made by scraping away or filling and tamping in under the barrel of the pipe. Wedging or blocking are not permitted.

3.07 BACKFILLING PIPE TRENCHES.

A. Backfilling Pipe Zone. Backfill material for the pipe zone shall consist of bedding material described above. Place material in the trench simultaneously on each side of the pipe for the full width of the trench and the depth of the pipe zone in layers six inches in depth. Each layer shall be thoroughly compacted by tamping or, where the material is sufficiently granular in nature as determined by the Owner, by water settling. In all cases, backfilling of the pipe zone must be done by hand. Particular attention shall be given to underside of the pipe and fittings to provide a firm support along the full length of the pipe. The pipe zone shall be considered to extend 12 inches above the top of the pipe, and shall be compacted to a compaction of not less than 90 percent in accordance with ASTM-D1557. In the case of gravel backfill, the material shall be placed in thin lifts and thoroughly tamped. Gravel and sand backfill lifts shall not exceed 8 inches in loose thickness prior to tamping or compacting. All bedding and pipe zone backfill compaction shall be verified in the field by the geotechnical engineer. Care shall be taken not to damage pipes or fittings during compaction. Typically, contractors will select "light" vibratory compaction equipment to accomplish this without damaging piping. The contractor shall take care not to damage the pipe. In the event of damage, the contractor shall be held solely responsible for the damages.

B. Backfilling Trench Zone. After the pipe has been laid in the trench and has been

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inspected and approved, and backfilling in the pipe zone is complete and compacted, the remainder of the trench may be backfilled. The backfill material shall be suitable material as hereinbefore specified. Care shall be taken to insure that no voids remain under, around or near the pipes. Whenever imported borrow for backfill is required, the Contractor shall furnish this borrow material and dispose of the excess trench excavation and shall include the expense of this work in his bid.

For all work within Caltrans right-of-way, backfill materials shall conform to Caltrans Standard Specifications Section 19.

C. Placement and Compaction of Trench Zone Backfill. The placement and compaction of all trench zone backfill shall conform to one of the following methods subject to the qualification specified therein:

1. For all work within Caltrans Right-of-Way... The method of compaction shall conform to Caltrans Standard Specifications Section 19. Backfill materials shall be compacted in 8" layers to a relative compaction of 95%.

2. For all work outside of Caltrans Right-of-Way.

a. Mechanically Compacted Backfill. With approval of Owner backfill shall be mechanically compacted in 8" lifts by means of tamping rollers, sheepfoot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers to 90 percent of maximum density at optimum moisture except where excavations are situated in roadways. In roadways, the upper 12 inches of trench subgrade shall be compacted to at least 95 percent of the maximum dry density. Similarly, road base and subbase materials shall be compacted to a minimum relative compaction of 95 percent and at or slightly over optimum moisture content. All trench backfill compaction should be verified in the field by the geotechnical consultant. All compaction equipment shall be of size and type approved by the Owner. Impact-type pavement breakers (stompers) will not be permitted over any pipe. Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, existing improvements, or improvements installed under the Contract. The Contractor shall make his own determination in this regard. Mechanically compacted backfill shall be placed in horizontal layers not exceeding eight inches. Each layer shall be evenly spread, the moisture content brought to near optimum condition and then tamped or rolled until the specified compaction has been attained.

b. Water Densified Backfill. As used in these Specifications, flooding shall mean the inundation of backfill with water on granular soils puddled with poles or bars to insure saturation of the backfill material for its full depth. Jetting shall be accomplished by the use of a jet pipe to which a hose is attached carrying a continuous supply of water under pressure. Densification by flooding and jetting shall be permitted only in those trenches which intersect clean sand, and flooded backfill materials shall be restricted to sandy soils. Densification by flooding and jetting shall not be permitted in the top three feet of any trench backfill. At least the upper three feet of all trench backfills shall be compacted as specified in 2a above. Unless flooding is specified or otherwise authorized by the Owner, all backfill to be densified by water shall be jetted. The backfill shall be placed, flooded, or jetted to 90 percent of maximum density except where excavations are situated in roadways. In roadways, the upper 12 inches of trench subgrade shall be compacted to at least 95 percent of the maximum dry density.

3. Restrictions. Densification by flooding or jetting shall be subject to all the following requirements.

a. Application of Water. The Contractor shall apply water in a

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manner, quantity and at a rate sufficient to thoroughly saturate the thickness of the lift being densified.

- b. **Use of Vibration.** Where required densities cannot be attained by jetting or flooding alone, the Owner may direct the Contractor to supplement the jetting or flooding process with the application of vibrating compacting equipment to the backfill.
- c. **Lift Thickness.** The lift of backfill shall not exceed that which can be readily densified by the jetting or flooding procedure, but in no case shall the undensified lift exceed three feet for flooding or six feet for jetting.

d. **Character of Material.** Where the nature of the material excavated from the trench is generally unsuitable for densification with water, the Contractor may, at no cost to the Owner, import suitable material for flooding or jetting or compacting the excavated material by the mechanical methods. If water densification methods are employed, the Contractor shall, at his expense, provide free-draining bedding material under the pipe and all structures to permit the unimpeded movement of excess water to the downstream end of the construction where continuous free outlet of excess water shall be provided by pumping or other approved means.

e. **Damage to Adjacent Improvements.** Contractor shall make his own determination that the use of flooding, jetting, or mechanical compaction methods will not result in damage to existing improvements. Permission to use such methods in densifying backfill shall not be construed as guaranteeing or implying that adjacent ground and improvements will be unaffected.

f. **Notification of Possible Flooding of Pipe.** In cases where jetting or flooding is used, the Contractor is warned that empty pipe will float in a jetted or flooded pipe trench. The Contractor is responsible to insure that the pipe is properly filled and does not float or change grade due to his flooding or jetting operations.

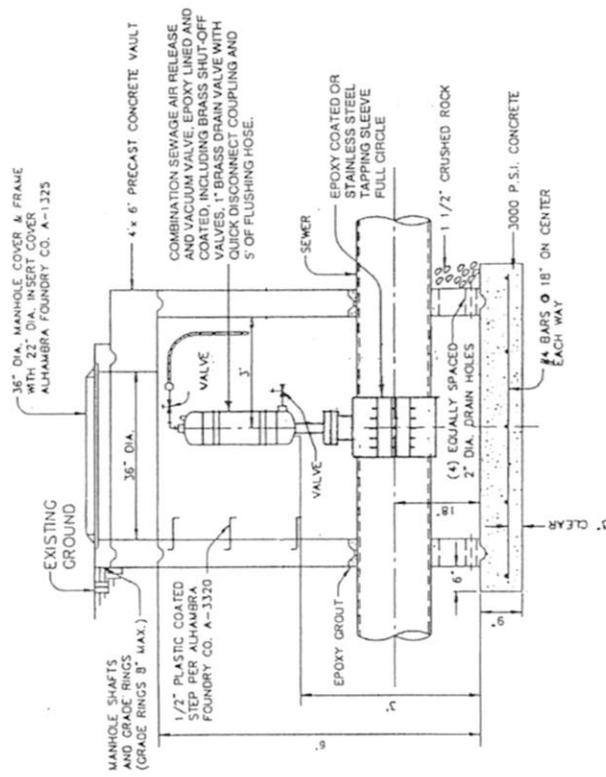
D. **Other Requirements.** Trench excavation, backfill, compaction, and surface repair in right-of-way under the jurisdiction of other public agencies shall be in accordance with their specifications, rules and regulations, but in no case less than the requirements of these specifications.

3.08 **RESTORING EXISTING IMPROVEMENTS.** All road and street improvements excavated or damaged and any damage to adjoining property caused by construction operations, shall be restored or repaired by the Contractor to conform to Riverside County Standard No. 818 and details listed in Section 15080 of these specifications for asphalt concrete overlays.

3.09 **PAVEMENT PLACEMENT.** All crushed rock pavement shall be compacted to a minimum of 95 percent of maximum density.

3.10 **CLEANUP.** Upon completion of work in this Section, all rubbish and debris shall be removed from the job site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.

3.11 **DISPOSAL OF SURPLUS AND/OR UNSUITABLE MATERIALS.** Excavated materials which are determined by the Soil Engineer to be unsuitable for use in backfill or compacted fills or excavated material that is in excess of that required to be used for backfill or to construct fills shall be disposed of at Owner approved sites.



PROFILE

- NOTES:
1. TAPPING SLEEVE, EPOXY COATED, STEEL WITH SS NUTS/BOLTS OR ALL STAINLESS STEEL JCM 412, 452 OR EQUAL.
 2. 4" AIR-VACUUM/AIR RELEASE SEWER VALVE WITH FACTORY INSTALLED ISOLATION AND BACK FLUSH VALVES/HOSES, SCOTCHKOTE 134 COATED, INTERIOR PARTS/TRIM SS, CRISPIN US41B OR EQUAL.

REVISIONS

SANTA ANA WATERSHED PROJECT AUTHORITY	SEWAGE VALVE AND VAULT DETAIL
STD. DWG. NO. SV-1	



FINAL COMPACTION REPORT

**24" Sewer Force Main
Temescal Canyon Road.
Corona, CA**

**Heider Engineering Services, Inc. Project No. 120065
May 30, 2012**

Performed for:

**Santa Ana Watershed Project Authority
11615 Sterling Ave.
Riverside, CA 92503**

Ph: (909) 673-0292

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800 S Rochester Ave Ste A, Ontario CA 91761-8171

PROFESSIONAL CERTIFICATION

This report has been prepared by the staff of Heider Engineering Services under the professional supervision of:



Dennis W. Heider
Principal Engineer, RCE 47379

This report has been prepared solely for use by our Client as it pertains to our geotechnical services at the subject site. Any reliance on this report by a third party shall be at such party's own risk. Our services have been performed in accordance with applicable state and local ordinances and generally accepted practices in soils engineering. No other warranty, either expressed or implied, is made.

Heider Engineering is not responsible or liable for any claims or damages associated with interpretation of available relevant information. In the event that changes to the property occur or additional relevant information about the property is brought to our attention, our conclusions and recommendations contained in this report may not be valid unless these changes and additional relevant information are reviewed and the conclusions of this report are modified or verified in writing.

All original drawings, field data, notes, laboratory test data, calculations, estimates or other documents prepared by this firm remain the property of this firm. No part thereof shall be modified, copied, disclosed to others or used in connection with any other work or project without the written consent of this firm.

FINAL COMPACTION REPORT
24" Sewer Force Main
Temescal Canyon Road.
Corona, CA

1.0 INTRODUCTION

This report presents the results of observation and testing services provided by this firm during the site improvements. The purposes of our services were to determine if existing fill placement was in compliance with the approved project specifications.

2.0 PROJECT INFORMATION

The subject site is located at 5 separate test pits along Temescal Canyon Rd. in Corona, California. Project plans prepared by DGA Consultants, Inc., dated April 13, 2000 were provided for reference, with notes added at test pits locations. The project consisted of the removal of pavement and existing fill, making observations of the fill and shading and gathering compaction test data.

3.0 OBSERVATION AND COMPACTION TESTING SERVICES

The operation for the test pit investigation, which was performed between May 8, 2012 and May 15, 2012, was observed and tested by soils technicians from this firm as requested by the project representative. The areas tested by our personnel were as follows:

- Station 573+30
- Station 559+14
- Station 558+30
- Station 553+35
- Station 550+20

The locations of field density tests are referenced by station numbers and depth below asphaltic pavement. The station numbers and test locations were determined by others.

The earthwork during the investigation within the subject site was accomplished generally with a Backhoe, Vacuum truck, shovel and jumping jack compactor. The results of our testing indicated that the soils at the locations tested, generally is not compacted to a minimum relative compaction of 90 percent or 95 percent, as appropriate for the intended areas. One exception occurred at station 550+20; the test located 30 inches below finished grade probed firm and tested above the required relative compaction. Also located at station 553+35; cobbles, up to 8 inches in diameter, were encountered in the existing fill, under and around the sewer main pipe. Backfill of the test pits was performed with a Class II aggregate base. We were requested to only provide testing of the backfill material at three locations/depths. The results of our backfill testing when filling the test pits, at these three locations indicated that the required relative compaction was achieved at these locations.

The Maximum Dry Density and Optimum Moisture Content of the various soil types were determined in accordance with ASTM D1557. The compacted fill was tested for field density using Sand Cone and Nuclear Gauge Methods in accordance with ASTM D1556 and D2922, respectively. Field moisture contents were determined in accordance with ASTM D2216, Laboratory Determination of Water Content of Soil and Rock or in accordance with ASTM D3017, Test Method for Water Content of Soil and Rock In-Place by Nuclear Methods. These test results are tabulated on Tables 1 and 2, attached to this report.

4.0 LIMITATIONS

This report has been prepared solely for use by the Santa Ana Watershed Project Authority and it's designates, as it pertains to the site improvements and testing results for this project. Heider Engineering Services, Inc. has performed the services under the scope of this report within the specifications of the Client, with the usual thoroughness and competence of the geotechnical engineering profession.

Attachments: Table 1 - Laboratory Maximum Density & Optimum Moisture Content Tests
Table 2 - Field Density Test Results

Table No. 1
Laboratory Maximum Density and Optimum Moisture Content Tests

Project: 24" Sewer Forced Main
 Temescal Canyon Rd & Pronio Rd
 Corona, CA
 Heider Engineering Project No.: 120065

Representative soil samples were tested in the laboratory to determine maximum dry density and optimum moisture content (ASTM D 1557) for each major soil type used for the project. The test procedure uses 25 blows of a 10 pound hammer falling 18 inches on each of 5 layers of soil placed in a 1/30th cubic foot cylindrical mold or 56 blows of a 10 pound hammer falling 18 inches on each of 5 layers of soil placed in a 0.075 cubic foot cylindrical mold. The results of the tests are presented below:

Soil ID No.	Soil Description	Location	Max. Dry Density (pcf)	Opt. Moist. Cont. (%)
76	Red Brown Fine to Coarse Silty Sand with Gravel	Temescal Canyon Rd, Station 573+30 @ 33" below AC	132.6	5.6
77	Olive Brown Silty Sand	Temescal Canyon Rd, Station 573+30 @ 55" below AC	135.0	7.8
78	Grey Class 2 CAB	Back Fill for Test Pits	135.1	5.6
83	Golden Brown Clayey Sand with Gravel	Station 558+30 @ 6' below Finished Grade, Existing	134.0	6.8
84	Dark brown Silty Clayey Sand with gravel	Station 553+35 @ 27" below Finished Grade	130.0	9.6
88	Red Brown Sandy Clay	Station 550+20 @ 7' below Finished AC, Existing	126.2	10.0

Table 2 Field Density Results**HE Project No.: 120065 - 24" Sewer Forced Main**

Test Type Test No.	Test Date	Location	Approx. Depth/Elev.(ft.)	In-place Moisture,%	In-place Dry Density	Max. Dry Density (pcf)	Compaction %	
							Required	Relative
SC-1	5/8/2012	Sewer station 573+30 southbound #1 lane	33" below AC	7.7	116.0	132.0	95	88
SC-2	5/8/2012	Sewer station 573+30 southbound #1 lane, shading	55" below AC	7.8	97.6	135.0	90	72
SC-3	5/8/2012	Sewer station 573+30 southbound #1 lane, backfill	20" below AC	5.3	139.0	135.1	95	103
SC-4	5/9/2012	Station 559+14 left turn lane	-32" FFG	9.0	108.1	135.0	95	80
SC-5	5/9/2012	Station 559+14 left turn lane	-60" FFG	8.0	100.4	135.0	90	74
SC-6	5/9/2012	Station 559+14 left turn lane, shading material	-87" FFG	8.4	92.8	135.0	90	69
SC-7	5/9/2012	Sewer station 559+14 left turn lane #1, backfill	Base	3.7	131.7	135.1	95	97
SC-8	5/9/2012	Sewer station 558+30 median	-3.00	7.9	100.7	132.6	90	76
SC-9	5/9/2012	Sewer station 558+30 median	-6.00	9.6	96.9	134.0	90	72
SC-10	5/9/2012	Sewer station 558+30 median	-9.00	10.9	103.9	134.0	90	78
SC-11	5/10/2012	24" forced sewer main, northbound Temescal Canyon, station 553+35	27" Below AC	7.5	110.7	130.0	95	85
SC-12	5/10/2012	24" forced sewer main, northbound Temescal Canyon, station 553+35	55" Below AC	7.4	91.2	130.0	90	70
SC-13	5/10/2012	24" forced sewer main, northbound Temescal Canyon, station 553+35	72" Below AC	6.7	100.5	130.0	90	77
SC-14	5/10/2012	Station 553+35, pit backfill	18" Below AC	4.4	133.7	135.1	95	99
SC-15	5/15/2012	Temescal Canyon northbound #2 lane, station 550+20	30" Below AC	9.6	130.1	135.0	95	96
SC-16	5/15/2012	Temescal Canyon northbound #2 lane, station 550+20 (clay)	55" Below AC	14.0	105.1	126.2	90	83
SC-17	5/15/2012	Temescal Canyon northbound #2 lane, station 550+20 (clay)	85" Below AC	18.9	90.7	126.2	90	72

SC = Sand Cone
N = Nuclear

FG = Finish Grade
AC = Asphaltic Concrete

C/G = Curb and Gutter
SG = Subgrade



INSPECTOR'S DAILY REPORT
HEIDER ENGINEERING SERVICES, INC.

800-A South Rochester Ave, Ontario, CA 91761

Phone: (909) 673-0292 Fax: (909) 673-0272

Project No.: 120065

Date: 5/8/12

Page: 1 of 1

Type of Inspection(s) Performed: Soils

Type of Field Test(s) Performed: Observations, and Density testing

Project Name: 24" Sewer Forced Main	Permit No.: None
Project Address: Temescal Canyon & Pronio Road Corona, CA	Issued By: None
Architect: N/A	Contractor: EMWD
Engineer: N/A	Subcontractor:

Samples Obtained for Laboratory Testing

Type of Sample	No. of Samples	Tests to be Performed

Summary of Observation and Testing

Arrived onsite as requested. On stand by for approx 45 min awaiting for contractor to arrive.

Contractor excavated a test pit on Temescal Canyon Road at STA 573+30 near the intersection with Pronio Rd on the SB #1 lane. Pit is approx 6'x9'. There is approx 10" of existing AC over 10" of CAB. A density test was taken at approx 33" below top of AC. Soils at this elevation consist of a Dark Reddish brown silty SAND with gravels up to 2". Soils are moist and dense. Hand probing of the soils proved them to be well firm and tight and well compacted. Examination of the test pit walls shows that this road rests on fill. A sand cone test was taken showing a in place dry density of 116.0pcf at 7.7% moisture. A bulk sample was taken for a max curve test.

Contractor then excavated down to approx 55" where a finer sandier material was exposed. This material lays approx 12" above the top of the 24" sewer pipe and is likely the Bedding and shading material for the pipe zone. Hand probing of this soils proved it to be moist and in a loose condition. Another sand cone density test was taken at this depth and resulted in a dry density of 97.6pcf at 7.8% moisture. Another bulk sample was taken from this sandier material.

Contractor then excavated around the pipe using a vacuum truck until the pipe was exposed down to its widest diameter. Jim Gusman from the Santa Ana Watershed Project Authority was onsite and took precise measurements of the pipe. Jim Stated to me that the pipe at this location is approx 3/4" out of round.

Contractor then backfilled the entire test pit with a Class II CAB. Base was placed in lifts approx 12" to 18" loose thickness and compacted with a jumping jack compactor. Our client requested a single compaction test on this base backfill. This was done and a bulk sample of the base was taken for a max curve. Test result will be available upon completion of the max curves.

Certificate of Compliance

I hereby certify that I have inspected, to the best of my knowledge, all work reported above. Unless otherwise noted, I have found this work to comply with the approved plans, specifications, and applicable sections of the governing building codes.

Time In	Time Out	Hrs	OT
7:30	12:30	5.00	

Jay Winscher

Approved By: _____

Print Name	Signature of Registered Inspector	
Soils	5039834	ICC
Discipline	License Number	Agency

Project Superintendent



HEIDER ENGINEERING SERVICES

800 - A South Rochester Ave., Ontario, CA 91761
 Phone: (909) 673-0292 Fax: (909) 673-0272

DSA File No.: _____
 DSA App No.: _____

Page 1 of 1 Job No. 120065 Date 5/9/2012

Type of Inspection Performed Soils
 Type of Field Testing Performed Density, Moisture, Hand Probing

Project Name	24" Sewer Force Main	Permit No.:	
Project Address	Temescal Canyon Rd. Sta. 542	Issued by:	
	Corona, CA	Contractor	Eastern Municipal Water District
Architect		Subcontractor	
Engineer		Subcontractor	
Samples obtained for lab testing			
Type of sample	No. of samples	Tests to be performed	
Bulk Soil	2	Check points	
Summary of Observation and Testing		Arrived on site as requested	

Arrived on site as requested. Upon my arrival the contractor had opened the excavation at station 559+14, within the left turn lane. My first test was taken about 32" below finish road surface (12" below bottom of base). Using a sandcone, the test showed a dry density of 107.7pcf at 9.0% moisture. hand probing the rest of the pit, the material was fairly loose, probing half way to the handle.

the next depth tested was at 60" below finished road surface, Again probing loose, to half the handle or worse. Test revealed a dry density of 100.3pcf at 8.0% moisture.

My last test was located on the east side of the pipe in the shading material, yielding a 92.5pcf dry density at 8.4% moisture. Both the existing fill and the shading material were sampled for checkpoints, against the material sampled the previous day, by Jay Winscher of Heider Engineering.

The pipe was measured with large calipers in three locations within the pit, with outside diameters of 27 1/8, 27 1/8, and 27 3/16. showing the pipe is approximately 2" out of round. Top of pipe measured 81" below finished road surface. I was relieved by Jay Winscher of Heider Engineering, for the backfill of the pit and the excavation of the next pit.

Certificate of Compliance

I hereby certify that I have inspected, to the best of my knowledge, all work reported above. Unless otherwise noted, I have found this work to comply with the approved plans, specifications, and applicable sections of the governing building codes.

Steven Runyan

Signature of Registered Inspector

Time In	Time Out	Reg. Hours	OT Hours
8:30	11:30		
Approved by  Project Superintendent			

Soils 8122808 ICC
 Discipline Number Agency



INSPECTOR'S DAILY REPORT
HEIDER ENGINEERING SERVICES, INC.

800-A South Rochester Ave, Ontario, CA 91761
 Phone: (909) 673-0292 Fax: (909) 673-0272

Project No.: 120065

Date: 5/9/12

Page: 1 of 1

Type of Inspection(s) Performed:

Soils

Type of Field Test(s) Performed:

Observations, and Density testing

Project Name: 24" Sewer Forced Main		Permit No.: None
Project Address: Temescal Canyon & Pronio Road Corona, CA		Issued By: None
Architect: N/A	Contractor: EMWD	
Engineer: N/A	Subcontractor:	
Subcontractor:		
Samples Obtained for Laboratory Testing		
Type of Sample	No. of Samples	Tests to be Performed
Bulk Soil	1	Max Density Curve
Summary of Observation and Testing		
Arrived onsite as requested. Relieved Steve Runyan of Heider Engineering.		
Upon my arrival the contractor has already exposed the 24" forced sewer main at STA 559+14 at the left turn lane on the NB side of Temescal Canyon Road. Steve has completed density testing of the in place soils and obtained bulk soil samples.		
I observed the backfill of this test pit. Contractor used Class II CAB for backfill. Base was placed in lifts and was lightly moisture conditioned as needed. Compaction was done using a jumping jack compactor. Per the request of our client a single density test was taken at the AC subgrade elevation. Test result showed that the base was compacted to a minimum 95% compaction. Contractor patched pavement with asphalt cold patch.		
A second test pit was excavated at STA 558+30 within the landscaped median for Temescal Canyon Road. In place density tests were taken at -3', -6' and -9'. Top of sewer pipe was at approx -10.4'. It was noted that the in place soils were in a moist and very loose condition. Soils present down to -3 feet are similar to soils encountered at the test pit at STA 573+30 and using the max from that location a relative density of 76% was shown at STA 558+30. Below -3 feet a different soils was encountered. This soils is a light Yellow-brown course silty SAND with trace gravels. This soil was moist and very loose and hand probed easily. Density tests taken on this material at -6 feet show a dry density of 96.9pcf at 9.6% moisture and at -9 feet a dry density of 103.9pcf at 10.9% moisture.		
Per Jim Gusman density tests on the backfill of this test pit were not needed due to it being within the landscaped median. Left job prior to exposing of the sewer line.		

Certificate of Compliance

I hereby certify that I have inspected, to the best of my knowledge, all work reported above. Unless otherwise noted, I have found this work to comply with the approved plans, specifications, and applicable sections of the governing building codes.

Time In	Time Out	Hrs	OT
11:15	16:00	4.25	

Jay Winscher

Print Name	Signature of Registered Inspector	
Soils	5039834	ICC
Discipline	License Number	Agency

Approved By: _____

Project Superintendent



INSPECTOR'S DAILY REPORT
HEIDER ENGINEERING SERVICES, INC.

800-A South Rochester Ave, Ontario, CA 91761
 Phone: (909) 673-0292 Fax: (909) 673-0272

Project No.: 120065

Date: 5/10/12

Page: 1 of 1

Type of Inspection(s) Performed: Soils
 Type of Field Test(s) Performed: Observations, and Density testing

Project Name: 24" Sewer Forced Main	Permit No.: None
Project Address: Temescal Canyon & Pronio Road Corona, CA	Issued By: None
Architect: N/A	Contractor: EMWD
Engineer: N/A	Subcontractor:

Samples Obtained for Laboratory Testing		
Type of Sample	No. of Samples	Tests to be Performed
Bulk Soil	2	Max Density Curve

Summary of Observation and Testing

Arrived onsite as requested.
 Contractor excavating a test pit on Temescal Canyon Road at STA 553+35 between the #1 & #2 northbound lanes. Existing AC was removed along with the existing base. Pavement section was 10 3/4" of AC over 5 1/2" of CAB. As contractor excavated to the sewer pipe density tests were taken at -27", -55", and -72" below top of existing asphalt.

Observations were done on the in place back fill. At -27" soils were moist and lightly dense and became looser as depth increases. Moisture contents remained consistent throughout the excavation. Soils below existing base consist of a medium brown, medium to coarse silty sand with gravel. At -72" a brown coarse sand was encountered. This sandy material lays approx 12" to 18" above the pipe and appears to be shading in the pipe zone. Also encountered in the pipe zone several cobbles up to 8" were exposed with a some cobbles found under and around the pipe. Shading material was in a moist and very loose condition.

Density tests taken on in place soils results as follows. At -27" soils had a dry density of 110.7pcf at 7.5% moisture. At -55" soils had a dry density of 91.2pcf at 7.4% moisture. At -72" the shading sand had a dry density of 100.5pcf at 6.7% moisture. Bulk samples were obtained from both soils types for max density testing.

After Jim Gusman from Santa Ana Watershed Project Authority completed his measurements of the sewer pipe the contractor backfilled the pit with a Class II CAB. Base was placed in lifts and lightly moisture conditioned as needed and compacted with a jumping jack compactor. Per the request of our client a single density tests was taken on the base backfill. Density test on this backfill shows a minimum 95% relative compaction.

Certificate of Compliance

I hereby certify that I have inspected, to the best of my knowledge, all work reported above. Unless otherwise noted, I have found this work to comply with the approved plans, specifications, and applicable sections of the governing building codes.

Time In	Time Out	Hrs	OT
8:30	14:00	5.00	

Jay Winscher
 Print Name Signature of Registered Inspector
Soils **5039834** **ICC**
 Discipline License Number Agency

Approved By: _____
 Project Superintendent



INSPECTOR'S DAILY REPORT
HEIDER ENGINEERING SERVICES, INC.

800-A South Rochester Ave, Ontario, CA 91761
 Phone: (909) 673-0292 Fax: (909) 673-0272

Project No.: 120065

Date: 5/15/12

Page: 1 of 1

Type of Inspection(s) Performed: Soils

Type of Field Test(s) Performed: Observations, and Density testing

Project Name: 24" Sewer Forced Main		Permit No.: None
Project Address: Temescal Canyon & Pronio Road Corona, CA		Issued By: None
Architect: N/A	Contractor: EMWD	
Engineer: N/A	Subcontractor:	
Samples Obtained for Laboratory Testing		
Type of Sample	No. of Samples	Tests to be Performed
Bulk Soil	1	Max Density Curve
Summary of Observation and Testing		
Arrived onsite as requested.		
Contractor is excavating on the #2 northbound lane of Temescal Canyon Road between Dos Lagos Drive and Cabot Drive at STA 550+20		
Existing paving section for this pit is approx 8" of AC over approx 12 3/4" aggregate base. Contractor is digging with a backhoe and removing the spoils from the dig area. Density tests were taken at -30", -55" and -85". Soils present in the upper 36" from top of AC were consistent with previously excavated soils. Below -36" a reddish brown silty clay with gravel was exposed and continued deeper. Upper 36" of soil were damp and appear well compacted. Soils proved firm, tight and unyielding during hand probing. Density test taken at this elevation showed a dry density of 130.1pcf at 9.6% moisture. Deeper clayey soils had a higher moisture content and probed soft and loose. Density test result at -55" was a dry density of 105.1pcf at 14.0% moisture and at -85" the result was a dry density of 90.7pcf at 18.9% moisture.		
At approx -9' the contractor hit the 24" line and ruptured it. The pit overflowed with water and flooded the street. This pipe was suppose to have 12 feet of cover over the top of the pipe. Contractor also said the pipe appeared to be laying further to the west of the locator marks.		
Left project at the request of Jim Gusman.		

Certificate of Compliance

I hereby certify that I have inspected, to the best of my knowledge, all work reported above. Unless otherwise noted, I have found this work to comply with the approved plans, specifications, and applicable sections of the governing building codes.

Time In	Time Out	Hrs	OT
9:00	12:30	3.50	

Jay Winscher

Print Name

Soils

Discipline

Signature of Registered Inspector

5039834

License Number

ICC

Agency

Approved By: _____

Project Superintendent

Pipe average OD	25.8	573+30	Test Pit 1	TCR and Pronio	Excavated 5/8				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	0.25 inch			
Area	522.7924335	26.25	25.35771429	0.01744186	Depth to top of pipe	5 feet		4 inches	
		26.75	24.88373832	0.036821705					
		27	24.65333333	0.046511628					
		559+14	Test Pit 2	TCR and Lakeshore (turning pocket)	Excavated 5/9				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	0 inch			
		27.125	24.5397235	0.051356589	Depth to top of pipe	7 feet		10 inches	
		27.125	24.5397235	0.051356589					
		27.1875	24.48331034	0.05377907					
		558+30	Test Pit 3	TCR and Lakeshore (median)	Excavated 5/9				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	N/A	inch		
		27.625	24.09556561	0.070736434	Depth to top of pipe	10 feet		6 inches	
		27	24.65333333	0.046511628					
		26.75	24.88373832	0.036821705					
		553+35	Test Pit 4	TCR and Cabot Drive (150 ft South)	Excavated 5/10				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	N/A	inch		
		26.875	24.768	0.041666667	Depth to top of pipe	7 feet		2 inches	
		27.125	24.5397235	0.051356589					
		27.25	24.42715596	0.05620155					
		550+20	Test Pit 5	TCR and Cabot Drive (450 ft South)	Excavated 5/15				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	N/A	inch		
		26.5	25.11849057	0.027131783	Depth to top of pipe	9 feet		0 inches	
		25.5	26.10352941	0.011627907					
		542+90	Test Pit N/A	Not excavated. Could not find pipe during potholing effort					
		x-measurement	y-measurement	Deflection-x					
		512+45	Test Pit 6	TCR and Leroy	Excavated 10/3				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	N/A	inch		
		27.5	24.20509091	0.065891473	Depth to top of pipe	5 feet		11 inches	
		27.5	24.20509091	0.065891473					
		27.375	24.31561644	0.061046512					
		600+10	Test Pit 7	TCR and Cajalco	Excavated 10/23				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	N/A	inch		
		26.75	24.88373832	0.036821705	Depth to top of pipe	11 feet		0 inches	
		26.5	25.11849057	0.027131783					
		26.75	24.88373832	0.036821705					
			Test Pit 8	TCR and Weirick	Excavated 11/27				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal		inch		
			#DIV/0!	-1	Depth to top of pipe	11 feet		11 inches	
			#DIV/0!	-1	Excavation to 3' under existing grade due to damaged unmarked conduit.				
			#DIV/0!	-1	Excavation abandoned until further notice.				
			Test Pit 9	TCR and Tom Barnes	Excavated				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal		inch		
			#DIV/0!	-1	Depth to top of pipe		feet		inches
			#DIV/0!	-1					
			#DIV/0!	-1					
			Test Pit 10	TCR and Trilogy	Excavated 12/4				
		x-measurement	y-measurement	Deflection-x	Pipe change after soil removal	N/A	inch		
		26.75	24.88373832	0.036821705	Depth to top of pipe	6 feet		2 inches	
		26.375	25.23753555	0.022286822					
		26.375	25.23753555	0.022286822					

Attachment B

Santa Ana Watershed Project Authority (SAWPA)

Brine Line Reach V Pipe Failure Analysis

Summary – One Day Expert Panel Discussion

September 11, 2012

1.0 Introduction

The Inland Empire Brine Line (Brine Line) operated by SAWPA conveys primarily highly saline, non-domestic wastewater from industrial dischargers and municipal desalter facilities within, Riverside and San Bernardino Counties. Constructed in the late 1970's through early 2000's, the Brine Line is a network of collector pipelines totaling 72 miles throughout the Upper Santa Ana Watershed.

The Santa Ana Watershed Project Authority (SAWPA) was formed in 1972 to plan and construct the Brine Line pipeline network with the goal of protecting and improving ground and surface water quality of the Santa Ana River Watershed. SAWPA is a joint powers agency and consists of five municipal member agencies; Eastern Municipal Water District, Western Municipal Water District, Inland Empire Utilities Agency, Orange County Water District and San Bernardino Valley Municipal Water District. SAWPA owns, operates and maintains 72 miles of the Brine Line within Riverside and San Bernardino Counties from the Orange/Riverside County line. This portion of Brine Line network is divided into Reaches IV through V. Orange County Sanitation District (OCSD) manages and maintains an additional 21 miles of the Brine Line within the Lower Santa Ana Watershed inside Orange County.

Reach V is the last section of the Brine Line network constructed in the early 2000's and runs from the intersection with Reach IV-B in Corona, roughly 22 miles south, to the boundary with Eastern Municipal Water District (EMWD). EMWD operates its own brine line to collect saline discharges from a power plant and water treatment desalting facilities. Reach V consists of mostly 24-inch and 30-inch PVC pipe with a section of 26-inch HDPE pipe and was designed as five separate contracts, each totaling 25-30,000 feet in length. Each section was publicly bid and one Contractor, (Kenko, Inc.) , was successful in securing the construction contract for all five sections.

On October 18, 2011, a brine spill was reported near the intersection of Temescal Canyon Road and Cabot Drive. Subsequent excavation of the brine line in this location, revealed the pipeline failed with a longitudinal crack through a joint. At the time of the failure, the pipeline was flowing at approximately 5,300 gpm at a pressure of 34 psi. The pipe material at this location was confirmed to be 24-inch PVC IPEX Centurion DR 51 pipe.

Once the excavation around the failure was cleaned up and the existing pipe exposed, SAWPA staff observed the pipeline to be significantly deflected, the soil material in the pipe zone and trench backfill contained large cobbles and no sand was visible in the pipe zone (bedding) as required by the Contract Documents. Overall, the conditions raised concern over the quality of construction and structural integrity of the entire Reach V pipeline.

Since the spill, SAWPA hired Heider Engineering Services, Inc. to perform testing of the soil material within five test pits along the pipeline in the vicinity of the spill to determine the backfill materials used during construction and compaction values within the trench zone. A section of the failed pipe was sent to Element Materials Testing in Houston, TX for forensic analysis. SAWPA has also performed a review of land development activities that have occurred in the failure area since pipeline construction was completed.

To help analyze the results of their investigation and provide recommendations to eliminate the potential for future spills, SAWPA convened this independent panel of pipeline experts for a one-day workshop on September 11, 2012. This panel consisted of the following individuals:

John Harris, P.E., RBF Consulting
Michael Fleury, P.E., BCEE, Carollo Engineers
Steve Tedesco, P.E., Tetra Tech.

Each of these experts possess more than 30 years of pipeline design and construction experience in the Southern California area and are familiar with the type of construction and materials employed during the Reach V installation and current rehabilitation and replacement techniques.

This summary report outlines the panel's discussion of the probable cause of the failure, potential for future failures, immediate investigative actions that should be taken and replacement /rehabilitation strategies to be evaluated and associated cost.

2.0 Existing Conditions

The location of the failure was determined by SAWPA to be at coordinates 117°30'20.592'' W and 33°48'46.034''N, which corresponds to the northeast section of the Temescal Canyon Road and Cabot Drive intersection. Accordingly, the spill location was calculated to have occurred at Station 555+61 (Sheet 28 of 35) of the record drawing set for the Temescal Valley Regional Interceptor (TVRI), Reach II and III. At this location, the pipeline was installed with approximately 11 feet of cover. Review of street improvement plans completed in 2007 show an additional 5 feet of cover was placed in this area, making the total depth of cover to be 16 feet. This location has the maximum depth of cover as the pipeline returns to less than 10 feet of cover within 300 feet upstream (north) of the spill location and within 100 feet downstream. Further downstream between Station 552+16 and 548+00, the pipe returns to a maximum cover depth of 11 feet.

According to the record drawings, the Reach V pipeline was installed in close proximity to a 42-inch welded steel water transmission main. Between Stations 555+43 and 557+12, the pipes are shown to be 5 feet apart.

The five test pits observed and soil materials tested by Heider in May 2012 were located between pipeline stations 550+20 and 573+30. Compaction tests were performed at various depths at each location. The results of which are shown in Table 1 below, and in general, reveal poor compaction, in the low 70% range, at all test pit locations within the pipe backfill. Low compaction results indicates the potential for settlement of the trench zone to occur, either immediately following placement of the backfill or subsequent to the additional load when the road improvement was completed. Excavation at each test pit extended down to expose the pipeline and SAWPA staff were able to obtain measurements of the pipeline diameter. The measurements indicated a deflection, with the soil load removed, between ¾-inch and 2-inch.

Table 1 – Compaction Test Results, May 2012 (Heider Engineering)

HE Project No.: 120065 - 24" Sewer Forced Main

Test Type Test No.	Test Date	Location	Approx. Depth/Elev. (ft.)	In-place Moisture, %	In-place Dry Density	Max. Dry Density (pcf)	Compaction %	
							Required	Relative
SC-1	5/8/2012	Sewer station 573+30 southbound #1 lane	33" below AC	7.7	116.0	132.0	95	88
SC-2	5/8/2012	Sewer station 573+30 southbound #1 lane, shading	55" below AC	7.8	97.6	135.0	90	72
SC-3	5/8/2012	Sewer station 573+30 southbound #1 lane, backfill	20" below AC	5.3	139.0	135.1	95	103
SC-4	5/9/2012	Station 559+14 left turn lane	-32" FFG	9.0	108.1	135.0	95	80
SC-5	5/9/2012	Station 559+14 left turn lane	-60" FFG	8.0	100.4	135.0	90	74
SC-6	5/9/2012	Station 559+14 left turn lane, shading material	-87" FFG	8.4	92.8	135.0	90	69
SC-7	5/9/2012	Sewer station 559+14 left turn lane #1, backfill	Base	3.7	131.7	135.1	95	97
SC-8	5/9/2012	Sewer station 558+30 median	-3.00	7.9	100.7	132.6	90	76
SC-9	5/9/2012	Sewer station 558+30 median	-6.00	9.6	96.9	134.0	90	72
SC-10	5/9/2012	Sewer station 558+30 median	-9.00	10.9	103.9	134.0	90	78
SC-11	5/10/2012	24" forced sewer main, northbound Temescal Canyon, station 553+35	27" Below AC	7.5	110.7	130.0	95	85
SC-12	5/10/2012	24" forced sewer main, northbound Temescal Canyon, station 553+35	55" Below AC	7.4	91.2	130.0	90	70
SC-13	5/10/2012	24" forced sewer main, northbound Temescal Canyon, station 553+35	72" Below AC	6.7	100.5	130.0	90	77
SC-14	5/10/2012	Station 553+35, pit backfill	18" Below AC	4.4	133.7	135.1	95	99
SC-15	5/15/2012	Temescal Canyon northbound #2 lane, station 550+20	30" Below AC	9.6	130.1	135.0	95	96
SC-16	5/15/2012	Temescal Canyon northbound #2 lane, station 550+20 (clay)	55" Below AC	14.0	105.1	126.2	90	83
SC-17	5/15/2012	Temescal Canyon northbound #2 lane, station 550+20 (clay)	85" Below AC	18.9	90.7	126.2	90	72

SAWPA staff was able to inspect the interior of the pipe with a robotic CCTV camera while the pipeline was being repaired following the initial failure, and again in January 2012, using an air/vacuum valve port for access. The video indicates the pipeline is deflected, though it is difficult to quantify the deflection percentage.

Proper installation of the existing DR 51 PVC pipe is highly dependent on sidewall compaction of the trench backfill, pipe zone bedding and the native soil materials. As shown in Table 2 below, estimated pipe deflection values vary significantly with depth of cover and compaction percentages. At 15 feet of cover with sand and gravel backfill at 85% compaction, the deflection value is listed at 3.8% well within the manufacturer’s allowable deflection limit of 7.5 %. To account for construction tolerance, standard engineering practice is to limit design deflection to 5%. The concern with the Reach V installation at the failure location is the following factors point to an over-deflected condition; depth of cover, poor compaction, improper pipe zone bedding and wide trench zone since both pipes are approximately 5 feet apart, and likely placed in the same trench. Once the pipeline’s depth of cover is less than 10 feet, the likelihood of excessive deflection is reduced, if the pipe zone has proper bedding material and is adequately compacted.

It was noted during the discussion of existing conditions, that along the entire 22-mile Reach V alignment, SAWPA has observed only one instance of trench settlement. This location was south of Weirick Road about 2,000 feet from the pipe failure area. The conclusion from this visual evidence is poor compaction of the trench backfill may be limited to an isolated section of the project between Weirick Road and Cajalco Road, which also corresponds to the area where major road improvements were performed as part of the Dos Lagos Shopping Center.

ASTM EMBEDMENT MATERIAL CLASSIFICATION	DENSITY (PROCTOR) AASHTO T-99	E' psi (kPa)	DR	HEIGHT OF COVER															
				(ft.) 1	2	4	6	8	10	15	20	25	30	35	40	45	50		
Manufactured Granular Angular	CLASS I	90%	3,000 (20 700)	51	n/r	0.5	0.3	0.4	0.4	0.5	0.7	0.9	1.1	1.4	1.6	1.8	2.0	2.3	
				41	n/r	0.5	0.3	0.4	0.4	0.4	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2	
				32.5	0.7	0.5	0.3	0.3	0.4	0.4	0.7	0.9	1.1	1.3	1.5	1.7	2.0	2.2	
Clean Sand & Gravel	CLASS II	90%	2,000 (13 000)	51	n/r	0.7	0.5	0.5	0.6	0.7	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.4	
				41	n/r	0.7	0.5	0.5	0.6	0.7	1.0	1.3	1.7	2.0	2.3	2.6	3.0	3.3	
				32.5	1.0	0.7	0.5	0.5	0.5	0.6	1.0	1.3	1.6	1.9	2.2	2.6	2.9	3.2	
		25	1.0	0.7	0.4	0.5	0.5	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	2.9			
		80%	1,000 (7 000)	51	n/r	1.5	1.0	1.1	1.1	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6	
				41	n/r	1.4	1.0	1.0	1.1	1.3	1.9	2.6	3.2	3.8	4.5	5.1	5.8	6.4	
32.5	2.0			1.3	0.9	1.0	1.0	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0			
25	1.7	1.1	0.8	0.8	0.9	1.0	1.6	2.1	2.6	3.1	3.6	4.2	4.7	5.2					
Sand & Gravel with Fines	CLASS III	90%	1,000 (7 000)	51	n/r	1.5	1.0	1.1	1.1	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6	
				41	n/r	1.4	1.0	1.0	1.1	1.3	1.9	2.6	3.2	3.8	4.5	5.1	5.8	6.4	
				32.5	2.0	1.3	0.9	1.0	1.0	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	
		25	1.7	1.1	0.8	0.8	0.9	1.0	1.6	2.1	2.6	3.1	3.6	4.2	4.7	5.2			
		85%	500 (3 500)	51	n/r	n/r	1.9	2.0	2.2	2.6	3.8	5.1	6.4	7.7	8.9	10.2	11.5	12.8	
				41	n/r	n/r	1.8	1.9	2.1	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	
32.5	n/r			2.4	1.6	1.7	1.8	2.1	3.2	4.3	5.3	6.4	7.5	8.5	9.6	10.7			
25	n/r	1.9	1.3	1.3	1.4	1.7	2.5	3.3	4.2	5.0	5.9	6.7	7.5	8.4					
Silt & Clay	CLASS IV	85%	400 (2 760)	51	n/r	n/r	2.4	2.5	2.7	3.1	4.7	6.3	7.9	9.4	11.0	12.6	14.1	15.7	
				41	n/r	n/r	2.2	2.3	2.5	2.9	4.4	5.8	7.3	8.8	10.2	11.7	13.1	14.6	
				32.5	n/r	2.8	1.9	2.0	2.2	2.5	3.8	5.1	6.3	7.6	8.9	10.1	11.4	12.7	
				25	n/r	2.1	1.4	1.5	1.6	1.9	2.9	3.8	4.8	5.7	6.7	7.6	8.6	9.5	

Table 2 – Deflection Data Table (Source: IPEX Centurion Pipe Brochure)

3.0 PVC Material Testing Results

Attached as Appendix A to this summary is the testing report prepared by Element Materials Testing. Their conclusion is the PVC pipe material has not lost structural integrity since installation and the fracture can be attributed to an over-deflection condition or operational pressure surge that exceeded the limitations of the pipe.

In response to the potential surge condition, SAWPA prepared a hydraulic profile of the Reach V alignment for the panel's review. The profile shows the pipeline to be mostly gravity flow with two high points. Record drawings show the pipeline has 4-inch vents at the high point locations. The pipe failure area is located in a pressurized section of the alignment, and as noted earlier, the operational pressure at the time of failure is estimated at only 34 psi.

From inspection of the profile, the panel did not view surge as a significant concern, though it was noted that the 4-inch vents seemed under-sized at the pipeline's extreme high points. However, the panel members are not surge experts, and to address this potential failure mode, the panel recommends that a surge study be performed.

4.0 Panel Discussion Topics

To assist in guiding the panel's discussion, the following list of questions was provided by SAWPA staff. The panel worked to address each question with consideration given to a number of engineering elements, such as allowable service outage, system hydraulics, construction impacts, traffic and community impacts, structural integrity of the existing pipeline and potential of long-term rehabilitation success using a deflected host pipe.

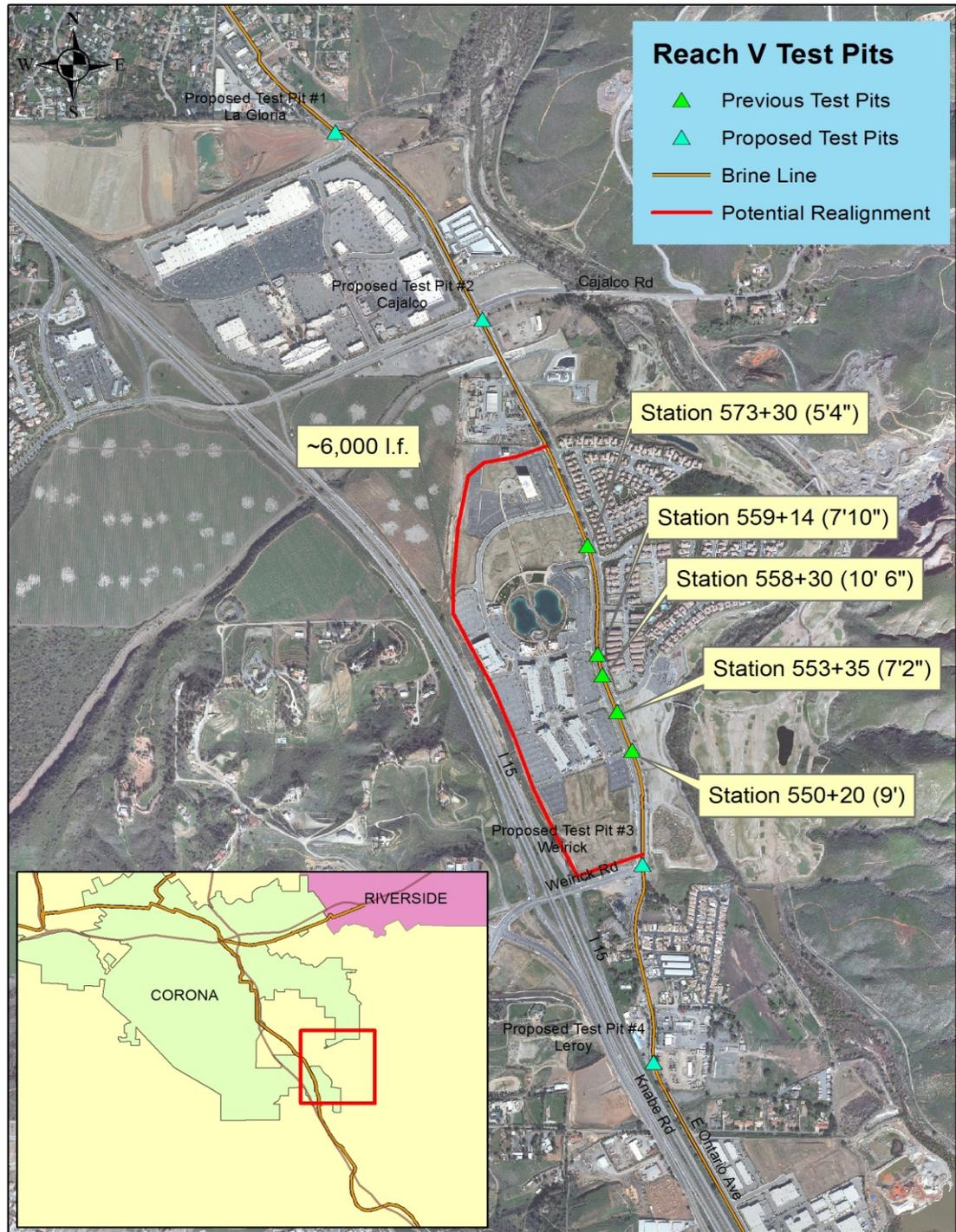
1. What is the likely cause of the pipe failure?
2. What are the risks of having an unexpected pipe failure? What is the maximum safe deformation for the PVC Pipe Material? What is the maximum loading for the PVC Pipe Material?
3. What conclusions are you able to make based on the PVC pipe testing?
4. What methods/ techniques are available to rehabilitate the pipeline?
5. What are the reasons to reject certain rehabilitation techniques?
6. What are the advantages and disadvantages for the recommended rehabilitation?
7. What is estimate of construction costs for the recommended rehabilitation methods?

While working through the list of questions, other discussion topics were raised and should be considered by SAWPA as part of a program level assessment of the Reach V pipeline.

1. Access Ports – currently there are a limited number of access ports on the pipeline to allow CCTV inspection of the pipeline. Additional ports should be considered to allow complete CCTV inspection of the pipeline.

2. CCTV Inspection – a complete CCTV assessment of the pipeline should be performed and any red-flag areas requiring immediate attention should be addressed. Subsequent inspections should be performed such that the entire pipeline is inspected every 5 years.
3. Leak Detection – It is recognized that implementing the CCTV inspection program may take a number of years to complete. A supplemental assessment technique that should be considered is inspection using the Smartball® technique. SmartBall® is a free-swimming in-line leak detection technology designed to operate in a live pipeline. It is a free-swimming foam ball with an instrument-filled aluminum core capable of detecting and locating small leaks and air pockets in pipelines. SmartBall® can be inserted and retrieved from a pipeline under normal operation through existing air/vacuum valve ports with a 4-inch minimum diameter. The ball can travel with the water flow collecting information about leaks over many miles of pipeline with a single deployment. The estimated cost to employ this technology is on the order of \$10,000 per linear mile plus \$25,000 for mobilization and reporting or \$250,000 for the entire Reach V pipeline.
4. Isolation Valves – Currently there are only four isolation valves on Reach V over its 22 mile length. It is recommended that an analysis be performed to determine additional valve locations with the intent of limiting the pipeline draining time to a reasonable period, such as 8 hours. At a minimum, the panel recommends the installation of 3-4 valves to reduce the spacing to approximately 3 miles apart.
5. Surge Study – As mentioned above, a system level surge analysis should be performed for the Reach V pipeline including the section operated by EMWD.
6. Test Pits – The concept of additional test pits was discussed to determine if the poor compaction results were isolated to the Cabot Drive location or systematic of the entire Reach V pipeline. Since the pipeline is only 10 years old, it is believed that proper inspection and quality control techniques should have been employed and the fact that no other settlement areas are evident supports this theory. Conversely, it is recognized that the same Contractor built the entire reach and it is now no longer in business. Additionally, it is understood that only the area surrounding the Dos Lagos shopping center has undergone major street improvement work where the road grade was substantially changed. The limits of this road work was determined to be La Gloria Street to the north and Dos Lagos Drive to the south. The distance between these two points is approximately 9,200 feet. The test pits previously performed by Heider spanned approximately 2,500 feet of this area.

The panel's recommendation is to perform 4 additional test pits in between the road improvement limits stated above and the Heider test pits. Locations have been identified where the pits would have minimal traffic impact and limited impact to existing surface improvements, and overall be cost efficient to perform. See Figure 1 for the recommended test pit locations.



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Figure 1 – Recommended Test Pit Locations

5.0 Response to Questions

5.1 What is the likely cause of the pipe failure?

Although the materials testing report, identifies surge as a potential cause, the panel's consensus is the failure was caused by a variety of "perfect storm" factors that combined to develop an over-deflection condition and ultimately joint failure. The factors identified are 1) poor bedding materials (native materials use as opposed to sand as specified) and soils compaction leading to poor sidewall support, 2) two pipelines in close proximity were likely installed in the same trench leading to a wider trench condition and subsequently limited sidewall support by native soils and reduced Modulus of Soil Reaction (E') value, and 3) placement of additional fill associated with the road improvement project created one of the deepest sections for the entire Reach V pipeline. The E' value is generally recognized as a relationship between the compaction level and the type of soils in the pipe zone. As shown in Appendix B, E' values vary widely depending on the degree of compaction and play a significant role in deflection calculations for flexible pipe.

5.2 What are the risks of having an unexpected pipe failure? What is the maximum safe deformation for the PVC Pipe Material? What is the maximum loading for the PVC Pipe Material?

In preparation of this summary report, the plan set for Reaches II and III were reviewed and the conditions identified above in response to question 5.1 only occur in a relatively short 180 foot long section between Stations 555+43 and 557+22. This area is certainly a cause for concern and a corrective action program should be a high priority.

As mentioned above in Table 2, the pipe manufacturer's data allows deflection of up to 7.5 % and the loading chart indicates this condition does not occur until the depth of cover reaches 20 feet. The large majority of the pipeline (within Reaches II and III) has less than 15 feet of cover. The conclusion from this data indicates the likelihood of widespread failure is low. However, this conclusion is tempered by the compaction test data. Once the additional test pits are completed, a more detailed analysis can be performed to identify potential over-deflection locations and could change the likelihood of of widespread failure from low to high.

5.3 What conclusions are you able to make based on the PVC pipe testing?

The concluding statement provided in Section 3.0 above is that the PVC material is sound and the failure is attributed to either poor installation or operational conditions.

5.4 What methods/ techniques are available to rehabilitate the pipeline?

The panel discussed in-situ trenchless rehabilitation techniques, such as cured-in-place pipe (CIPP) lining, Slip-lining, Pipe- Bursting and traditional replacement. The following factors were included in the discussion.

- Hydraulics
- Cost
- Allowable service outage
- By-pass
- Adjacent utilities
- Construction Impacts
- Traffic
- Right-of-way
- Structural Integrity

5.5 What are the reasons to reject certain rehabilitation techniques?

The CIPP process could easily conform to the deflected pipe condition and maintain hydraulic characteristics similar to the existing pipe, however, there are a number of concerns raised by the panel that caused its rejection. Access to the pipeline would be required at 2,000-3,000 foot intervals depending on the horizontal and vertical alignment of the pipe, the host pipe needs to be dry in order to perform the CIPP process and from the CCTV video there are some sags in the pipeline which would retain water, and installation under deflected conditions would not eliminate the potential of continued deflection and possible failure in the future.

Slip-lining with a smaller diameter pipe than the existing 24-inch would severely impact the hydraulic conveyance capacity of Reach V as it is estimated that only an 18-inch slip-liner pipe would be feasible. This represents a 43% reduction in capacity, and therefore, was rejected.

Pipe Bursting using a 24-inch liner pipe is feasible and would not impact the system hydraulics. The panel, however, had concerns with the number of horizontal and vertical deflection points within the existing pipe, the limited number of potential contractors with this expertise, and the potential for trench heave (i.e., lifting of the soil column creating a mound at the surface. This is caused by the trench sidewalls acting as a weakened plane joint compared to the surrounding material and the burst pressure seeks the least path of resistance, which in this case is up). Further investigation of this technique may be warranted when comparing to the remaining alternative of replacement in a new alignment.

Replacement of the existing pipeline through the area adjacent to the Dos Lagos Shopping Center is considered to be the most conservative approach and provides SAWPA with the best apparent long-term approach to correcting the over-deflection condition. An alignment along the perimeter road within the shopping center was identified to avoid the numerous utilities and traffic impacts along Temescal Canyon Road. This alignment is approximately 6,000 feet in length and based on the unit costs presented below, the estimated cost for this approach would be \$1.5 - \$2.0 million. Further investigation of the limits of the over-deflected pipe is recommended which may reduce the length of replacement and the overall remediation cost.

5.6 What are the advantages and disadvantages for the recommended rehabilitation?

See comments above.

5.7 What is estimate of construction costs for the recommended rehabilitation methods?

- Cured-in-place pipe (CIPP) - \$150/ft, (noted it is not a structurally equivalent)
- Slip-lining \$200 - \$250/ft
- Pipe bursting \$200 - \$250/ft
- Replacement \$250 - \$300/ft

6.0 Conclusions

The following list summarizes the list of primary findings developed by the panel that are believed to have been contributing factors in the pipeline's failure.

- Poor installation / compaction
- Lack of specified bedding material (sand)
- Joint trench with 42-inch water transmission main
- Poor sidewall support and reduced E' value
- Rocks in pipe zone
- Over deflection
- Failure of joint gasket
- One contractor for entire Reach V (22 miles)
- Failure in the area of added roadway fill

The panel also developed a list of remedial action items for SAWPA's consideration to help assess the condition of the Reach V pipeline and identify other potential high risk areas.

6.1 Risk Assessment

This activity would review the entire Reach V pipeline and identify areas where a combination of failure modes are present. The review would focus on deep installation areas, high risk/high cost repair locations and areas with high environmental damage potential. The 180 foot section between Stations 555+43 and 557+22 should be reviewed as a first priority.

The result of this assessment could be used to fine tune and prioritize other investigative measures, such as additional test pit locations, CCTV inspection and/or Smartball® leak detection surveys. Additionally, a budget level estimate of construction costs can be provided.

6.2 Program Level Condition Assessment

A program level condition assessment is the development of a systematic approach to inspecting and evaluating the entire Reach V pipeline. The program would also define the frequency interval to which such an assessment is required (i.e. every 5 or 10 years). This would take into account the risk assessment described above and funding constraints to develop a plan of action. Specific elements to be considered are the installation of additional access ports, quantity of CCTV inspection that can be performed on an annual basis and the use of alternative inspection techniques like the Smartball® or sonar.

6.3 Additional Test Pits

The panel was very concerned with the poor compaction levels obtained during Heider's investigation and view the information obtained from the additional pits as critical data to prove the presence of an isolated area of poor quality control or more of a widespread problem that may plague the entire Reach V pipeline. Data from these test pits will be used to define additional work in the condition assessment program.

6.4 Surge Analysis

This item is recommended to understand the operational mechanics of the Reach V pipeline under various operational schemes and to identify locations where improvements are needed to improve/protect the hydraulic performance of the system.

6.5 Identify Repair/Rehab/Replacement limits

With the completion of the above, SAWPA will have sufficient information to evaluate the appropriate repair or replacement strategy for specific locations along the pipeline's route and define the limits of work.

6.6 Consideration of EMWD Dischargers

Dischargers to the Brine Line from the EMWD service area operate their facilities around the clock. Consequently, any service outage to the Brine Line creates significant financial impacts to these facilities. Future repair/rehabilitation programs for the Brine Line must consider these dischargers and a by-pass system must be included with any plan to ensure uninterrupted service.

APPENDIX A
PVC PIPE MATERIAL TEST REPORT
ELEMENT MATERIALS TESTING



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TEST CERTIFICATE — EAR-CONTROLLED DATA

Date: 9/25/2012
P.O. No.: 2012-71 WO
W/O No.: RBF001-09-25-06221-1

Re: Cabot Road Spill PVC Pipe Testing
SAWPA Work Order Number 2012-71

INTRODUCTION

Element Materials Technology received three continuous sections of a fractured PVC pipe from a SAWPA project in Corona, CA.. The pipe was apparently in service for 10-15 years, with an initial embedment depth of 10' followed by an additional 6 ft after a renovation project. The soil was classified as a dry sand type mix with an estimated weight of 110 lbs/cubic foot. The failure of the pipe was found by observing a leak in the pavement surface. Element was asked to determine the physical properties of the pipe relative to the original specifications.

The pipe is of a nominal 24" OD, SDR 51. Two sections were 36" in length, with a fracture through the wall, running the length of the samples. The third piece was 12" in length; this contained a crack extending about 4" into this end section; the crack was a continuation of the fracture from the adjacent piece.

The markings on the pipe, manufactured by IPEX, were as follows:

R-51 GD B137.3 AWWA C-905 PR80 (550 KPa) @ 23°C NS F-61 – H – 00123043109M Made in Canada.

According to published literature by IPEX, the pipe has a nominal pressure rating of 80 psi, with a 2:1 safety factor. The pipe is designed to withstand short-term transient surge pressures equal to 60% greater than the pressure rating while maintaining this 2:1 safety factor. With a nominal pressure rating of 80 psi, the 60% short term transient pressure rating will be 128 psi. The short term minimum burst pressure is 255 psi, established by IPEX in testing conforming to ASTM D1599, "Standard Test Method for Resistance to Short-term hydraulic Pressure of Plastic Pipe, Tubing, and Fittings", and CSA B137.3 "Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications". Sustained pressure testing, in compliance with CSA B137.3 and AWWA C905, "Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. through 48 in." indicates that this pipe should be able to withstand 168 psi pressure without showing signs of cracking or leaking. This test value is established through a 1,000 hour sustained pressure test. The IPEX literature also states that the long term maximum deflection of 7.5% is recommended in gravity flow applications.

SUMMARY FINDINGS

Results produced from testing were compared against established test values by IPEX and against industry standards. The results of Element's testing indicates that the PVC has not lost structural integrity since installation, and the fracture appears to be attributed to either an over-deflected condition or some type of operational pressure surge that exceeded the limitations of the pipe.

Respectfully Submitted

Terry Wilt
Department Manager, Metals & Product Testing

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TEST CERTIFICATE — EAR-CONTROLLED DATA

Date: 9/25/2012
P.O. No.: 2012-71 WO
W/O No.: RBF001-09-25-06221-1

EXAMINATION AND TESTING

Element performed a visual and dimensional examination of the pipe sections and fracture surfaces, hoop tensile testing which helped determine the burst pressure and the estimated tensile strength of the material in its present condition. A pipe stiffness test (deflection) was also conducted to determine the external loading capacity of the pipe in its current condition. Tensile samples were produced, but the samples were slipping in the test machine grips; as the hoop tensile test produced results that can also be applied to estimated tensile strength, no further attempts at tensile testing were performed. It is not uncommon for PVC material to slip in the machine grips during this type of testing. Without receiving comparable new PVC pipe of the same material make-up, no additional testing was performed.

For the examination, there are no obvious signs of impact or other external markings on the pipe that would indicate mishandling or improper installation. The fracture surfaces are smooth and featureless, and do not provide any indications that may lead to a cause of the failure. The outside diameter measured 25.818" on the intact end. This was the only sample that could be checked to verify the outside dimension. AWWA C905 states that the OD should be 25.800" ± 0.030. The wall thickness of the three sections ranged from 0.545"-0.603". AWWA C905 indicates a specified wall thickness of 0.506"-0.577". ASTM D2241, "Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Related Pipe (SDR Series)" specifies a wall thickness of 0.486"-0.554". Although some actual wall measurements of the three sections exceeded this allowance, the test results were positive. The wall measurements over the 0.577" upper limit were the only results that were not in compliance with published expected values.

Pipe Stiffness and Flattening Test

AWWA C905 says to perform flattening per ASTM D2412, "Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading", with a required sample deflection of 40% of the nominal OD. The loading is achieved within a 2-5 minute period. After reaching the 40% deflection, the load is removed and the pipe is examined for any splitting, cracking, or breaking. The pipe did not exhibit any damage after the 40% deflection. Based on the visual appearance of the test sample at 40% deflection, as seen on Page 6 of this report, no pipe or line could withstand this much compression before experiencing a leak. IPEX literature indicated that no more than a 7.5% deflection should exist in the line for this material. ASTM D2412 requires three test samples, each having a width of 6". Based on the material received, and that the intact end actually contained a partial crack, testing was limited to one flattening sample, and the width of the test sample was 5.4". With PVC being a homogeneous material, the test result should still be valid although the width was less than the required 6" from ASTM D2412.

Respectfully Submitted

Terry Wilt
Department Manager, Metals & Product Testing

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TEST CERTIFICATE — EAR-CONTROLLED DATA

Date: 9/25/2012
P.O. No.: 2012-71 WO
W/O No.: RBF001-09-25-06221-1

Hoop Tensile Strength and Burst Pressure

One sample was prepared and tested in accordance with ASTM D2290, "Hoop Tensile Strength of Plastic Pipe by Split Disk Method". This test should provide reasonably accurate information with regard to apparent tensile strength of plastic pipe. The specification suggests five tests, but this was not possible based on the amount of material received. The measured breaking load of 7,898 lbs., using calculations in D2290, produced an estimated burst strength of 407 psi. and tensile strength of 8,890 psi. The IPEX literature, AWWA C905 and ASTM data required a minimum 260 psi burst strength. Industry standards indicate that PVC material should have a tensile strength 6,900-7,500 psi. The calculations from the hoop tensile testing produced a calculated tensile strength of 8,890 psi, although this is based on one test sample.

Tensile Test Properties

Five tensile test samples were produced from the available material. However, as can be common when testing PVC, the samples were slipping in the grips before any actual tensile strength values could be determined. However, based on the successful test results from other testing, no additional steps were taken to complete the ASTM D638 testing. For reference, ASTM D638 is "Standard Test Method for Tensile Properties of Plastics".

Further Discussion

It appears AWWA C905 states that the pressure class is the design capacity to resist working pressures up to 73.4° F sustained operating temperatures. C905 considers two types of surges: recurring (cyclic) surge pressure and occasional (emergency or transient) surge pressure. Recurring (cyclic) surge pressure, according to AWWA C905, is surge pressure that occurs frequently and is inherent to the design and operation of the system (such as normal pump start up or shutdown and normal valve opening and closure). Recurring surge pressures may occur up to a million times in a pipe's operating lifetime. The occasional surge pressure may be caused by emergency pump and valve operations which are usually severe.

Respectfully Submitted

Terry Wilt
Department Manager, Metals & Product Testing

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TEST CERTIFICATE — EAR-CONTROLLED DATA

Date: 9/25/2012
P.O. No.: 2012-71 WO
W/O No.: RBF001-09-25-06221-1



Three sections received for analysis. Fracture Crack

Respectfully Submitted

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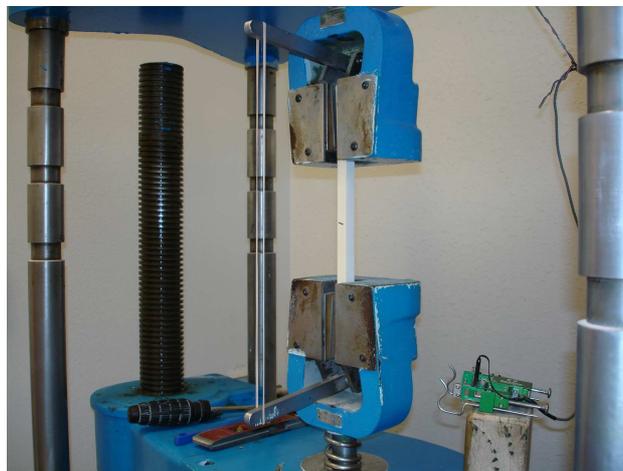
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Hoop Tensile Testing



Axial Tensile Testing (samples slipped in grips)

Respectfully Submitted

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Test sample, pre-load



Test sample at 10" (40%) deflection

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Respectfully Submitted

Terry Wilt
Department Manager, Metals & Product Testing

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APPENDIX B
AVERAGE VALUES OF E'
FOR IOWA FORMULA

Table 9-10 Bureau of Reclamation Average Values of E' for Iowa Formula (for Initial Flexible Pipe Deflection)

Soil type-pipe bedding material (Unified Classification System ^a) (1)	E' for Degree of Compaction of Bedding, in pounds per square inch			
	Dumped (2)	Slight, <85% Proctor, <40% relative density (3)	Moderate, 85%-95% Proctor, 40%-70% relative density (4)	High >95% Proctor, >70% relative density (5)
Fine-grained Soils (LL > 50) ^b Soils with medium to high plasticity CH, MH, CH-MH	No data available; consult a competent soils engineer: Otherwise use $E' = 0$			
Fine-grained Soils (LL < 50) Soils with medium to no plasticity CL, ML, ML-CL, with less than 25% coarse-grained particles	50	200	400	1,000
Fine-grained Soils (LL < 50) Soils with medium to no plasticity CL, ML, ML-CL, with more than 25% coarse-grained particles Coarse-grained Soils with Fines GM, GC, SM, SC ^c contains more than 12% fines	100	400	1,000	2,000
Coarse-grained Soils with Little or No Fines GW, GP, SW, SP ^c contains less than 12% fines	200	1,000	2,000	3,000
Crushed Rock	1,000	3,000	3,000	3,000
Accuracy in Terms of Percentage Deflection ^d	± 2	± 2	± 1	± 0.5

^aASTM Designation D-2487, USBR Designation E-3.

^bLL = Liquid limit.

^cOr any borderline soil beginning with one of these symbols (i.e., GM-GC, GC-SC).

^dFor ± 1% accuracy and predicted deflection of 3%, actual deflection would be between 2% and 4%.

Note: Values applicable only for fills less than 50 ft (15 m). Table does not include any safety factor. For use in predicting initial deflections only, appropriate Deflection Lag Factor must be applied for long-term deflections. If bedding falls on the borderline between two compaction categories, select lower E' value or average the two values. Percentage Proctor based on laboratory maximum dry density from test standards using about 12,500 ft-lb/cu ft (598,000 J/m³) (ASTM D-698, AASHTO T-99, USBR Designation E-11). 1 psi = 6.9 KPa.

Attachment C

SANTA ANA WATERSHED PROJECT AUTHORITY
AGREEMENT FOR SERVICES BY INDEPENDENT CONSULTANT

This Agreement is made this ___ day of _____, 201_ by and between the Santa Ana Watershed Project Authority ("SAWPA") located at 11615 Sterling Ave., Riverside, California, 92503 and _____ ("Consultant") whose address is _____.

RECITALS

This Agreement is entered into on the basis of the following facts, understandings, and intentions of the parties to this Agreement:

- SAWPA desires to engage the professional services of Consultant to perform such professional consulting services as may be assigned, from time to time, by SAWPA in writing;
- Consultant agrees to provide such services pursuant to, and in accordance with, the terms and conditions of this Agreement and has represented and warrants to SAWPA that Consultant possesses the necessary skills, qualifications, personnel, and equipment to provide such services; and
- The services to be performed by Consultant shall be specifically described in one or more written Task Orders issued by SAWPA to Consultant pursuant to this Agreement.

AGREEMENT

Now, therefore, in consideration of the foregoing Recitals and mutual covenants contained herein, SAWPA and Consultant agree to the following:

ARTICLE I

TERM OF AGREEMENT

1.01 This agreement shall become effective on the date first above written and shall continue until _____, unless extended or sooner terminated as provided for herein.

ARTICLE II

SERVICES TO BE PERFORMED

2.01 Consultant agrees to provide such professional consulting services as may be assigned, from time to time, in writing by the Commission and the General Manager of SAWPA. Each assignment shall be made in the form of a written Task Order. Each such Task Order shall include, but shall not be limited to, a description of the nature and scope of the services to be performed by Consultant, the amount of compensation to be paid, and the expected time of completion.

2.02 Consultant may at Consultant's sole cost and expense, employ such competent and qualified independent professional associates, subcontractors, and consultants as Consultant deems necessary to perform each assignment; provided that Consultant shall not subcontract any work to be performed without the prior written consent of SAWPA.

ARTICLE III

COMPENSATION

3.01 In consideration for the services to be performed by Consultant, SAWPA agrees to pay Consultant as provided for in each Task Order.

3.02 Each Task Order shall specify a total not-to-exceed sum of money and shall be based upon the regular hourly rates customarily charged by Consultant to its clients.

3.03 Consultant shall not be compensated for any services rendered nor reimbursed for any expenses incurred in excess of those authorized in any Task Order unless approved in advance by the Commission and General Manager of SAWPA, in writing.

3.04 Unless otherwise provided for in any Task Order issued pursuant to this Agreement, payment of compensation earned shall be made in monthly installments after receipt from Consultant of a timely, detailed, corrected, written invoice by SAWPA's Project Manager, describing, without limitation, the services performed, when such services were performed, the time spent performing such services, the hourly rate charged therefore, and the identity of individuals performing such services for the benefit of SAWPA. Such invoices shall also include a detailed itemization of expenses incurred. Upon approval by an authorized SAWPA employee, SAWPA will pay within 30 days after receipt of a valid invoice from Consultant.

ARTICLE IV

CONSULTANT OBLIGATIONS

4.01 Consultant agrees to perform all assigned services in accordance with the terms and conditions of this Agreement including those specified in each Task Order. In performing the services required by this Agreement and any related Task Order Consultant shall comply with all local, state and federal laws, rules and regulations. Consultant shall also obtain and pay for any permits required for the services it performs under this Agreement and any related Task Order.

4.02 Except as otherwise provided for in each Task Order, Consultant will supply all personnel and equipment required to perform the assigned services.

4.03 Consultant shall be solely responsible for the health and safety of its employees, agents and subcontractors in performing the services assigned by SAWPA. Consultant hereby covenants and agrees to:

4.03a Obtain a Commercial General Liability and an Automobile Liability insurance policy, including contractual coverage, with limits for bodily injury and property damage in an amount of not less than \$2,000,000.00 per occurrence for each such policy. Such policy shall name SAWPA, its officers, employees, agents and volunteers, as an additional insured, with any right to subrogation waived as to SAWPA, its officers, employees, agents and volunteers. If Commercial General Liability Insurance or other form with an aggregate limit is used, either the general aggregate limit shall apply separately to the work assigned by SAWPA under this Agreement or the general aggregate limit shall be at least twice the required occurrence limit. The coverage shall be at least as broad as Insurance Services Office Commercial General Liability Coverage (occurrence Form CG 00 01) and Insurance Services Office Form CA 00 01 covering Automobile Liability, Code 1 (any auto). The Commercial Liability Insurance shall include operations, products and completed operations, as applicable;

4.03b Obtain a policy of Professional Liability (errors and omissions) insurance appropriate to the Consultant's profession in a minimum amount of \$2,000,000.00 per claim or occurrence to cover any negligent acts or omissions or willful misconduct committed by Consultant, its employees, agents and subcontractors in the performance of any services for SAWPA. Architects' and engineers' coverage shall include contractual liability;

4.03c Obtain a policy of Employer's Liability insurance in a minimum amount of \$1,000,000.00 per accident for bodily injury and property damage.

4.03d Provide worker's compensation insurance or a California Department of Insurance-approved self-insurance program in an amount and form required by the State of California and the Employer's Liability Insurance that meets all applicable Labor Code requirements, covering all persons or entities providing services on behalf of the Consultant and all risks to such persons or entities;

4.03e Consultant shall require any subcontractor that Consultant uses for work performed for SAWPA under this Agreement or related Task Order to obtain the insurance coverages specified above.

4.03f Consultant hereby agrees to waive subrogation which any insurer of Consultant may seek to require from Consultant by virtue of the payment of any loss. Consultant shall obtain an endorsement that may be necessary to give effect to this waiver of subrogation. In addition, the Workers Compensation policy shall be endorsed with a waiver of subrogation in favor of SAWPA for all work performed by Consultant, and its employees, agents and subcontractors.

All such insurance policy or policies shall be issued by a responsible insurance company with a minimum A. M. Best Rating of "A-" Financial Category "X", and authorized and admitted to do business in, and regulated by, the State of California. If the insurance company is not admitted in the State of California, it must be on the List of Eligible Surplus Line Insurers (LESLI), shall have a minimum A.M. Best Rating of "A", Financial Category "X", and shall be domiciled in the United States, unless otherwise approved by SAWPA in writing. Each such policy of insurance shall expressly provide that it shall be primary and noncontributory with any policies carried by SAWPA and, to the extent obtainable, such coverage shall be payable notwithstanding any act of negligence of SAWPA that might otherwise result in forfeiture of coverage. Evidence of all insurance coverage shall be provided to SAWPA prior to issuance of the first Task Order. Such policies shall provide that they shall not be canceled or amended without 30 day prior written notice to SAWPA. Consultant acknowledges and agrees that such insurance is in addition to Consultant's obligation to fully indemnify and hold SAWPA free and harmless from and against any and all claims arising out of an injury or damage to property or persons caused by the negligence, recklessness, or willful misconduct of Consultant in performing services assigned by SAWPA.

4.04 Consultant hereby covenants and agrees that SAWPA, its officers, employees, and agents shall not be liable for any claims, liabilities, penalties, fines or any damage to property, whether real or personal, nor for any personal injury or death caused by, or resulting from, or claimed to have been caused by or resulting from, any negligence, recklessness, or willful misconduct of Consultant. Consultant shall hold harmless, defend and indemnify SAWPA and its officers, employees, agents and volunteers from and against any and all liability, loss, damage, fines, penalties, expense and costs, including, without limitation, attorneys' fees and litigation expenses and costs, of every nature arising out of or related to Consultant's negligence, recklessness, or willful misconduct related to or arising from the performance of the work required under this Agreement and any related Task Order or Consultant's failure to comply with any of its obligations contained in this Agreement and any related Task Order, except as to such loss or damage which was caused by the active negligence or willful misconduct of SAWPA.

4.05 In the event that SAWPA requests that specific employees or agents of Consultant supervise or otherwise perform the services specified in each Task Order, Consultant shall ensure that such individual(s) shall be appointed and assigned the responsibility of performing the services.

4.06 In the event Consultant is required to prepare plans, drawings, specifications and/or estimates, the same shall be furnished with a registered professional engineer's number and shall conform to local, state and federal laws, rules and regulations. Consultant shall obtain all necessary permits and approvals in connection with this Agreement, any Task Order or Change Order. However, in the event SAWPA is required to obtain such an approval or permit from another governmental entity, Consultant shall provide all necessary supporting documents to be filed with such entity, and shall facilitate the acquisition of such approval or permit.

ARTICLE V

SAWPA OBLIGATIONS

5.01 SAWPA shall:

5.01a Furnish all existing studies, reports and other available data pertinent to each Task Order that are in SAWPA's possession;

5.01b Designate a person to act as liaison between Consultant and the General Manager and Commission of SAWPA.

ARTICLE VI

ADDITIONAL SERVICES, CHANGES AND DELETIONS

6.01 During the term of this Agreement, the Commission of SAWPA may, from time to time and without affecting the validity of this Agreement or any Task Order issued pursuant thereto, order changes, deletions, and additional services by the issuance of written Change Orders authorized and approved by the Commission of SAWPA.

6.02 In the event Consultant performs additional or different services than those described in any Task Order or authorized Change Order without the prior written approval of the Commission of SAWPA, Consultant shall not be compensated for such services.

6.03 Consultant shall promptly advise SAWPA as soon as reasonably practicable upon gaining knowledge of a condition, event, or accumulation of events, which may affect the scope and/or cost of services to be provided pursuant to this Agreement. All proposed changes, modifications, deletions, and/or requests for additional services shall be reduced to writing for review and approval or rejection by the Commission of SAWPA.

6.04 In the event that SAWPA orders services deleted or reduced, compensation shall be deleted or reduced by a comparable amount as determined by SAWPA and Consultant shall only be compensated for services actually performed. In the event additional services are properly authorized, payment for the same shall be made as provided in Article III above.

ARTICLE VII

CONSTRUCTION PROJECTS: CONSULTANT CHANGE ORDERS

7.01 In the event SAWPA authorizes Consultant to perform construction management services for SAWPA, Consultant may determine, in the course of providing such services, that a Change Order should be issued to the construction contractor, or Consultant may receive a request for a Change Order from the construction contractor. Consultant shall, upon receipt of any requested Change Order or upon gaining knowledge of any condition, event, or accumulation of events, which may necessitate issuing a Change Order to the construction contractor, promptly consult with the liaison, General Manager and Commission of SAWPA. No Change Order shall be issued or executed without the prior approval of the Commission of SAWPA.

ARTICLE VIII

TERMINATION OF AGREEMENT

8.01 In the event the time specified for completion of an assigned task in a Task Order exceeds the term of this Agreement, the term of this Agreement shall be automatically extended for such additional time as is necessary to complete such Task Order and thereupon this Agreement shall automatically terminate without further notice.

8.02 Notwithstanding any other provision of this Agreement, SAWPA, at its sole option, may terminate this Agreement at any time by giving 10 day written notice to Consultant, whether or not a Task Order has been issued to Consultant.

8.03 In the event of termination, the payment of monies due Consultant for work performed prior to the effective date of such termination shall be paid after receipt of an invoice as provided in this Agreement.

ARTICLE IX

CONSULTANT STATUS

9.01 Consultant shall perform the services assigned by SAWPA in Consultant's own way as an independent contractor, in pursuit of Consultant's independent calling and not as an employee of SAWPA. Consultant shall be under the control of SAWPA only as to the result to be accomplished and the personnel assigned to perform services. However, Consultant shall regularly confer with SAWPA's liaison, General Manager, and Commission as provided for in this Agreement.

9.02 Consultant hereby specifically represents and warrants to SAWPA that the services to be rendered pursuant to this Agreement shall be performed in accordance with the standards customarily applicable to an experienced and competent professional consulting organization rendering the same or similar services. Furthermore, Consultant represents and warrants that the individual signing this Agreement on behalf of Consultant has the full authority to bind Consultant to this Agreement.

ARTICLE X

AUDIT AND OWNERSHIP OF DOCUMENTS

10.01 All draft and final reports, plans, drawings, specifications, data, notes, and all other documents of any kind or nature prepared or developed by Consultant in connection with the performance of services assigned to it by SAWPA are the sole property of SAWPA, and Consultant shall promptly deliver all such materials to SAWPA. Consultant may retain copies of the original documents, at its option and expense. Use of such documents by SAWPA for project(s) not the subject of this Agreement shall be at SAWPA's sole risk without legal liability or exposure to Consultant. SAWPA agrees to not release any software "code" without prior written approval from the Consultant.

10.02 Consultant shall retain and maintain, for a period not less than four years following termination of this Agreement, all time records, accounting records, and vouchers and all other records with respect to all matters concerning services performed, compensation paid and expenses reimbursed. At any time during normal business hours and as often as SAWPA may deem necessary, Consultant shall make available to SAWPA's agents for examination of all such records and will permit SAWPA's agents to audit, examine and reproduce such records.

ARTICLE XI

MISCELLANEOUS PROVISIONS

11.01 This Agreement supersedes any and all previous agreements, either oral or written, between the parties hereto with respect to the rendering of services by Consultant for SAWPA and contains all of the covenants and agreements between the parties with respect to the rendering of such services in any manner whatsoever. Any modification of this Agreement will be effective only if it is in writing signed by both parties.

11.02 Consultant shall not assign or otherwise transfer any rights or interest in this Agreement without the prior written consent of SAWPA. Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under this Agreement.

11.03 In the event Consultant is an individual person and dies prior to completion of this Agreement or any Task Order issued hereunder, any monies earned that may be due Consultant from SAWPA as of the date of death will be paid to Consultant's estate.

11.04 Time is of the essence in the performance of services required hereunder. Extensions of time within which to perform services may be granted by SAWPA if requested by Consultant and agreed to in writing by SAWPA. All such requests must be documented and substantiated and will only be granted as the result of unforeseeable and unavoidable delays not caused by the lack of foresight on the part of Consultant.

11.05 Consultant shall comply with all local, state and federal laws, rules and regulations including those regarding nondiscrimination and the payment of prevailing wages.

11.06 SAWPA expects that Consultant will devote its full energies, interest, abilities and productive time to the performance of its duties and obligations under this Agreement, and shall not engage in any other consulting activity that would interfere with the performance of Consultant's duties under this Agreement or create any conflicts of interest. If required by law, Consultant shall file a Conflict of Interest Statement with SAWPA.

