S A W P A

SANTA ANA WATERSHED PROJECT AUTHORITY
11615 Sterling Avenue, Riverside, California 92503 • (951) 354-4220

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This meeting will be conducted in person at the address listed above. As a convenience to the public, members of the public may also participate virtually using one of the options set forth above. Any member of the public may listen to the meeting or make comments to the Committee using the call-in number or Zoom link above. However, in the event there is a disruption of service which prevents the Authority from broadcasting the meeting to members of the public, the meeting will not be postponed or rescheduled but will continue without remote participation. The remote participation option is provided as a convenience to the public and is not required. Members of the public are welcome to attend the meeting in-person.

REGULAR MEETING OF THE
PROJECT AGREEMENT 24 COMMITTEE
TUESDAY, APRIL 1, 2025 – 10:00 A.M.

(or immediately following the 9:30 a.m. SAWPA Commission meeting)

Committee Members

Eastern Municipal Water District	Inland Empire Utilities Agency
Director Philip E Paule	Director Jasmin A. Hall
Director David J. Slawson (Alt)	Shivaji Deshmukh, General Manager (Alt)
San Bernardino Valley Municipal Water District	**Western Municipal Water District**
Director T. Milford Harrison, Chair	Director Mike Gardner, Vice Chair
Director Gil Botello (Alt)	Craig Miller, General Manager (Alt)

AGENDA

1. CALL TO ORDER | PLEDGE OF ALLEGIANCE (T. Milford Harrison, Chair)

2. ROLL CALL

3. PUBLIC COMMENTS

Members of the public may address the Committee on items within the jurisdiction of the Committee; however, no action may be taken on an item not appearing on the agenda unless the action is otherwise authorized by Government Code §54954.2(b).

Members of the public may make comments in-person or electronically for the Committee's consideration by sending them to publiccomment@sawpa.gov with the subject line "Public Comment". Submit your electronic comments by 5:00 p.m. on Monday, March 31, 2025. All public comments will be provided to the Chair and may be read into the record or compiled as part of the record. Individuals have a limit of three (3) minutes to make comments and will have the opportunity when called upon by the Committee.

4. ITEMS TO BE ADDED OR DELETED

Pursuant to Government Code §54954.2(b), items may be added on which there is a need to take immediate action and the need for action came to the attention of the Santa Ana Watershed Project Authority subsequent to the posting of the agenda.

5. CONSENT CALENDAR

All matters listed on the Consent Calendar are considered routine and non-controversial and will be acted upon by the Committee by one motion as listed below.

A. **APPROVAL OF MEETING MINUTES: MARCH 4, 2024** **5**
Recommendation: Approve as posted.

6. COMMITTEE DISCUSSION/ACTION ITEMS

A. **2025 BRINE LINE SEWER SYSTEM MANAGEMENT PLAN (SSMP) UPDATE (PA24#2025.9)** **9**
Presenter: Daniel Vasquez
Recommendation: That the Project Agreement 24 Committee certifies the 2025 Brine Line Sewer System Management Plan (SSMP) for submission to the State Water Resources Control Board according to Waste Discharge Requirements (WDR) 2022-0103-DWQ.

B. **INLAND EMPIRE BRINE LINE REACH IV-D CONDITION ASSESSMENT FINAL REPORT (PA24#2025.10)** **53**
Presenter: David Ruhl
Recommendation: Receive and file.

7. INFORMATIONAL REPORTS

Recommendation: Receive for information.

A. **BRINE LINE FINANCIAL REPORT – JANUARY 2025** **209**
Presenter: Karen Williams

B. **GENERAL MANAGER REPORT**
Presenter: Jeff Mosher

C. **COMMITTEE MEMBERS COMMENTS**

D. **CHAIR'S COMMENTS/REPORT**

8. COMMITTEE MEMBER REQUESTS FOR FUTURE AGENDA ITEMS

9. CLOSED SESSION

There were no Closed Session items anticipated at the time of the posting of this agenda.

10. ADJOURNMENT

PLEASE NOTE:
In compliance with the Americans with Disabilities Act, if you need special assistance to participate in this meeting, please contact the Clerk of the Board at (951) 354-4220. Notification at least 48 hours prior to the meeting will enable staff to make reasonable arrangements to ensure accessibility to this meeting.

Materials related to an item on this agenda submitted to the Committee after distribution of the agenda packet are available for public inspection during normal business hours at the SAWPA office, 11615 Sterling Avenue, Riverside, and available at www.sawpa.org, subject to staff's ability to post documents prior to the meeting.

Declaration of Posting

I, Sara Villa, Clerk of the Board of the Santa Ana Watershed Project Authority declare that on March 27, 2025, a copy of this agenda has been uploaded to the SAWPA website at www.sawpa.gov and posted at SAWPA's office, 11615 Sterling Avenue, Riverside, California.

2025 Project Agreement 24 Committee Regular Meetings

Inland Empire Brine Line
First Tuesday of Every Month
(Note: All meetings begin at 10:00 a.m., or immediately following the 9:30 a.m. SAWPA Commission meeting, whichever is earlier, unless otherwise noticed, and are held at SAWPA.)

January		February	
1/7/25	~~Regular Committee Meeting~~ [cancelled]	2/4/25	Regular Committee Meeting
March		April	
3/4/25	Regular Committee Meeting	4/1/25	Regular Committee Meeting
May		June	
5/6/25	Regular Committee Meeting	6/3/25	Regular Committee Meeting
July		August	
7/1/25	Regular Committee Meeting	8/5/25	Regular Committee Meeting
September		October	
9/2/25	Regular Committee Meeting	10/7/25	Regular Committee Meeting
November		December	
11/4/25	Regular Committee Meeting	12/2/25	Regular Committee Meeting

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PROJECT AGREEMENT 24 COMMITTEE
Inland Empire Brine Line
REGULAR MEETING MINUTES
March 4, 2025

COMMITTEE MEMBERS PRESENT

T. Milford Harrison, Chair, San Bernardino Valley Municipal Water District Governing Board
Mike Gardner, Vice Chair, Western Municipal Water District Governing Board
Jasmin A. Hall, Inland Empire Utilities Agency Governing Board

COMMITTEE MEMBERS ABSENT

Phil Paule, Eastern Municipal Water District Governing Board

ALTERNATE COMMITTEE MEMBERS PRESENT [Non-Voting]

Gil Botello, San Bernardino Valley Municipal Water District Governing Board

STAFF PRESENT

Jeff Mosher, Karen Williams, David Ruhl, Dean Unger, John Leete, Lucas Gilbert, Sara Villa, Marie Jauregui, Daniel Vasquez

OTHERS PRESENT

Thomas S. Bunn, Lagerlof, LLP; Nick Kanetis, Eastern Municipal Water District; Kayla Arias, Orange County Sanitation District; Leo Ferrando, San Bernardino Valley Municipal Water District

1. CALL TO ORDER | PLEDGE OF ALLEGIANCE

The Regular Meeting of the PA 24 Committee was called to order at 10:49 a.m. by Chair T. Milford Harrison on behalf of the Santa Ana Watershed Project Authority, 11615 Sterling Avenue, Riverside, CA 92503.

2. ROLL CALL

3. PUBLIC COMMENTS

There were no public comments; there were no public comments received via email.

4. ITEMS TO BE ADDED OR DELETED

There were no items to be added or deleted.

5. CONSENT CALENDAR

A. APPROVAL OF MEETING MINUTES: FEBRUARY 4, 2025

Recommendation: Approve as posted.

MOVED, to approve the Consent Calendar as posted.

Result:	**Adopted by Roll Call Vote**
Motion/Second:	Gardner/Hall
Ayes:	Gardner, Hall, Harrison
Nays:	None
Abstentions:	None
Absent:	None

6. COMMITTEE DISCUSSION/ACTION ITEMS

A. FYE 2026 AND 2027 BRINE LINE FUND DRAFT BUDGET (PA24#2025.6)

Karen Williams provided a presentation on the FYE 2026 and 2027 Brine Line Draft Budget, contained in the agenda packet on pages 13-58. Ms. Williams reported that the first draft FYE 2026 and 2027 Budget was presented to the member agencies' financial staff on February 6, 2025, and was pleased to hear that the Brine Line rates are low given the inflation from the past few years. Ms. Williams noted that this budget will come back when the comprehensive budget is presented, and the staff's recommendation is to approve the budget, and it will move on to Commission for approval. There was no discussion.

MOVED, to adopt the draft FYE 2026 and 2027 Brine Line Fund Budget.

Result:	**Adopted by Roll Call Vote**
Motion/Second:	Hall/Gardner
Ayes:	Gardner, Hall, Harrison
Nays:	None
Abstentions:	None
Absent:	None

B. REQUEST FOR PROPOSALS FOR DEBRIS HAULING AND DISPOSAL SERVICES (PA24#2025.7)

Daniel Vasquez provided a presentation on the Brine Line Service Contracts Request for Proposals (RFP), contained in the agenda packet on pages 93-100. SAWPA relies on several outside service providers to perform critical maintenance activities on the Brine Line. One such service is Debris Hauling and Disposal which facilitates the removal of dewatering bins and hauling to a disposal site. The duration of the contract shall be for a period of 2 years (July 1, 2025, through June 30, 2027). If the release of the RFP is approved, the contract award is anticipated to be April 10, 2025. Estimated cost is $70,000, or $35,000 annually, covering delivery, pickup, landfill transfer, and rental costs. Additional charges may apply if dewatering is delayed by weather or debris volume. There was no discussion.

MOVED, to direct the General Manager to issue a Request for Proposals (RFP) for Debris Hauling and Disposal services.

Result:	**Adopted by Roll Call Vote**
Motion/Second:	Gardner/Hall
Ayes:	Gardner, Hall, Harrison
Nays:	None
Abstentions:	None
Absent:	None

C. REQUEST FOR PROPOSALS FOR THE INLAND EMPIRE BRINE LINE SCADA SPECIFICATION DESIGN AND WORK PLAN (PA24#2025.8)

Daniel Vasquez provided a presentation on the Request for Proposals for SCADA Specification Design and Work Plan, contained in the agenda packet on pages 119-129. SAWPA Staff completed the Master Plan in December 2024. The development of a SCADA system was identified in several future projects in the Capital Improvement Program (CIP) for the enhanced monitoring of the Brine Line. Collection of real-time flow and quality data increases SAWPA's ability to monitor, operate and provide appropriate enforcement actions for the longevity of the Brine Line. A comprehensive SCADA System for the Brine Line would include remote data collection and transmittal devices installed at each discharger location and in five (5) in-line

flow monitoring locations. The deliverables include a bid-ready Design Specification and Work Plan for future implementation.

Mr. Vasquez noted that the schedule is as follows: Issue RFP March 4th, proposal meeting March 19th, proposals due April 16th, interviews April 24th, and award recommendation on May 6th.

Committee Member Mike Gardner asked for the estimated cost. David Ruhl noted that the Master Plan estimates the total scope of the projects at around $2.7 million. However, estimating the cost for just the design and specifications is challenging due to variables like the location of inline monitoring stations, proximity to local utilities, vulnerability to vandalism, and visibility. These factors will be addressed in the 30% design phase, which will give us a clearer idea of the costs. As for the budget, we have approximately $150,000 allocated for this work, which is already accounted for in the budget.

Committee Member Mike Gardner asked if staff would want remote capabilities to close valves if needed, rather than sending someone to the field. Mr. Ruhl noted that the system operates 24/7, 365 days a year, and staff generally do not need to shut down parts of the system. Staff prefer to handle shutdowns physically, with potential control at metering stations. Large valves are rarely operated, though they are controlled on a schedule. However, remote operation is risky because something could go wrong without direct monitoring and both stations should remain closely monitored.

MOVED, to direct the General Manager to issue a Request for Proposals (RFP) for the Inland Empire Brine Line SCADA Specification Design and Work Plan.

Result:	**Adopted by Roll Call Vote**
Motion/Second:	Gardner/Hall
Ayes:	Gardner, Hall, Harrison
Nays:	None
Abstentions:	None
Absent:	None

7. INFORMATIONAL REPORTS

Recommendation: Receive and file the following oral/written reports/updates.

A. BRINE LINE FINANCIAL REPORT – DECEMBER 2024

B. FINANCIAL REPORT FOR THE INLAND EMPIRE BRINE LINE ENTERPRISE/CIP FOR THE SECOND QUARTER ENDING DECEMBER 31, 2024

C. GENERAL MANAGER REPORT

There were no comments/reports from the General Manager.

D. COMMITTEE MEMBERS COMMENTS

There were no comments/reports from the Committee.

E. CHAIR'S COMMENTS/REPORT

There were no comments/reports from the Chair.

8. COMMITTEE MEMBER REQUESTS FOR FUTURE AGENDA ITEMS

There were no requests for future Agenda items.

9. CLOSED SESSION

There was no Closed Session.

10. ADJOURNMENT

There being no further business for review, Committee Chair T. Milford Harrison adjourned the Regular meeting at 11:06 a.m.

Approved at a Regular Meeting of the Project Agreement 24 Committee on April 1, 2025.

_____
T. Milford Harrison, Chair

Attest:

_____
Sara Villa, Clerk of the Board

PA 24 COMMITTEE MEMORANDUM NO. 2025.9

DATE: April 1, 2025

TO: Project Agreement 24 Committee
(Inland Empire Brine Line)

SUBJECT: 2025 Brine Line Sewer System Management Plan (SSMP) Update

PREPARED BY: Daniel Vasquez, Manager of Operations

RECOMMENDATION
That the Project Agreement 24 Committee certifies the 2025 Brine Line Sewer System Management Plan (SSMP) for submission to the State Water Resources Control Board according to Waste Discharge Requirements (WDR) 2022-0103-DWQ.

DISCUSSION
The State Water Resources Control Board adopted the Statewide Waste Discharge Requirements (WDR) General Order WQ 2022-0103-DWQ on December 6, 2022. This order became effective on June 5, 2023, and is a reissue of the previous General Order from 2006. This General Order requires SAWPA to certify and adopt a Sewer System Management Plan. A summary of new requirements for the SSMP can be seen below on Table 1.

Table 1: Summary of New WDR Requirements for Sewer System Management Plan

SSMP Element	Summary of 2022 WDR Changes
Goal and Introduction	• Implementation of SSMP as "Living Document" • Updated Sewer Map • Narrative for regulatory context
Organization	• Contact information of responsible staff for SSMP elements
Legal Authority	• Collaboration with storm drain agencies
O/M Program	• Enhanced training, SERP mockups
Design and Performance Provisions	• Non Substantive
Spill Emergency Response Plan	• Spill Categories • Storm drain agencies collaboration • Annual Certification
Sewer Pipe Blockage Control program	• Justification for FOG Program management
System Evaluation, Capacity Assurance, and Capital Improvements	• Implementation of Capital Improvements • Capacity Assessments
Monitoring, measurement, and Program Modifications	• Change Log • Key Performance Indicators
Internal Audits	• Internal Audits every 3 years, Update every 6
Communication program	• Enhanced communication procedures

As part of the WRD requirements, SAWPA is required to update the SSMP every six years and provide internal audits every 3 years. The previous SSMP update was performed by SAWPA staff in 2019. An audit of the SSMP was completed in 2024 and the findings presented to the PA 24 Committee in November of 2024. Examples of updates include the development of Key Performance Indicators (KPI's) to review SSMP element effectiveness, Legal Authority was clearly outlined for PA 24 Brine Line governance, and the Maintenance and Operations program rewritten to reflect SAWPA's sole responsibility. All updates were completed to meet the new

SSMP requirements. The updated SSMP is required to be uploaded to the California Integrated Water Quality System (CIWQS) by May 2, 2025. Once the updated SSMP is uploaded to the State's website, it will be made available to the general public on SAWPA's website.

RESOURCE IMPACTS
Sufficient funds for SAWPA staff to update the SSMP is included in the Fiscal Year 2025 Budget Fund 240 (Brine Line Enterprise).

Attachments:
1. 2025 Brine Line SSMP
2. PowerPoint Presentation

Santa Ana Watershed Project Authority

Sewer System Management Plan

INLAND EMPIRE BRINE LINE

APRIL 2025

1 Table of Contents

2 Abbreviations/Acronyms

Abbreviation	Definition
BMP	Best Management Practices
CCTV	Closed Circuit Television
CM	Corrective Maintenance
CRC	California Rehabilitation Center
CWEA	California Water Environment Association
EMWD	Eastern Municipal Water District
FOG	Fats, Oils and Grease
FRP	Fiberglass Reinforced Thermosetting Plastic
FSE	Food Service Establishment
GIS	Geographic Information System
HDPE	High Density Polyethylene
I/I	Inflow and Infiltration
ID	Identification
IEC	Infrastructure Engineering Corporation
IEUA	Inland Empire Utilities Agency
JCSD	Jurupa Community Service District
LRO	Legally Responsible Official
MRP	Monitoring and Reporting Program
NPDES	National Pollution Discharge Elimination System
NWLUO	Non-reclaimable Waste Line Use Ordinance
O&M	Operation and Maintenance
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
SERP	Spill Emergency Response Plan
PD	Predictive Maintenance
PM	Preventative Maintenance
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
SARI	Santa Ana Regional Interceptor (now known as Inland Empire Brine Line)
SAWPA	Santa Ana Watershed Project Authority
SBVMWD	San Bernardino Valley Municipal Water District
SOP	Standard Operating Procedures
SSMP	Sewer System Management Plan
SWRCB	State Water Resource Control Board
USEPA	United States Environmental Protection Agency
VCP	Vitrified Clay Pipe

WDR	Waste Discharge Requirement
WMWD	Western Municipal Water District

3 Executive Summary

The latest General Order WQ 2022-0103-DWQ supersedes the previous State Water Resources Control Board Order 2006-003-DWQ. This General Order was adopted by the State Water Resources Quality Control Board on December 6, 2022. As described in the WDR, an SSMP must contain eleven specific elements that encompass the planning, operations, maintenance, and engineering efforts that an agency undertakes in order to limit Spills in its sanitary sewer system. In addition, the SSMP provides a mechanism for measuring the effectiveness of existing and future efforts so that an agency's efforts to prevent Spills can be continuously improved. The eleven elements required in the SSMP include the following:

1. Sewer System Management Plan Goal and Introduction
2. Organization
3. Legal Authority
4. Operation and Maintenance Program
5. Design and Performance Provisions
6. Spill Emergency Response Program
7. Sewer Pipe Blockage Control Program
8. System Evaluation, Capacity Assurance, and Capital Improvements
9. Monitoring, Measurement, and Program Modifications
10. Internal Audits
11. Communication Program

SAWPA has developed an SSMP for the Inland Empire Brine Line that meets the requirements of the reissued WDR. Just as importantly, this SSMP has been developed to be a valuable reference tool for SAWPA staff and its operators and contractors. The SSMP is designed to allow staff to update and access, as reference, any of the sections contained therein.

SAWPA has been proactive in its management of the Brine Line, and over the years has developed and implemented a series of ordinances, specifications, and programs to protect the capacity of the Brine Line, serve customers and member agencies, and minimize Spills and accidents as well as contain and mitigate the spills that do occur. SAWPA has developed a Geographic Information System tools to assist in managing the SSMP. The specific GIS tools include modules to manage USA DigAlert tickets, status of air release and blow off valves, status of sealed maintenance access structures, maintenance access structure inspections, as well as a work order tracking tool. A description of the elements found in the Brine Line SSMP follows below.

Sewer System Management Plan Goal and Introduction

Project Agreement 24 adopted the SSMP at a Public Meeting on April 1, 2025. Following this adoption, SAWPA shall make updates to the SSMP as required.

The Goal and Introduction Chapter covers the requirements of the WDR including the regulatory context in which SAWPA manages, operates and maintains the Brine Line, a general description of the SSMP, update and audit schedule, and an overview of Brine Line assets. Additionally, Chapter 1 outlines the necessary markers for the annual review of implementation and effectiveness.

Organization

The Organization chapter satisfies the requirements of Attachment D, Element 2 of the reissued WDR by listing the Legally Responsible Officials, Data Submitters, and the management, administrative positions, and operation and maintenance positions responsible for implementing specific Sewer System Management Plan elements. In addition, this section details the organizational lines of authority, chain of communication for reporting spills, and indexes titles, telephone numbers, and email addresses.

Legal Authority

The Brine Line SSMP demonstrates that SAWPA has the necessary legal authority to:

1. Prevent illicit discharges into its sanitary sewer system.
2. Require that sewers and connections be properly designed and constructed.
3. Ensure access for maintenance, inspection, or repairs for portions of the lateral owned or maintained by SAWPA.
4. Limit the discharge of Fats, Oils, and Grease (FOG) and other debris that may cause blockages.
5. Enforce any violation of its sewer ordinances.

SAWPA's legal authority to effectively own and operate the Brine Line and comply with the WDR derives from the following documents. Primary legal authority is derived from Project Agreement 24 and subsequently *Ordinance No. 8* with the other documents implementing that legal authority and passing it through to member agencies and customers:

- Project Agreement 24, A signed agreement between SAWPA and the Member Agencies of SAWPA to establish PA 24 as the governing body which owns, operates, and is responsible for the Brine Line.
- *Ordinance No. 8, An Ordinance Establishing Regulations for the Use of the Inland Empire Brine Line*
- Sewer System Standard Drawings and Specifications
- Member Agency Agreements
- Discharge Permits
- SAWPA Easement Summary

Operation and Maintenance Program

SAWPA's Operation and Maintenance Program satisfies the following requirements:

1. An up-to-date map of the sanitary sewer system, showing all gravity line segments and maintenance access structures, pressure pipes and valves with procedures that provide State and Regional Water Board staff with access.
2. Routine preventive operation and maintenance activities by staff.
3. Training on a regular basis for staff in sanitary sewer system operations and maintenance including requirements of the General Order, SERP, and CIWQS reporting procedures.
4. Inventory of Sewer System Equipment including critical replacement and spare parts.

During the 2025 SSMP Audit, SAWPA staff rewrote the Operation and Maintenance Program to include:

- Brine Line-specific training for staff performing maintenance on the Brine Line
- Work Order tracking and reporting of maintenance activities
- Prioritization of maintenance tasks based on consultant performed Consequence of Failure and Probability of Failure Analysis and subsequent condition assessments.
- SAWPA ownership of maintenance activities

In addition, the Brine Line Geographic Information System (GIS) has been updated into a utility-based system that will allow the GIS to serve as the primary data location for preventative maintenance and future asset management functions. Reporting functions are currently being explored for regular analysis of maintenance activities for effectiveness.

Design and Performance Provisions

SAWPA's Design and Performance Provisions provide that the Brine Line has

1. Design and construction standards and specifications for the installation of new sanitary sewer systems; and for the rehabilitation and repair of existing sanitary sewer systems.
2. Procedures and standards for inspecting and testing the installation of new sewers, and for rehabilitation and repair projects.

The standards and procedures required by the WDR are contained in the Standard Drawings developed previously by SAWPA, and in the Standard Technical Provisions developed as part of the SSMP development process.

Spill Emergency Response Program

SAWPA has developed and implemented a Spill Emergency Response Plan that addresses all requirements in General Order 2022-0103-DWQ and can be found in Appendix E-1. Training is performed annually for both Operators and regional stakeholders are invited to attend. A SERP handout has been developed to ensure that Brine Line contractors are trained before commencing work on the Brine Line.

Sewer Pipe Blockage Control Program

SAWPA does not have sections of the Brine Line that are susceptible to the accumulation of fats, oils and greases which could cause blockages due to the implementation of discharger FOG control programs and the majority of wastewater in the Brine Line being comprised of highly saline discharge from member agency desalters. *Ordinance No. 8* and the PA 24 Member Agency Agreement provide the legal authority that SAWPA requires to limit discharge of FOG into the Brine Line. Discharge permits and agreements with domestic dischargers to the Brine Line pass this authority on to customers. WMWD and IEUA staff have identified FOG-susceptible areas of the Brine Line for increased maintenance and monitoring.

System Evaluation and Capacity Assurance Plan

SAWPA has prepared and implemented a System Evaluation and Capacity Assurance Plan to ensure that there is adequate hydraulic capacity of key sanitary sewer system elements for dry weather peak flow conditions, as well as the appropriate design storm or wet weather event. SAWPA's System Evaluation and Capacity Assurance Plan encompasses the following components:

1. Evaluation of Brine Line hydraulics.
2. Establishment of design criteria.
3. Quantification of existing and future predicted discharges into the Brine Line.
4. Development of possible capacity enhancement measures.

The primary component of SAWPA's capacity assurance plan is the hydraulic model of the Brine Line. Since its development in 2006, the model has been updated by SAWPA staff to include the latest flow and infrastructure information. The model is regularly updated as required to serve as a capacity evaluation tool. The Brine Line Master Plan discusses the relevant system evaluations for capacity assurance and informs the Capital Improvement Program.

Monitoring, Measurement, and Program Modifications

SAWPA's Monitoring, Measurement, and Program Modifications are designed to:

1. Maintain relevant information that can be used to establish and prioritize appropriate SSMP activities
2. Monitor the implementation and, where appropriate, measure the effectiveness of each element of the SSMP
3. Assess the success of the preventative maintenance program
4. Update program elements, as appropriate, based on monitoring or performance evaluations
5. Identify and illustrate Spill trends, including frequency, location, and volume.

This program is accomplished through a spreadsheet that lists all of the SSMP key performance indicators that are established in each program. The checklist maintains the person responsible for KPI as well as the data required for measurement of each metric. The data is to be compiled once per year for analysis of success and modification

of goals and programs where necessary. Any changes to the SSMP that result from this annual review of KPI's is recorded in the change log.

SSMP Program Audits

SAWPA is required to conduct Sewer System Management Plan Audits according to section 5.4 of General Order 2022-0103-DWQ within six months after the end of the required 3-year audit period. The LRO shall submit an audit report into CIWQS per the reporting requirements of the General Order.

Audits were conducted in 2010, 2013, 2016, 2018, 2021 and 2024.

Communication Program

SAWPA has communicated on a regular basis with interested parties, including member agencies, on the implementation and performance of this SSMP. Where necessary, member agencies and Brine Line customers were contacted for input and data during the development of the SSMP. Member agencies have reviewed the SSMP and provided input.

SAWPA made the SSMP and all appendices available to the public through SAWPA's website. The SSMP was also adopted by PA 24 at a public meeting on April 1, 2025 where the public was permitted to give input.

The SSMP will undergo review and revision through audits every three (3) years and updates every six 6) years. The results of these audits will be provided to member agencies and will be available to the public on SAWPA's website (www.sawpa.org). Additionally, SAWPA's website presents information about on-going efforts to manage and maintain the Brine Line.

- Any discharge from a sanitary sewer system that has the potential to discharge to surface waters of the State is prohibited unless it is promptly cleaned up and reported as required in the referenced General Order.

The goal of this SSMP is to properly manage, operate and maintain all parts of The Inland Empire Brine Line, reduce and prevent spills, and to contain and mitigate spills that do occur. The SSMP exists as a living document which will be audited and updated according to the SSMP Update Schedule provided in Appendix A-2. The reissued General Order requires an audit of the SSMP every two (2) years and an update performed every six (6) years. A Change Log has been developed since the previous 2019 update and is listed under Appendix J-1. A discussion of implementation and effectiveness are included per the reissued WDR requirements.

4 Goal and Introduction

4.1 Compliance Documents

The following documents allow SAWPA to comply with the development plan and schedule requirements of the WDR and are attached as appendices.

- State of California Water Resources Control Board Order No. 2022-0103-DWQ, Appendix A-1
- Project Agreement 24, Appendix A-2SSMP Schedule, Appendix B-2

4.2 Document Descriptions

General Order WQ 2022-0103-DWQ (Appendix A-1)The State Water Resources Control Board adopted the Statewide Waste Discharge Requirements (WDR) General Order WQ 2022-0103-DWQ (Order) on December 6, 2022. The Order became effective on June 5, 2023. The purpose of this Order is to ensure that wastewater collection systems are properly operated and maintained by the municipalities that oversee their operations. The General Order applies to all public collection system agencies in California that own or operate collection systems comprised of more than one mile of pipe or sewer lines and convey untreated wastewater to a publicly owned treatment facility. The principal elements of the General Order include requiring each agency to prepare a Sewer System Management Plan (SSMP),

which outlines how the municipality operates and maintains the collection system and reporting of all Sanitary Sewer Spills (Spills) to the SWRCB's online Spill database (CIWQS), with the ultimate goal of minimizing spills. SAWPA has historically performed audits every two years per the requirements of the state, which has shifted to every three years under State Water Resources Control Board (SWRCB) General Order 2022-0103-DWQ. SAWPA seeks to have an external audit performed to evaluate the implementation and effectiveness of SAWPA's SSMP in preventing spills and overall compliance with the General Order. A final report with findings and recommended corrective actions will service SAWPA in addressing any SSMP deficiencies and submit a complete audit report to the State Water Resources Control Board.

4.2.1 Project 24 Agreement (Appendix B-2)

Project Agreement 24 for the Inland Empire Brine Line was signed on July 17, 2019 by and between SAWPA and the PA24 Committee Members. This agreement founded PA 24 and vested it with the executive authority to provide policy direction and oversight of SAWPA's ownership and operation of the Brine Line. SSMP Schedule (Appendix A-3) The SSMP Schedule sets the audit and update schedule to meet the requirements of the WDR.

4.2.2 SSMP Audit 2024 (Appendix A-4)

The SSMP Audit 2024 was performed by Dudek and uploaded to CIWQS according to the requirements of the reissued General Order. The findings and recommendations have been reviewed and implemented by SAWPA Staff as appropriate for General Order compliance. Inland Empire Brine Line Service Boundary Map (Appendix F-1) The updated Brine Line Service Map conveys the service area terrain and boundaries. The Inland Empire Brine Line serves a combined population of 3,215,059 people in Riverside, San Bernardino, and Orange Counties within the Santa Ana Watershed. Brine Line Asset data, including system size, description, structures, and data management can be further found in Appendix C. See the description below of Appendix C documents:

4.2.3 Sewer System Standard Drawings (Appendix C-1)

These drawings include the SAWPA's Sewer System Standard Drawings for:

- S-01 60" Diameter Precast Maintenance Access Structure Installation
- S-02 Maintenance Access Structure Base for New or Existing Pipe
- S-03 Maintenance Access Structure Pipe Connectors
- S-04 Maintenance Access Structure Miscellaneous Details
- S-05 36" Maintenance Access Structure Frame and Two Concentric Covers
- S-06 Maintenance Access Structure Lining System
- S-07 Locking Maintenance Access Structure Cover
- S-08 Pipe Bedding and Trench Backfill for Sewer Facilities
- S-09 Permissible Depth of Cover for PVC Pipe
- S-10 Water, Recycled Water and Sewer Main Parallel Separations
- S-11 Water, Recycled Water and Sewer Main Perpendicular Separations
- S-12 Water, Recycled Water and Sewer Main Parallel and Perpendicular Separations Notes
- S-13 Sealed HDPE Gravity Sewer Access Maintenance access structure
- S-14 Sealed FRP Gravity Sewer Access Maintenance access structure
- S-15 Pipe Support for Undercut Sewer Mains

5 Organization

The General Manager and the Executive Manager for Engineering and Operations are named as the Legally Responsible Officials (LROs). The LROs are responsible for completing the monthly on-line spill reports as well as for certifying that all elements of the SSMP have been completed. The Manager of Operations has updated this SSMP after an audit completed in 2024. Operators and Engineering staff participated in the 2024 audit per the requirements of the reissued General Order. The findings of that audit have been incorporated into this SSMP and

can be viewed in the Change Log. All position titles, contact information, and organizational lines of authority can be viewed in the Organizational Chart in Appendix A-3. The chain of communication for reporting spills can be identified in the Spill Emergency Response Plan in Appendix E-1. This Appendix is reviewed annually to ensure that all relevant information is up to date including the names, positions, titles, and contact information of LRO's administrative, management, and operational personnel for the Brine Line are up to date.

6 Legal Authority

SAWPA's Legal Authority addresses those mandatory SSMP provisions outlined in section D-4 Legal Authority of General Order 2022-0103-DWQ. In PA 24 (Appendix B-2), Covenant 2, SAWPA has the "authority to enter any necessary agreement that specify how existing Brine Line infrastructure and all future facility improvements will be financed, designed, constructed, operated, and maintained."

SAWPA will demonstrate, through sanitary sewer system use ordinances, service agreements, or other legally binding procedures, that it possesses the necessary legal authority to:

1. Prevent illicit discharges into its sanitary sewer system (examples may include I/I, stormwater, chemical dumping, unauthorized debris and cut roots, etc.).
2. Require that sewers and connections be properly designed and constructed.
3. Ensure access for maintenance, inspection, or repairs for portions of the lateral owned or maintained by SAWPA.
4. Limit the discharge of Fats, Oils, and Grease (FOG) and other debris that may cause blockages.
5. Enforce any violation of its sewer ordinances.

The table below summarizes the Legal Authority Order Requirements and Applicable sections of subsequent documents.

Table 1: Legal Authority

Legal Authority Order Requirements	Applicable Sections of SAWPA's Legal Authority
a. Prevent illicit discharges into its sanitary sewer system from inflow and infiltration (I&I); unauthorized stormwater; chemical dumping; unauthorized debris; roots; fats, oils, and grease; and trash, including rags and other debris that may cause blockages	SAWPA Ordinance No 8: • Article 2, Section 201 • Article 2, Section 203 • Article 2, Section 204 • Article 4, Section 402 • Article 4, Section 412 • Article 5, Sections 506 – 508 Multijurisdictional Pretreatment Agreement • Section 1
b. Collaborate with storm sewer agencies to coordinate emergency spill responses, ensure access to storm sewer systems during spill events, and prevent unintentional cross connections of sanitary sewer infrastructure to storm sewer infrastructure	Spill Emergency Response Plan
c. Require that sewer system components and connections be properly designed and constructed	SAWPA Ordinance No 8: • Article 5, Section 505 • Article 5, Section 506 • Article 5, Section 507
d. Ensure access for maintenance, inspection, and/or repairs for portions of	SAWPA Ordinance No 8: • Article 4, Section 413

the service lateral owned and/or operated by the Enrollee	• Article 5, Section 502 • Article 5, Section 506
e. Enforce any violation of its sewer ordinances, service agreements, or other legally binding procedures	SAWPA Ordinance No 8: • Article 6 Multijurisdictional Pretreatment Agreement • Section 1 • Section 2 • Section 5 Enforcement Response Plan
f. Obtain easement accessibility agreements for locations requiring sewer system operations and maintenance, as applicable	SAWPA Easement Summary detailing SAWPA Easements & Accessibility Agreements

6.1 Compliance Summary

SAWPA is regulated by several agencies of the United States Government and the State of California, pursuant to the provisions of Federal and State Law. Federal and State Laws (including, but not limited to: 1) Federal Water Pollution Control Act, commonly known as the Clean Water Act (33 U.S.C. Section 1251 et seq); 2) California Porter Cologne Water Quality Act (California Water Code section 13000 et seq.); 3) California Health & Safety Code sections 25100 to 25250; 4) Resource Conservation and Recovery Act of 1976 (42 U.S.C. Section 6901 et seq.); and 5) California Government Code, Sections 54739-54740) grant to SAWPA the authority to regulate and/or prohibit, by the adoption of an ordinance, and by issuance of control mechanisms, the discharge of any waste, directly or indirectly, to SAWPA sewerage facilities. Said authority includes the right to establish limits, conditions, and prohibitions; to establish flow rates or prohibit flows discharged to SAWPA sewerage facilities; to require the development of compliance schedules for the installation of equipment systems and materials by all users; and to take all actions necessary to enforce its authority, whether within or outside SAWPA boundaries, including those users that are tributary to Brine Line or within areas for which SAWPA has contracted to provide sewerage services.

Through *Ordinance No. 8* adopted by the Commission and Member Agency Agreements, SAWPA possesses the necessary legal authority required by section D-4 Legal Authority of General Order 2022-0103-DWQ.

6.2 Compliance Documents

The following documents allow SAWPA to comply with the Legal Authority requirements of the WDR, and are attached as appendices:

- *Ordinance No. 8, An Ordinance Establishing Regulations for the Use of the Inland Empire Brine Line, Appendix B-1*
- Sewer System Standard Drawings, Santa Ana Watershed Project Authority, Appendix C-1.
- Member Agency Agreements, Appendix C-2.
- Multijurisdictional Pretreatment Agreement between Western Municipal Water District, Eastern Municipal Water District, Inland Empire Utilities Agency, San Bernardino Valley Municipal Water District, Yucaipa Municipal Water District, Jurupa Community Services District, San Bernardino Municipal Water Department and Santa Ana Watershed Project Authority, November 25, 2013.
- List and Samples of Discharge Permits, Appendix C-3.
- SAWPA Easement Summary, RBF Consulting, January 2008, Appendix C-6.
- Brine Line Fees, Appendix C-7
- Sample Brine Line Connection Application, Appendix C-9
- Brine Line Discharge Permits, Appendix C-8
- Enforcement Response Plan (C-11)

6.3 Document Descriptions

Each of the following documents provides a portion of SAWPA's Legal Authority, as required in SWRCB reissued General Order 2022-0103-DWQ.

6.3.1 Ordinance No. 8, Establish Regulations for Use of the Inland Empire Brine Line (Appendix B-1)

This ordinance, adopted by the Commission on September 19, 2017, regulates the use of the Inland Empire Brine Line (formerly known as SARI) sewer system and tributaries thereto and the wastewater discharged to this sewer system, by providing for the distribution of the cost of construction, administration, operation and maintenance of the system, and by providing procedures that will allow SAWPA to comply with all regulatory requirements imposed upon SAWPA by contract requirements and by federal, state, and local agencies. The provisions of this Ordinance apply to sewer use, maintenance, discharge, deposit, or disposal of wastewater, both directly and indirectly, into and through all SAWPA collection systems and to the issuance of control mechanisms and assessment/imposition of fees, fines and penalties thereof. This Ordinance applies to all users of SAWPA's sewer system and specifies herein that all users of SAWPA's sewer system are subject to regulation and enforcement.

6.3.2 Member Agency Agreements (Appendix C-2)

Each of the Member Agency Agreements, or successive Addendums, between SAWPA its member agencies contains detailed obligations for the appropriate member agency in order to comply with Orange County Sanitation District's (OCSD) Ordinance, SAWPA's *Ordinance No. 8*, and federal and state laws and regulations. These obligations may include: the responsibility to issue Waste Discharge Permits (Permits) and to enforce violations of Permit requirements; the responsibility to monitor wastewater flows and perform inspections at the member agency's expense; the responsibility to collect any noncompliance fines, fees, user charges, taxes, capital recovery fees, and other lawful charges as levied by the member agency; the responsibility to monitor discharge of trucked wastewater; and the responsibility to prepare and submit appropriate Quarterly and Annual Reports about the administration of the member agency's Non-reclaimable Waste Line Use Ordinance (NWLUO), as well as the agreement to the US Environmental Protection Agency (USEPA), the Santa Ana Regional Water Quality Control Board, and SAWPA.

- Multijurisdictional Pretreatment Agreement between Western Municipal Water District, Eastern Municipal Water District, Inland Empire Utilities Agency, San Bernardino Valley Municipal Water District, Yucaipa Municipal Water District, Jurupa Community Services District, San Bernardino Municipal Water Department and Santa Ana Watershed Project Authority, November 25, 2013.

6.3.3 List and Samples of Discharge Permits (Appendix C-3)

- A list of all dischargers with Discharge Permits.
- A sample of a Discharge Permit between member agency and SAWPA.
- A sample of a Discharge Permit between vendor and member agency.

6.3.4 SAWPA Easement Summary (Appendix C-6)

This list summarizes the easements and agreements which grant SAWPA access to the Brine Line facilities owned and maintained by SAWPA.

6.3.5 Brine Line Fees (Appendix C-7)

The adopted fees for discharge into the Brine Line are updated on a yearly basis.

6.3.6 Sample Brine Line Application (Appendix C-8)

The application is provided to potential dischargers into the Brine Line.

6.3.7 Brine Line Discharge Permits (Appendix C-9)

Copies of all current connection permits for the Brine Line.

6.3.8 Brine Line Enforcement Response Plan (Appendix C-11)

The procedures to enforce any violation of Brine Line Pretreatment Permits.

7 SAWPA's Operating and Maintenance Program

SAWPA's Operation and Maintenance Program encompasses the following components:

1. An up-to-date map of the sanitary sewer system, showing all gravity line segments and maintenance access structures, pressure pipes and valves.
2. Routine preventive operation and maintenance activities by staff, including a system for scheduling regular maintenance and cleaning of the sanitary sewer system with more frequent cleaning and maintenance targeted at known problem areas. The Preventative Maintenance (PM) program includes a system to document scheduled and conducted activities, such as work orders.
3. A rehabilitation and replacement plan to identify and prioritize system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. The program should include regular visual and CCTV inspections of maintenance access structures and sewer pipes, and a system for ranking the condition of sewer pipes and scheduling rehabilitation. Rehabilitation and replacement focuses on sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Finally, the rehabilitation and replacement plan includes a capital improvement plan that addresses proper management and protection of the infrastructure assets. The plan includes a time schedule for implementing the short- and long-term plans plus a schedule for developing the funds needed for the capital improvement plan.
4. A Training Matrix which details an up to date training schedule.
5. Equipment and replacement part inventories, including identification of critical replacement parts.

7.1.1 Compliance Summary

SAWPA has developed and maintains a Geographic Information System (GIS) that stores data on the Brine Line system. As shown in Appendix D-2, a series of system maps were produced using the GIS data as a basis. CWEA guidelines are included in Appendix D-5. The combination of maps and data tables satisfies the mapping requirements of the SSMP, and allows Operations and Maintenance staff to perform required field activities.

7.2 Preventative Operations and Maintenance

7.2.1 Compliance Summary

SAWPA's current preventative operations and maintenance activities are summarized in the *Operation and Maintenance Program Plan* included in Appendix D-5.

Preventive Maintenance (PM) Tasks:

The following asset-specific maintenance tasks for the care of each Brine Line asset throughout its life cycle have been developed. The major PM task groupings are as follows:

- sewer inspection
- condition assessment

- sewer cleaning

PM Frequencies:

Frequency for PM tasks are described below.

Gravity Sewer Program

Statistics show that smaller diameter gravity sewers are more prone to blockages than larger diameter interceptor and trunk sewers. The only lines in the Brine Line that fall in this category are lateral connections. Best Management Practices indicate that a 12 to 18-month schedule for production cleaning of smaller diameter sewers is appropriate.

SAWPA has a great tool for recording cleaning and inspection tasks in the utility GIS system. Cleaning data will be stored in tabular format and linked to GIS for analysis and mapping. A Microsoft excel table that can be used for such purposes is included in Appendix D-5. Regular updates to this spreadsheet can be linked back to the GIS.

The Brine Line system's gravity sewer lines, not including laterals, are composed of what are typically considered large diameter gravity sewer lines. BMPs for such sewer lines that have given no indication of performance or capacity problems state that such lines should be regularly cleaned according to the results of regular inspections.

Gravity mains without known trouble spots in the Brine Line system will be initially placed on a reconnaissance-based cleaning cycle. Inspection will be performed at five (5) locations around the Brine Line system on a yearly basis. These locations have been picked to provide representative coverage for the Brine Line. The results of these inspections will determine the amount and location of cleaning to take place during that year. Maintenance Access Structures (MAS)'s will be inspected on rotation every five (5) years. The examination of the MAS includes the determination of the proper elevation around the lid, lid deficiencies, and examining the structural integrity and functional capacity inside.

Trouble Spot and Siphon PM Program

In order to protect the operational capabilities of the Brine Line system, areas of known maintenance trouble must be prioritized in the PM program. Because of the hydraulic nature of the low velocity siphons in the Brine Line system, all siphons should be treated as trouble spots. The list of siphons and their location can be seen in Appendix D-5 as well as their cleaning periodicities. Inspections of trouble spots will be uploaded to the GIS through inspection forms.

Summary data should be collected for each reach for tracking and analysis purposes. A Microsoft Excel table as seen in Appendix D-5 can be used for such purposes.

Pressure Sewers Maintenance Program:

Isolation valves in the pressure sewers (gate valves in Reach V) should be exercised annually to make sure they are in good working order. Air/vacuum release valves along Reach V should also be checked annually. Deficient Air/vacuum release valves will be rebuilt. The Air/Vacuum release valves have been given a new identification system under the direction of SAWPA staff. The ID system and cleaning schedule can be seen in Appendix D-6. Reach V and its pressure sections are discussed in more detail below.

. Summary data should be collected for each reach for tracking and analysis purposes. A Microsoft Excel table as seen in Appendix D-4 can be used for such purposes.

Predictive Maintenance (PD) Tasks:

Predictive Maintenance (PD) tasks are inspection and condition assessment-type tasks. These are performed to determine if the planned preventive maintenance task should be done as scheduled or rescheduled to a forward date if preventive maintenance, rehab or replacement is not needed. PM tasks are therefore performed based on asset condition and need rather than a strict time interval when maintenance may not be required. Tasks include:

- Closed Circuit TV (CCTV) video inspection of piping
- visual inspection of the maintenance access structure structures and their flow channels
- trending of flow monitoring data
- ground surface inspection of rights of way and easements over the gravity
- odor and corrosion assessment and monitoring programs

The 2021 Criticality Assessment Report identified areas of highest risk according to a consequence and probability of failure analysis. This provides a driver for Condition Assessments, predictive cleaning, and future rehabilitations as further identified in the Brine Line Master Plan (Appendix F-5)

Corrective Maintenance (CM) Tasks:

Corrective maintenance (CM) tasks are performed in response to a failure of an asset, component or part, or a critical utility outage. When managed assets critical to the process fail, they should be scheduled for CM on an urgent or routine basis on a priority schedule. Some of these repairs may be capitalized as a follow-up activity depending on asset cost and life expectancy. These types of CM repairs include:

- emergency cleaning to eliminate a pipe blockage
- spot repair or replacement of a failed pipe
- replacing a rattling or failed maintenance access structure cover
- respond to, investigate and mitigate customer complaints and sewer Spills
- repair of earthquake damage and vandalism

CM tasks should be documented at the time of the event and then input into GIS records as a work order. Findings may lead to a spot repair of the pipe, , re-cleaning for grease or debris removal on a periodic preventive basis, or scheduling a maintenance access structure-to-maintenance access structure pipe replacement or rehab in an urgent or lower priority planned manner.

7.2.2 Reach V Preventative Operations and Maintenance

Reach V is an essential and significant element of the Brine Line system. The same BMPs that apply to the other reaches must be applied to Reach V in order to protect the operational capabilities of the Brine Line system. The current configuration of Reach V and the resulting lack of access to the reach provide difficulty in maintaining these BMPs.

In order to maintain BMPs on Reach V of the Brine Line system, SAWPA is studying the implementation of pressure monitoring along Reach V to monitor the capacity of pipes that are not accessible. Preliminary hydraulic modeling results indicate that during high flow, or “flushing” scenarios, pressure deviations could be used to identify areas where capacity has been lost to sediment or debris. As this program is implemented, results and recommendations will be included in SSMP updates.

7.3 Rehabilitation and Repair Program

7.3.1 Compliance Summary

SAWPA has identified and ranked the condition of pipes and maintenance access structures in much of the Brine Line system through the 2021 Criticality Assessment. The ranking system utilized identifies facilities in need of immediate repair or replacement, those in need of short-term repair and replacement, those in need of long-term repair and replacement, and those in need of more maintenance and/or monitoring as well as future Condition Assessments. SAWPA continues to identify and rank new rehabilitation and repair priorities as CCTV work is continued.

7.4 Training

7.4.1 Compliance Summary

- SAWPA staff participate in conducted formal training in the following areas:
- Confined Space Entry
- Trench shoring
- First Aid and CPR
- Spill Response
- WDR Spill Reporting
- General Order Requirements
- SERP procedures and practice drills
- Skilled estimations of spill volume

- Electronic CIWQS reporting procedures
- SAWPA Contractors are required to review SERP requirements, and a record is maintained to ensure compliance. SAWPA Staff training records are maintained with all SSMP compliance records in a centralized network. Modifications to training requirements will be made on an as-needed basis with such changes reflected in the SSMP.

7.5 Equipment and Replacement Part Inventories

7.5.1 Existing Compliance Summary

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Due to the lack of pump stations to be maintained in the Brine Line system, the number of critical replacement parts is minimal. SAWPA maintains a critical spare parts list that will be reviewed annually. This list can be accessed on Appendix D-3.

7.6 Compliance Documents

The following documents, attached as appendices, support SAWPA's Operation and Maintenance Program, thereby allowing SAWPA to comply with the Operation and Maintenance Program requirements of the WDR:

- A Map of SAWPA's Existing Wastewater Facilities, including all gravity line segments and maintenance access structures, pressure pipes and valves, Appendix D-2
- *Inland Empire Brine Line Operation and Maintenance Program Plan,* Santa Ana Watershed Project Authority, April 2025 Update, Appendix D-5
- Sample Draft O&M Data Collection Sheets, Appendix D-5
- Draft Valve Inspection Schedule Sheets, Appendix D-5
- Critical Spare Parts List Appendix D-3
- Brine Line Master Plan, Appendix G-1
- Brine Line-Specific Training Protocols, Appendix D-7

7.7 Document Descriptions

A description for each compliance document listed above is described below:

7.7.1 Map of Existing Wastewater Facilities (Appendix D-2)

SAWPA maintains an up-to-date Geographic Information System (GIS) database of their sanitary sewer system, including all gravity line segments and maintenance access structures, pressure pipes and valves. This database was utilized to create this map of SAWPA's wastewater facilities. Also included is a table of required system map data along with sample data tables to comply with this requirement.

7.7.2 Inland Empire Brine Line Operation and Maintenance Program Plan (Appendix D-1)

SAWPA maintains different types of system information, and perform various functions related to the overall Brine Line O&M program. This document summarizes the primary elements of the O&M program for the Brine Line

The cleaning activities described in the *Brine Line O&M Program Plan* have been organized in tables and linked to SAWPA's GIS for figural depiction. The gravity main maintenance activity can be seen in Figure 1. The lateral and connection maintenance activity can be seen in Figure 2 and Figure 3. Also included is a table of recommended lateral cleaning frequency. Figure 4 shows the yearly extent of SAWPA's CCTV work. Figure 5 shows the current known trouble spots and siphons.

7.7.3 Sample Draft O&M Data Collection Sheets (Appendix D-5)

- SAWPA Sewer Cleaning Report
- Easement/Maintenance Access Structure Inspection Form

- Valve Maintenance/Inspection Form

7.7.4 Brine Line-Specific Training Protocols (Appendix D-7)

This appendix is an outline of specific trainings given to Brine Line staff to fulfill all regulatory requirements in reference to the Brine Line.

8 Design And Performance Provisions

SAWPA's Design and Performance Provisions address those mandatory SSMP provisions outlined in Section D, 13 Design and Performance Provisions of SWRCB Order No. 2022-0103-DWQ.
SAWPA's Design and Performance Provisions encompass the following components:

- Design and construction standards and specifications for the installation of new sanitary sewer systems; and for the rehabilitation and repair of existing sanitary sewer systems.
- Procedures and standards for inspecting and testing the installation of new sewers, and for rehabilitation and repair projects.

8.1 Compliance Summary

SAWPA requires that all new sanitary sewer systems and appurtenances, as well as the rehabilitation and repair of existing sewer facilities, be designed and constructed in accordance with the SAWPA's *Sewer System Standard Drawings* and *Technical Provisions of the Sewer System Specifications and Standard Drawings*. Procedures and standards for inspecting and testing the installation of new sewers and other appurtenances and for rehabilitation and repair projects are outlined in the SAWPA's *Technical Provisions of the Sewer System Specifications and Standard Drawings*.
SAWPA maintains Design and Performance Provisions which meet the requirements of Section 8 Design and Performance Provisions of SWRCB reissued General Order No. 2022-0103:

- SAWPA's *Sewer System Standard Drawings* and *Technical Provisions of the Sewer System Specifications and Standard Drawings* contain design and construction standards and specifications for the installation of new sanitary sewer systems and other appurtenances, and for the rehabilitation and repair of existing sanitary sewer infrastructure.
- SAWPA's *Technical Provisions of the Sewer System Specifications and Standard Drawings* contains procedures and standards for inspecting and testing the installation of new sewers and other appurtenances and for rehabilitation and repair projects.

8.2 Compliance Documents

The following documents, attached as appendices, support SAWPA's Design and Performance Provisions, thereby allowing SAWPA to comply with the Design and Performance Provisions requirements of the WDR:

- *Sewer System Standard Drawings*, Santa Ana Watershed Project Authority, Appendix C-1.
- *Technical Provisions of the Sewer System Specifications and Standard Drawings*, Santa Ana Watershed Project Authority, Appendix C-10.

8.2.1 Sewer System Standard Drawings (Appendix C-1)

These drawings include the SAWPA's Sewer System Standard Drawings for:
S-01 60" Diameter Precast Maintenance Access Structure Installation

- S-02 Maintenance Access Structure Base for New or Existing Pipe
- S-03 Maintenance Access Structure Pipe Connectors
- S-04 Maintenance Access Structure Miscellaneous Details
- S-05 36" Maintenance Access Structure Frame and Two Concentric Covers
- S-06 Maintenance Access Structure Lining System
- S-07 Locking Maintenance Access Structure Cover
- S-08 Pipe Bedding and Trench Backfill for Sewer Facilities

- S-09 Permissible Depth of Cover for PVC Pipe
- S-10 Water, Recycled Water and Sewer Main Parallel Separations
- S-11 Water, Recycled Water and Sewer Main Perpendicular Separations
- S-12 Water, Recycled Water and Sewer Main Parallel and Perpendicular Separations Notes
- S-13 Sealed HDPE Gravity Sewer Maintenance Access Structure
- S-14 Sealed FRP Gravity Sewer Maintenance Access Structure
- S-15 Pipe Support for Undercut Sewer Mains

8.2.2 Technical Provisions of the Sewer System Specifications and Standard Drawings (Appendix C-10)

SAWPA's *Technical Provisions of the Sewer System Specifications and Standard Drawings* requires contractors to perform all operations necessary to construct sewer mains and appurtenances as specified within the provisions, and as shown on SAWPA's *Sewer System Standard Drawings*. Specific sewer specifications are outlined in the following sections:

- Scope
- Excavation
- Bedding
- Bedding and Backfill
- Vitrified Clay Pipe (VCP) Sewer Pipe
- Installation
- Maintenance access structures and Appurtenances
- Laterals
- Testing Sewer for Leakage and Visual Inspection
- Inspection and Pipeline Interior
- Pipe Repair and Replacement
- Conductor Casings and Carrier Pipes
- Polyvinyl Chloride (PVC) Sewer Pipe
- High Density Poly Ethelene (HDPE) Pipe
- Special Rules and Regulations Applicable for Certain Sewer Connections

9 Spill Emergency Response Plan (Appendix E-1)

SAWPA maintains a plan for responding and reporting to Spills in their *Spill Emergency Response Plan*. The purpose of these procedures is to minimize the impact of Spill's to the public and the environment. This program stands as a Standard Operating Procedure in the event of a Spill, and is reviewed annually to ensure that all corrective measures are being taken. The SERP details the activities of SAWPA's first responders to a spill event and contains contact information for SAWPA's mutual aid partners who may be involved in site response. It also contains information on spill estimation techniques, reporting requirements, necessary spill notifications, public communications, and other provisions and procedures required by the reissued General Order.

9.1 Compliance Summary

SAWPA has outlined specific measures to protect public health and the environment in its *Spill Emergency Response Plan* (Appendix E-1). These procedures contain a plan for responding and reporting to Spills which includes, but is not limited to, the following:

- Descriptions, responsibilities and authorities for each management, administrative and maintenance position responsible for responding to and reporting an Spill.
- Procedures for receiving Spill notification and immediately notifying first responders of the Spill.
- Procedures to rapidly mobilize; contain any Spill; and diagnose, report on, and relieve its cause.

- Procedures to provide emergency operations, such as traffic control, in the event of an Spill.
- Procedures for reporting all Spills to the On-Line Spill Reporting System.
- Procedures to post the proper signs to warn the public of potential contamination hazards.
- Procedures to restore the environment to the condition that existed before the Spill occurred.

SAWPA and appropriate member agency personnel conduct internal training sessions to ensure familiarity with these procedures and prepare staff for an Spill event, from initial notification to Spill report documentation, including any necessary emergency activities, such as traffic control.

9.2 Compliance Documents

The following documents allow SAWPA to comply with the Spill Emergency Response Plan requirements of the WDR and are attached as appendices.

- *Spill Emergency Response Plan*, Santa Ana Watershed Project Authority, Last Updated January 2025, Appendix E-1.

10 Sewer Pipe Blockage Control Program

SAWPA's Sewer Pipe Blockage Control Program addresses those mandatory SSMP provisions outlined in the reissued WDR and addresses the following:

- Legal authority to prohibit discharges to the system and identify measures to prevent Spill's and blockages caused by FOG.
- Requirements to install grease removal devices, design standards for the removal devices, maintenance requirements, BMP requirements, record keeping and reporting requirements.
- Authority to inspect grease producing facilities, enforcement authorities, and sufficient staff to inspect and enforce the ordinances.
- Identification of sanitary sewer system sections subject to sewer pipe blockages and establishment of a cleaning maintenance schedule for each section.
- Development and implementation of source control measures for all sources of potential sewer pipe blockages for each section identified.

10.1 Compliance Summary

SAWPA has utilized the FOG programs and Operation and Maintenance Programs of its member agencies as a basis to enforce ordinances and prevent dischargers that produce FOG or other potential sewer pipe blockages from affecting the operation of the Brine Line. Due to this enforcement through Ordinance 8, and the existing pretreatment and FOG programs of the member agencies, SAWPA is justified in having no FOG control program of its own to manage.

The Jurupa Community Service District (JCSD) disposes of waste into the Brine Line and maintains a FOG control program. JCSD identifies all Food Service Establishments (FSE) within their service area. Accordingly, each of these customers receives a *Food Service Establishment FOG Information Packet*. This packet includes a FSE Information and Preventative Maintenance Form, FSE Best Management Practices, two Managing FOG Posters to be posted in dishwashing and cooking areas, Grease Interceptor Operation, and Grease Interceptor Pumping Companies. Additionally, all dischargers to the Brine Line must complete a *Waste Discharge Application* in order to receive sewer service, as per SAWPA's *Ordinance No. 8*. Currently there are no Significant Industrial Users, and only one Permitted FSE, Farmer Boys Restaurant, in the JCSD that discharge into the Brine Line. JCSD conducts unscheduled annual inspections of each FSE to ensure that the FOG Control System is being properly operated and maintained. During the inspection, the grease interceptor's condition is checked, the FSE's compliance with the BMP's is evaluated, and the Information and Grease Interceptor Forms are updated. JCSD maintains standard drawings of grease interceptors.

Western Municipal Water District (WMWD) conducts preventative operation and maintenance activities and provides a system for scheduling regular maintenance and cleaning of the sanitary sewer system with more frequent cleaning and maintenance targeted at known problem areas.

In summary, SAWPA maintains a Sewer Pipe Blockage Control Program that meets the requirements of the reissued General Order:

(1) SAWPA maintains a plan and schedule for the disposal of pipe blocking substances generated within their sanitary sewer system service area in SAWPA's *Ordinance No. 8* details interceptor maintenance and requires that sediment, liquid and floating material will be legally disposed of when an interceptor is cleaned. Additionally, JCSD distributes a *Food Service Establishment FOG Information Package* which includes a list of grease interceptor pumping companies that can provide collection and disposal services within their service area.

(2) SAWPA possesses the legal authority to prohibit discharges to the system and identify measures to prevent Spill's and blockages caused by FOG through *Ordinance No. 8* prohibits discharge of FOG into the Brine Line System. Additionally, *JCSD Ordinance 226, Section 2.15.28* prohibits discharge of any wastewater to the storm drain, service dock areas, or ground and requires that wastewater generated by restaurants will be disposed of to a sanitary sewer through an approved gravity separation interceptor, or a sample station connected to a sanitary sewer, or hauled off-site and disposed at a legal disposal site.

(3) SAWPA's requirements to install grease removal devices, design standards for the removal devices, maintenance requirements, BMP requirements, record keeping and reporting requirements are discussed in *Ordinance No. 8*, and their *Waste Discharge Permit Application*. Additionally, JCSD distributes a *Food Service Establishment FOG Information Packet* to all FSEs within their service area. This packet includes a FSE Information and Preventative Maintenance Form, FSE Best Management Practices, and Grease Interceptor Operation. JCSD also maintains standard drawings for grease interceptors.

(4) SAWPA has authority to inspect pipe blockage producing facilities through *Ordinance No. 8* and enforces any violation of its sewer ordinances in accordance with their *Enforcement Response Plan.* SAWPA has sufficient staff to provide inspections of each removal device in their service area.

(5) SAWPA has developed and implemented source control measures for all sources of pipe blockage substances discharged to the sanitary sewer system for each section identified by adopting *Ordinance No. 8* and their Member Agency Agreements and by requiring Wastewater Discharge Permits.

(6) As JCSD is the agency which disposes of FOG waste into the Brine Line, they distribute a *Food Service Establishment FOG Information Packet* to all FSEs within their service area. This packet includes a FSE Information and Preventative Maintenance Form, FSE Best Management Practices, two Managing FOG Posters to be posted in dishwashing and cooking areas, Grease Interceptor Operation, and Grease Interceptor Pumping Companies.

10.2 Compliance Documents

The following documents, attached as appendices, support SAWPA's FOG Control Program, thereby allowing SAWPA to comply with the FOG Control Program requirements of the Statewide General Waste Discharge Requirements (WDR):

- *Ordinance No. 8, An Ordinance Establishing Regulations for the Use of the Inland Empire Brine Line,* Adopted by the Commission of the Santa Ana Watershed Project Authority, September 19, 2017, Appendix B-1.
- Member Agency Agreements, Appendix C-2.
- Multijurisdictional Pretreatment Agreement between Western Municipal Water District, Eastern Municipal Water District, Inland Empire Utilities Agency, San Bernardino Valley Municipal Water District, Yucaipa Municipal Water District, Jurupa Community Services District, San Bernardino Municipal Water Department and Santa Ana Watershed Project Authority, November 25, 2013.
- *Inland Empire Brine Line Operation and Maintenance Program Plan,* Santa Ana Watershed Project Authority, April 2025 Update, Appendix D-5.
- *JCSD Ordinance 226,* Sections Related to FOG, Jurupa Community Service District, Appendix F-1.
- *JCSD Food Service Establishment FOG Information Package,* Jurupa Community Service District, November 16, 2006, Appendix F-1.

- *JCSD Interceptor Standard Drawings,* Jurupa Community Service District, August 1990, Appendix F-1.

10.3 Document Descriptions

A description for each compliance document listed above is described below:

10.3.1 Ordinance No. 8, Establish Regulations for Use of the Inland Empire Brine Line (Appendix B-1)

This ordinance, adopted by the Commission on September 19, 2017, regulates the use of the Inland Empire Brine Line (formerly known as SARI) sewer system and tributaries thereto and the wastewater discharged to this sewer system, by providing for the distribution of the cost of construction, administration, operation and maintenance of the system, and by providing procedures that will allow SAWPA to comply with all regulatory requirements imposed upon SAWPA by contract requirements and by federal, state, and local agencies. The provisions of this Ordinance apply to sewer use, maintenance, discharge, deposit, or disposal of wastewater, both directly and indirectly, into and through all District collection systems and to the issuance of control mechanisms and assessment/imposition of fees, fines and penalties thereof. This Ordinance applies to all users of SAWPA's sewer system and specifies herein that all users of SAWPA's sewer system are subject to regulation and enforcement.

10.3.2 Member Agency Agreements (Appendix C-2)

Each of the Member Agency Agreements, or successive Addendums, between SAWPA its member agencies contains detailed obligations for the appropriate member agency in order to comply with Orange County Sanitation District's (OCSD) Ordinance, SAWPA's Ordinance No. 8, and federal and state laws and regulations. These obligations may include: the responsibility to issue Waste Discharge Permits (Permits) and to enforce violations of Permit requirements; the responsibility to monitor wastewater flows and perform inspections at the member agency's expense; the responsibility to collect and noncompliance fines, fees, user charges, taxes, capital recovery fees, and other lawful charges as levied by the member agency; the responsibility to monitor discharge of trucked wastewater; and the responsibility to prepare and submit appropriate Quarterly and Annual Reports about the administration of the member agency's Non-reclaimable Waste Line Use Ordinance (NWLUO), and the agreement to the US Environmental Protection Agency (USEPA), the Santa Ana Regional Water Quality Control Board, and SAWPA.

- Multijurisdictional Pretreatment Agreement between Western Municipal Water District, Eastern Municipal Water District, Inland Empire Utilities Agency, San Bernardino Valley Municipal Water District, Yucaipa Municipal Water District, Jurupa Community Services District, San Bernardino Municipal Water Department and Santa Ana Watershed Project Authority, November 25, 2013.

10.3.3 Brine Line Operation and Maintenance Program Plan (Appendix D-5)

This document summarizes the primary elements of the O&M program currently in place for the Brine Line. JCSD Ordinance 226, Sections Related to FOG (Appendix F-1)

This Ordinance enforces JCSD's FOG Control Program in the following sections.

- Section 2.11.25 Interceptor Requirements
- Section 2.12.26 Standard Interceptor Designs
- Section 2.13.26 Interceptor Maintenance
- Section 2.14.27 Restaurants
- Section 2.15.28 Prohibited Restaurant Surface Discharges
- Section 2.16.28 Conditional Waivers

10.3.4 JCSD Food Service Establishment FOG Information Package (Appendix F-1)

JCSD distributes this information package to all Food Service Establishments within their service area. Each package details JCSD's FOG Control Program and BMPs and includes the following:

- FSE Information and Preventative Maintenance Form
- FSE Best Management Practices
- Managing Fats, Oil and Grease Posters (2)
- Grease Interceptor Operations
- Grease Interceptor Pumping Companies

10.3.5 JCSD Interceptor Standard Drawings (Appendix F-1)

These drawings include the standard drawings for devices used to intercept and separate FOG including:

- Gravity Separator (850 gal to 1500 gal)
- Gravity Separator (2000 gal to 3000 gal)

11 System Evaluation and Capacity Assurance Plan

SAWPA's System Evaluation and Capacity Assurance Plan addresses those mandatory SSMP provisions, outlined in System Evaluation and Capacity Assurance Plan of SWRCB Order No. 2022-0103-DWQ. In 2021, a Criticality Assessment was performed followed by condition assessments of Reach IV and IV-B. These condition assessments were performed by outside consultants who employed various nondestructive testing methods to the inner pipe conditions to establish empirical data used to determine remaining useful life. This data has been collected and informs the Capital Improvement Plan. Future condition assessments are prioritized according to the Criticality Assessment and new data collected via condition assessment. Since the condition assessments are data driven, there is no baseline percentage of system that is assessed every year outside of the normal preventative and predictive maintenance found in the Operations and Maintenance Program.

SAWPA has prepared and implemented a Brine Line Master Plan (Appendix G-1) to ensure that there is adequate hydraulic capacity of key sanitary sewer system elements for dry weather peak flow conditions, as well as the appropriate design storm or wet weather event. SAWPA's Brine Line Master Plan encompass the following components:

(1) Evaluation - Actions needed to evaluate those portions of the sanitary sewer system that are experiencing or have contributed to an Spill discharge caused by hydraulic deficiency. The evaluation provides estimates of peak flows (including flows from Spills that escape from the system) associated with conditions similar to those causing Spill events, estimates of the capacity of key system components, hydraulic deficiencies (including components of the system with limiting capacity) and the major sources that contribute to the peak flows associated with Spill events.

(2) Design Criteria - Where design criteria do not exist or are deficient, undertake the evaluation identified in (1) above to establish appropriate design criteria.

(3) Capacity Enhancement Measures - The steps needed to establish a short- and long-term CIP to address identified hydraulic deficiencies, including prioritization, alternatives analysis, and schedules. The CIP includes increases in pipe size, I/I reduction programs, and storage facilities as necessary. The CIP will include an implementation schedule and will identify sources of funding.

(4) Schedule – SAWPA has developed a schedule of completion dates for all portions of the CIP developed in (1)-(3) above. This schedule will be reviewed and updated consistent with the SSMP review and update requirements as described in Section D. 14.

SAWPA has identified all Brine Line Assets as potentially impacted, directly or indirectly, by Climate Change. Flooding or erosion due to increased storm volumes, storm frequency, wildfires, and power disruptions could potentially impact every part of the Inland Empire Brine Line, particularly sections that align beneath Prado Dam, or cross seasonal waters. Other kinds of impact include potentially increased infiltration, MAS cover damage, flowmeter loss of power, and spills. These considerations have been included for the Capital Improvement Program and the future planning in the Brine Line Master Plan.

The System Evaluation and Capacity Assurance Plan will be reviewed annually according to the key performance indicators for corrections and improvement. The KPI checklist can be found in Appendix H-1. Such changes will be noted in the Change Log.

11.1 Compliance Summary

(1) SAWPA developed and maintains a hydraulic model of the Brine Line system for evaluation of hydraulic capacity. The development of this model is described in *Brine Line Master Plan (Appendix G-1)*. As described in this document, the hydraulic model of the Brine Line system is an all-pipes, fully dynamic model based upon the Storm Water Management Model (SWMM) engine, which is approved by both FEMA and the EPA. The model evaluates Average Dry Weather Flow (ADWF), Peak Dry Weather Flow (PDWF) and Peak Wet Weather Flow (PWWF) in the Brine Line system. These flows are evaluated for both existing and future conditions. The model is actively used by SAWPA staff and is updated when Brine Line infrastructure or flow changes.

(2) SAWPA maintains the appropriate design criteria necessary to ensure sufficient capacity, as well as preserve the estimated life-cycle of wastewater infrastructure. These design criteria were developed in the *Brine Line Master Plan*. The hydraulic design criteria for the Brine Line system can be seen summarized in Appendix F-3.

(3) Hydraulic modeling results show that SAWPA has sufficient capacity to convey the projected flows from the current dischargers and the current projected future dischargers. Existing discharge amounts and predicted future discharge amounts are updated regularly in the model by SAWPA staff. The most current discharge flow information can be seen in F-4.

(4) A Capital Improvement Program (CIP) was developed from rankings provided by SAWPA. As projects are completed the schedule will be reviewed and updated consistent with the SSMP review and update requirements. Additionally, as new dischargers connect to the Brine Line, SAWPA will reevaluate the sewer system using the hydraulic model. The CIP includes projected cost estimates, alternatives analysis, project prioritization, and an identification of potential sources of funding. The Capital Improvement Plan can be found in Appendix D-6.

11.2 Compliance Documents

The following documents, attached as appendices, support SAWPA's System Evaluation and Capacity Assurance Plan, thereby allowing SAWPA to comply with the System Evaluation and Capacity Assurance Plan requirements of the WDR:

- Brine Line Dischargers, Santa Ana Watershed Project Authority, Jan 2025, Appendix F-2.
- *Brine Line Master Plan 2024 Appendix G-1.*
- *Brine Line Hydraulic Design Criteria*, Santa Ana Watershed Project Authority, Appendix F-3
- Current Flow Data (SAWPA, June 2025), Appendix F-4

11.3 Document Descriptions

A description for each compliance document listed above is described below:

11.3.1 Brine Line Master Plan (Appendix G-1)

The 2024 Brine Line Master Plan The purpose of this master plan is to identify the current capacity of the Brine Line system under a variety of anticipated flow conditions, identify system deficiencies, develop near- and long-term system improvements to address identified deficiencies, as well as update and calibrate the existing SAWPA Brine Line hydraulic model. In addition, the project identifies potential capacity management activities that SAWPA may implement to maximize regional use of the Brine Line, over time. The project also identifies existing dischargers and the potential regional market for future dischargers.

11.3.2 Current Flow Data (SAWPA, 2025) (Appendix F-4)

This data is collected monthly and will be updated annually in the document.

12 Monitoring, Measurement, and Program Modifications

SAWPA's Monitoring, Measurement, and Program Modifications addresses those mandatory SSMP provisions outlined in reissued General Order 2022-0103-DWQ.

SAWPA's Monitoring, Measurement, and Program Modifications encompass the following components:

- Maintain relevant information that can be used to establish and prioritize appropriate SSMP activities;
- Monitor the implementation and, where appropriate, measure the effectiveness of each element of the SSMP;
- Assess the success of the preventative maintenance program;
- Update program elements, as appropriate, based on monitoring or performance evaluations; and
- Identify and illustrate Spill trends, including: frequency, location, and volume.

12.1 Compliance Summary

SAWPA tracks the location and cause of all Spills, blockages, gravity main hot-spots, and other problem areas. SAWPA's member agencies maintain record of all cleaning activities. Further, Appendix D-5 contains recommended Operation and Maintenance Data Sheets which details the size, material and location of each pipe cleaned, as well as the equipment utilized, and any relevant remarks observed during the cleaning to keep all documentation organized.

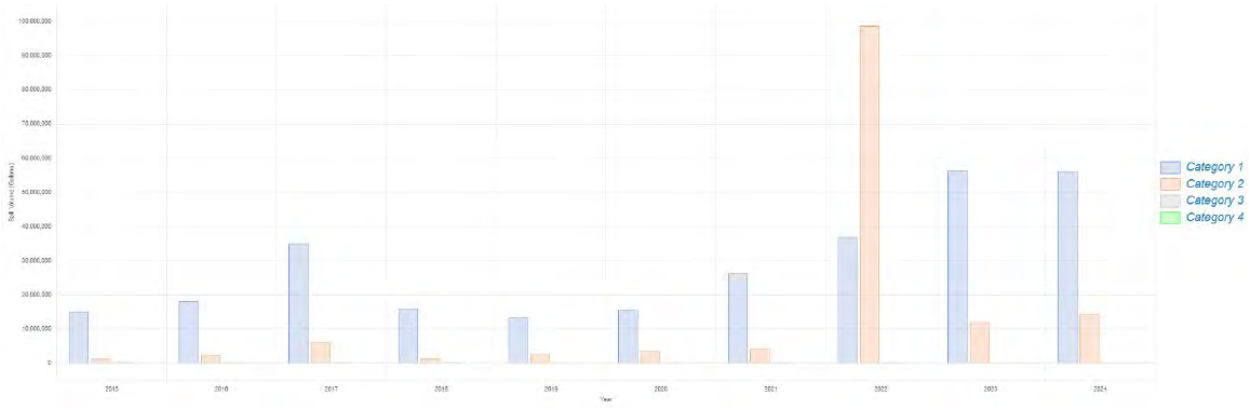
SAWPA identifies food preparation and service locations that connect to the Brine Line by during the Wastewater Discharge Application process. These locations that directly or indirectly connect to the Brine Line are required by the governing agency to maintain interceptors. Routine inspections are performed and recorded by the governing agency for those interceptors tributary to sections of the sanitary sewer system subject to high levels of FOG.

In the past few years, SAWPA has undertaken an extensive program to provide CCTV video inspection for the Brine Line system. The program is ongoing, and results of the program are being utilized to develop rehabilitation and repair program priorities.

In order to monitor the implementation and measure the effectiveness of the SSMP, SAWPA tracks several performance indicators in their Monitoring, Measurement, and Program Modification Key Performance Indicator Spreadsheets (Appendix D-5).

In order the keep the SSMP up to date, SAWPA has assigned a staff member to review the SSMP annually. In addition to tracking the above performance indicators, the staff member will review all sections of the SSMP for effectiveness and timeliness. Collection system personnel will also be consulted annually to review the effectiveness of the SSMP and help identify potential areas for improvement.

Figure 1: Spill History for Brine Line



In summary, SAWPA maintains a Monitoring, Measurement, and Program Modifications which meets the requirements of Attachment D, Section 9 Monitoring, Measurement, and Program Modifications of SWRCB reissued General Order No. 2022-0103:

(1) SAWPA tracks the location and cause of all Spills, blockages, and gravity main hot-spots, and other problem areas. SAWPA's member agencies maintain record of all cleaning activities. Further, Appendix D-5 contains recommended Operation and Maintenance Data Sheets which details the size, material and location of each pipe cleaned, as well as the equipment utilized, and any relevant remarks observed during the cleaning to keep all documentation organized. SAWPA identifies food preparation and service locations that connect to the Brine Line by during the Wastewater Discharge Application process. These locations that directly or indirectly connect to the Brine Line are required by the governing agency to maintain interceptors. Routine inspections are performed and recorded by the governing agency for those interceptors tributary to sections of the sanitary sewer system subject to high levels of FOG.

(2) SAWPA monitors the implementation of the SSMP, and measures the effectiveness of each element by SSMP by developing and tracking key performance indicators in their Monitoring, Measurement and Program Modification Key Performance Indicator Spreadsheets (Appendix H-1) on an annual basis;

(3) SAWPA has consolidated SSMP compliance documents in a single repository network drive to maintain a centralized location for updated information regarding the SSMP.

(4) By tracking key performance indicators during the annual SSMP review, SAWPA is able to assess the success of its preventative maintenance program;

(5) SAWPA has assigned the Manager of Operations to review the SSMP annually, in order to update all program elements as appropriate. In addition to tracking the above performance indicators, the staff member will review all sections of the SSMP for effectiveness and timeliness. Collection system personnel will also be consulted annually to review the effectiveness of the SSMP, and help identify potential areas for improvement;

(6) SAWPA tracks the frequency, location and volume of all Spills.

12.2 Compliance Documents

The following documents allow SAWPA to comply with the Monitoring, Measurement, and Program Modifications requirements of the WDR, and are attached as appendices.

SSMP Monitoring, Measurement, and Program Modifications Key Performance Indicator Spreadsheets, Santa Ana Watershed Project Authority, March 2009, Appendix H-1.

12.3 Document Descriptions

A description for each compliance document listed above is described below:

12.3.1 SSMP Monitoring, Measurement and Program Modification Key Performance Indicator Spreadsheets (Appendix H-1)

SAWPA annually updates spreadsheets for each chapter of the SSMP to monitor and measure the effectiveness of the SSMP elements and to keep a record of program updates.

13 SSMP Program Audits

SAWPA's SSMP Program Audits addresses those mandatory SSMP provisions outlined in Section D, 13 (x) SSMP Program Audits of SWRCB Order No. 2022=0103-DWQ.

SAWPA is required to conduct audits every three (3) years and uploaded into CIWQS within six (6) months of the audit period. This audit will focus on evaluating the effectiveness of the SSMP and SAWPA's compliance with the reissued General Order including the identification of any deficiencies in the SSMP and steps to correct them. The next audit of SAWPA's SSMP will take place in 2027 and will include any deficiencies found and schedule of system improvements for the upcoming year.

In 2024, an Audit was performed. Audit findings, as well as the audit report are found in Appendix A-4.

13.1 Compliance Summary

SAWPA will conduct an audit of their SSMP every two years and focus on the effectiveness of the SSMP and SAWPA's compliance with the SSMP requirements of reissued General Order No. 2022-0103. Appendix A contains a checklist of the elements of the audit. Each three-year audit should be stored with the SSMP.

13.2 Compliance Documents

2024 SAWPA SSMP Audit, Appendix A-4.

14 Communication Program

SAWPA's Communication Program addresses those mandatory SSMP provisions outlined in Attachment D, section 11 Communication Program of SWRCB Order No. 2022-0103-DWQ

SAWPA should communicate regularly with the public on the development, implementation, and performance of its SSMP. The communication system will provide the public with the opportunity to offer input to SAWPA as the program is developed and implemented.

SAWPA has compiled with this requirement through hosting numerous meetings and presentations, utilizing SAWPA's website and social media tools as a resource for disseminating information. Elements of our communication program for SAWPA include:

14.1 Compliance Summary

14.1.1 Implementation

SAWPA has communicated regularly with interested parties, including member agencies, on the implementation and performance of this SSMP. Key actions include:

- Communicating with member agencies and Brine Line customers to gather input and data during the SSMP development.
- Allowing member agencies to review the SSMP and provide input.
- Making the SSMP available to the public for review via the SAWPA website (www.sawpa.gov).
- Inviting public comments at a PA 24 meeting on April 1, 2025, to allow for public input.

14.1.2 Ongoing Efforts

The SSMP will undergo review and revision through the following processes:

- Annual SSMP Review for implementation and effectiveness.
- Conducting audits every three (3) years.
- Performing SSMP Updates every six (6) years.
- PA 24 Meetings are fully open to the public, and agendas of each meeting are posted on the Agency's website. At these meetings, regular reports are given on the status and operations of SAWPA's sewer collection system.
- Providing audit results to member agencies and making them available to the public on SAWPA's website (www.sawpa.gov).
- Presenting information on SAWPA's website about ongoing efforts to manage and maintain the Brine Line.
- Website Links: The approved SSMP is posted through a link on SAWPA's website (www.sawpa.gov) and can be easily located and read through. The website also houses PA 24 meeting agendas, minutes, and other general information.

To further enhance communication, SAWPA will implement the following ongoing strategies:

- Social Media: Regular updates and engagement on platforms including Instagram, Twitter, and LinkedIn.
- Email Newsletters: SAWPA publishes quarterly newsletters called "SAWPA's Watershed Watch," with an opportunity to provide updates on sewer system programs and functions to subscribers.
- 24/7 Hotline: A Brine Line hotline for reporting issues or getting information during emergencies, including SAWPA's Inland Empire Brine Line hotline number: (951) 324-8680.

14.2 Compliance documents

- Public meeting Minutes (SAWPA Commission Meeting 2025), Appendix I-1

14.3 Document Descriptions

14.3.1 PA 24 Minutes (PA 24 April 2025 Public Meeting) (Appendix I-1)

The minutes describe the public adoption of the SSMP by PA 24.

15 SSMP Certification

As mandated by the WDR, SAWPA's SSMP for the Brine Line was certified electronically by the LRO after adoption of the SSMP by PA 24.

15.1 Compliance Documents

- Public Meeting Minutes (PA 24 Meeting April 2025), Appendix I-1
- Electronic SSMP Certification Form, Appendix I-2

15.2 Document Descriptions

A description for each compliance document listed above is described below:

15.2.1 Public Meeting Minutes (SAWPA Commission Meeting April 2025) (Appendix I-1)

The minutes describe the public adoption of the SSMP by the SAWPA Commission.

15.2.2 Electronic SSMP Certification Form (Appendix I-2)

The signed form was printed from the online certification program.

16 SSMP Appendices

	Document
A-1	State of California Water Resources Control Board Order No. 2022-0103-DWQ
A-2	SSMP Schedule
A-3	SAWPA Organization Chart
A-4	2024 SSMP Audit
B-1	Ordinance No. 8, an Ordinance Establishing Regulations for Use of the Inland Empire Brine Line
B-2	Project Agreement 24
C-1	Sewer System Standard Drawings
	S-01 60" Diameter Precast Manhole Installation
	S-02 Manhole Base for New or Existing Pipe
	S-03 Manhole Pipe Connectors
	S-04 Manhole Miscellaneous Details
	S-05 36" Manhole Frame and Two Concentric Covers
	S-06 Manhole Lining System
	S-07 Locking Manhole Cover
	S-08 Pipe Bedding and Trench Backfill for Sewer Facilities
	S-09 Permissible Depth of Cover for PVC Pipe
	S-10 Water, Recycled Water and Sewer Main Parallel Separations
	S-11 Water, Recycled Water and Sewer Main Perpendicular Separations
	S-12 Water, Recycled Water and Sewer Main Parallel and Perpendicular Separations Notes
	S-13 Sealed HDPE Gravity Sewer Access Manhole
	S-14 Sealed FRP Gravity Sewer Access Manhole
	S-15 Pipe Support for Undercut Sewer Mains
C-2	Member Agency Agreements
	Multijurisdictional Pretreatment Agreement Between WMWD and SAWPA
	Multijurisdictional Pretreatment Agreement Between EMWD and SAWPA
	Multijurisdictional Pretreatment Agreement Between IEAU and SAWPA
	Multijurisdictional Pretreatment Agreement Between SBVWD and SAWPA
	Multijurisdictional Pretreatment Agreement Between WMWD and SAWPA
C-3	List and Samples of Discharge Permits
C-4	List of Dischargers to the Brine Line
C-5	Direct User Discharge Permit No. 4B-06-S60 for Western Municipal Water District
C-6	SAWPA Easement Summary, RBF Consulting
C-7	Brine Line Fees
C-8	Sample Brine Line Connection Application
C-9	Copies of all permits for Brine Line discharge

	Document
C-10	Technical Provisions of the Sewer Specifications and Standard Drawings
D-1	Inland Empire Brine Line Operation and Maintenance Program Plan
D-2	System Maps and Brine Line Data
D-3	Critical Spare Parts List
D-4	Available Brine Line GIS Data
D-5	SAWPA: Current Brine Line Reach Cleaning Yearly Schedule
	SAWPA: Current Brine Line Lateral Sewer Cleaning Yearly Schedule
	Recommended Lateral Cleaning Frequency
	Brine Line Reach Cleaning Yearly Schedule
	Brine Line Lateral Sewer Cleaning Yearly Schedule
	Brine Line Lateral Sewer Cleaning Yearly Schedule
	Brine Line Trouble Spots/Siphon Areas
	Sample Draft Operation and Maintenance Data Collection Sheets
	SAWPA Sewer Cleaning Report
	Easement/Manhole Inspection Form
	Valve Maintenance
	Critical Spare Parts List
D-6	Capital Improvement Program
D-7	Brine Line-Specific Training Protocols
	Training Schedule
	Training Record Sheet
	CWEA Certification Handbook
E-1	*Spill Emergency Response Plan, CDM*
F-1	JCSD Ordinance 226, Sections Related to FOG
	JCSD Food Service Establishment FOG Information Package
	JCSD Interceptor Standard Drawings
	S-19 Gravity Separator (750 gal to 1,500 gal)
	S-20 Gravity Separator (2,000 gal to 3,000 gal)
F-2	Brine Line Dischargers
F-3	Brine Line Hydraulic Design Criteria
F-4	Current Brine Line Flow Data 2025
F-5	2021 Criticality Assessment
G-1	Brine Line Master Plan
H-1	SSMP Monitoring, Measurement, and Program Modification Key Performance Indicator Spreadsheets
I-1	Public Meeting Minutes (SAWPA Commission Meeting April 2025)
I-2	Electronic SSMP Certification Form
J-1	Change Log

SANTA ANA WATERSHED PROJECT AUTHORITY

2025 Brine Line Sewer System Management Plan Update

PA 24 Committee
Item No. 6.A
Daniel Vasquez
Manager of Operations
April 1, 2025

Recommendation

That the Project Agreement 24 Committee certifies the 2025 Brine Line Sewer System Management Plan (SSMP) for submission to the State Water Resources Control Board according to Waste Discharge Requirements (WDR) 2022-0103-DWQ.

Sewer System Management Plan

- SSMP is required for publicly owned collection systems comprised of more than 1 mile of pipe or sewer line that convey untreated wastewater to a publicly owned treatment facility.

- State Water Resources Control Board recently adopted new Waste Discharge Requirements (WDR) General Order 2022-0103-DWQ which outlines new requirements.

SSMP Overview

- Spill Emergency Response Plan was last updated in January 2025.
- **SSMP Update is Due May 2, 2025**

	SSMP REQUIRED ELEMENTS
1	Sewer System Management Plan Goal and Introduction
2	Organization
3	Legal Authority
4	Operation and Maintenance Program
5	Design and Performance Provisions
6	Spill Emergency Response Plan
7	Sewer Pipe Blockage Control Program
8	System Evaluation, Capacity Assurance and Capital Improvements
9	Monitoring, Measurement and Program Modifications
10	Internal Audits
11	Communication Program

Summary of New Requirements (1 of 2)

SSMP Element	Summary of 2022 WDR Changes
Goal and Introduction	• Implementation of SSMP as “Living Document” • Updated Sewer Map • Narrative for regulatory context
Organization	• Contact information of responsible staff for SSMP elements
Legal Authority	• Collaboration with storm drain agencies
O/M Program	• Enhanced training, SERP mockups
Design and Performance Provisions	• Non-Substantive
Sewer Pipe Blockage Control program	• Justification for FOG Program management

Summary of New Requirements (2 of 2)

SSMP Element	Summary of 2022 WDR Changes
Spill Emergency Response Plan	• Spill Categories • Storm drain agencies collaboration • Annual Certification
System Evaluation, Capacity Assurance, and Capital Improvements	• Implementation of Capital Improvements • Capacity Assessments
Monitoring, measurement, and Program Modifications	• Change Log • Key Performance Indicators
Internal Audits	• Internal Audits every 3 years, Update every 6
Communication program	• Enhanced communication procedures

SSMP Updates

- Restructured Legal Authority element to reflect the governance of PA 24 over the Brine Line.
- Developed new training to meet new WDR requirements such as spill-mockup training, contractor SERP training, and data entry to State Website.
- Integration of Brine Line Master Plan into System Evaluation, Capacity Assurance, and Capital Improvements SSMP Element.
- Development of Key Performance Indicators (KPI’s) for each SSMP Element to measure effectiveness and implementation of all SSMP requirements.

Recommendation

That the Project Agreement 24 Committee certifies the 2025 Brine Line Sewer System Management Plan (SSMP) for submission to the State Water Resources Control Board according to Waste Discharge Requirements (WDR) 2022-0103-DWQ.

Questions?

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PA 24 COMMITTEE MEMORANDUM NO. 2025.10

DATE: April 1, 2025

TO: Project Agreement 24 Committee
(Inland Empire Brine Line)

SUBJECT: Inland Empire Brine Line Reach IV-D Condition Assessment Final Report

PREPARED BY: David Ruhl, Executive Manager of Engineering and Operations

RECOMMENDATION
Receive and file.

DISCUSSION
In September 2023, the PA 24 Committee authorized Woodard and Curran (W&C) to perform a condition assessment on Reach IV-D as recommended in the 2018 Reach IV-D Rehabilitation Work Plan and the 2019 update.

The condition assessment field investigation work was conducted over 30 hours beginning on February 27, 2024. To conduct the condition assessment a shutdown of the Reach IV-D and Reach IV-E dischargers was necessary. The shutdown commenced the day prior allowing sufficient time for the line to drain. Depending on each discharger's location of the Brine Line the shutdown for each individual discharger lasted between 13 – 58 hours. Work included the cleaning and CCTV of nearly seven (7) miles of the Brine Line and man-entry at seven (7) locations to conduct visual assessments and physical tests of the unlined and lined concrete surface. The field investigation tests and inspections were analyzed to assess the condition of the pipeline. Preliminary findings and recommendations were presented to the PA 24 Committee in July 2024. A draft Report was provided to member agency staff for review in August 2024. Minor comments were received from member agency staff, and the Final Report was completed in November 2024 (attached).

A summary of the findings and recommendations from the Final Report are as follows:

Condition Assessment Findings
Overall, the pipe segments and maintenance access structures appear to be in similar condition as in 2018 and 2019. The unlined concrete surfaces below the liner termination point have moderately deteriorated, meaning the concrete has exposed aggregate. The man-entry and CCTV inspections did not positively identify any exposed rebar. The man-entry testing results indicated the lined concrete appeared to be well protected from the corrosive environment and in good condition.

Condition Assessment Recommendations
Near-Term. Complete minor PVC T-Lock liner repair work and perform additional CCTV inspections with 1 to 2 years.

Mid-Term. Reinspect Reach IV-D in 5 to 10 years.

Long-Term. Based on the observed concrete deterioration that has occurred at the interface of the concrete and T-Lock liner along the pipeline, it is recommended that SAWPA plan on a phased approach to rehabilitation of Reach IV-D. The segments with the highest degree of

deterioration based on the CCTV and man-entry condition assessments would be addressed in "Phase 1" with a timeline of 10 to 15 years (2034 to 2039). The remainder of the alignment would be addressed in "Phase 2" with a timeline 20+ years. Cured-in-Place Pipe (CIPP) lining is the recommended rehabilitation method.

A summary of the recommendations described above are provided in the following table.

Summary of Condition Assessment Recommendations

Project	Anticipated Schedule	Project Recommendation	Order of Magnitude Cost
Near-Term	2 years	Man-entry inspections at two key locations, Clean and CCTV 1 pipe segment	$90,000
Mid-Term	5 – 10 years	Clean and CCTV 7 miles of pipeline. Man-entry inspection at 7 locations. Refine useful life estimate	$900,000
Long-Term Phase 1	10 – 15 years	Rehabilitate 23,000 feet of Brine Line	$28 Million (+/-) Subject to reevaluation
Long-Term Phase 2	20+ years	Rehabilitate 12,000 feet of Brine Line	$15 Million (+/-) Subject to reevaluation

Next Steps

- Include the recommended Projects and schedule in the Brine Line CIP.
- Continue to coordinate with the City of Chino on the proposed Euclid Bridge Project. A portion of the pipeline included in the Long-Term Phase 1 Project may be impacted by the Euclid Bridge Project. If a relocation of the Brine Line is necessary due to impacts from the Euclid Bridge Project, the scope of the Long-term Phase 1 project would be reduced by about 25% and a portion of the costs may be reimbursable by the City of Chino.

Reach IV-D Pipeline Background

The Brine Line Reach IV-D was constructed in the early 1990's and runs from the intersection with Reach IV-A in the City of Chino approximately 21 miles East, to the intersection with Reach IV-E in the City of Rialto. A portion (seven (7) miles) of Reach IV-D consists of T-lock lined 42-inch reinforced concrete pipe (RCP). The T-lock lining is a polyvinyl chloride (PVC) lining on the interior circumference of the pipe that provides a protective corrosion barrier between the flow and concrete pipe. The T-lock lining on this portion of the Brine Line was installed on the upper 270 degrees of the pipeline leaving the invert or bottom 90 degrees of the pipe unlined. Low flows during the initial years of operation placed the flow line below the termination of the T-lock liner and exposed the concrete to corrosion and uplifting of the T-lock liner.

In 2018, the SAWPA Commission authorized Woodard & Curran to conduct a condition assessment on Reach IV-D. The report recommendations included conducting additional field investigation in five (5) years to characterize the rate of deterioration and further refine the remaining useful life of the pipe (mid-term recommendation).

RESOURCE IMPACTS
Funds to cover the field investigations and the Final Report are included in the Fiscal Year 2024-25 Budget Fund No. 327 and Fund 240 (Brine Line Enterprise).

Attachments:
1. PowerPoint Presentation
2. Data Analysis and Summary Report for Brine Line Reach IV-D Rehabilitation Work Plan Mid-Term Recommended Inspection Final Report

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SANTA ANA WATERSHED PROJECT AUTHORITY

Inland Empire Brine Line
Reach IV-D Condition Assessment

PA 24 Committee
Item No. 6.B
David Ruhl
Executive Manager of Engineering and Operations
April 1, 2025

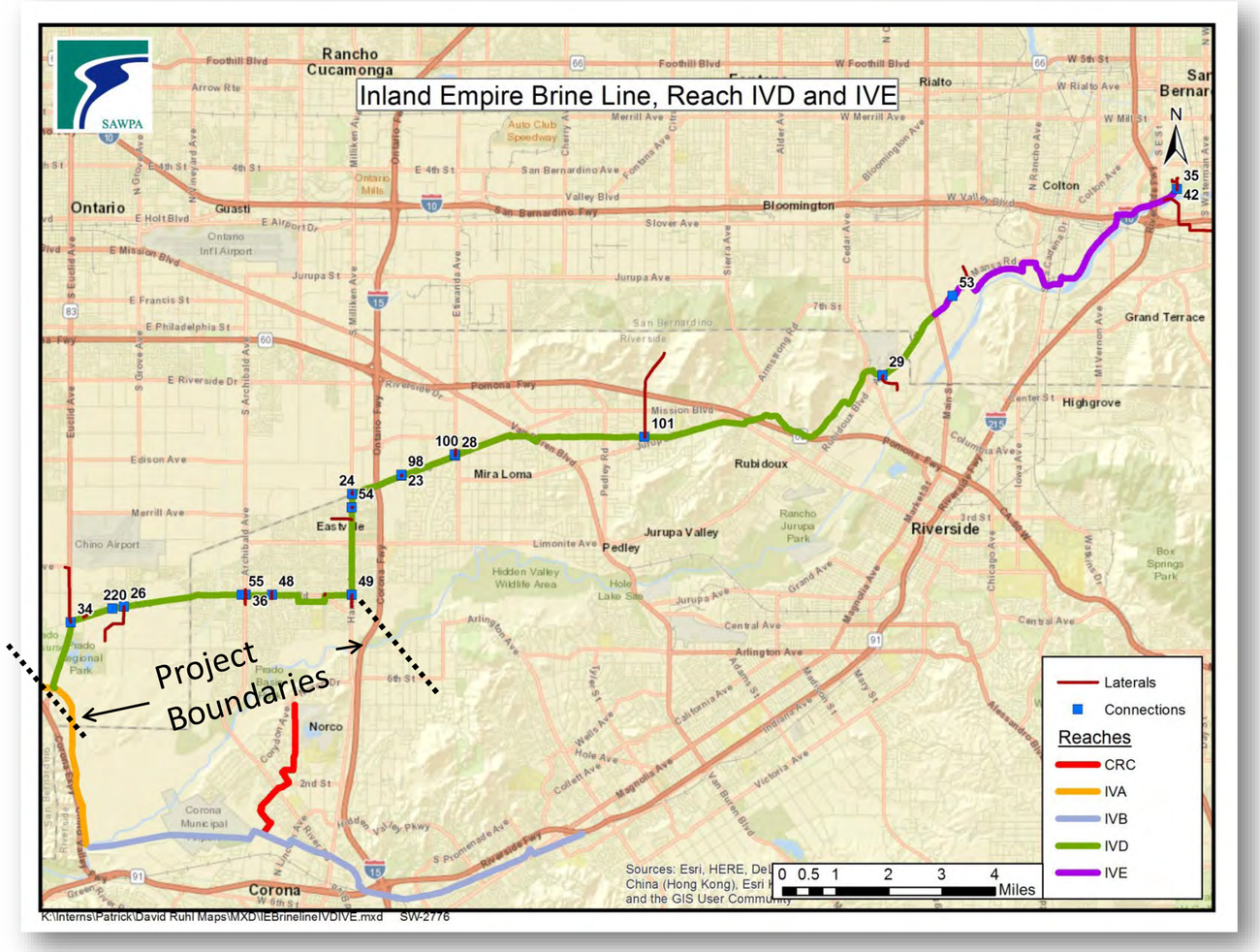
Brine Line Reach IV-D Pipeline Corrosion

Reach IV - D

- 21 Miles
- Built in mid 1990s
- Pipe size 36” – 48”
- Ave. Flow 5.5 MGD

Project Boundaries

- 7 Miles
- 42” RCP with 270 degree T-Lock
- Within Cities of Chino and Eastvale



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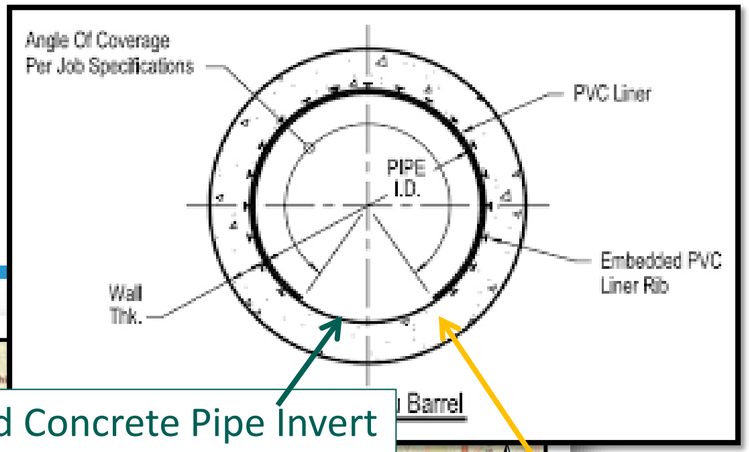

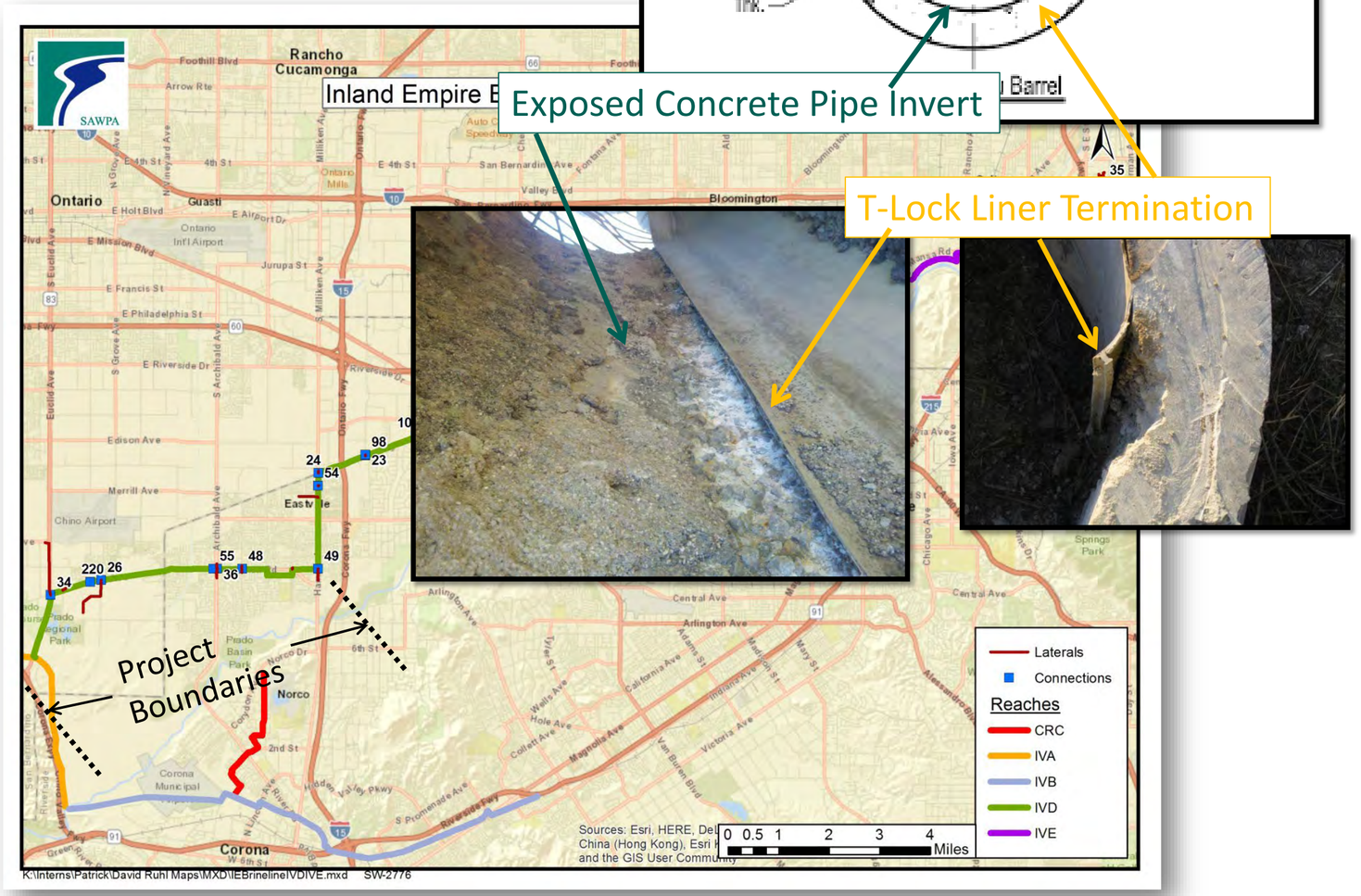

Field Investigation

- Dischargers shutdown beginning on February 26th
- Condition assessment 30 hours beginning on February 27th
- Line cleaning and CCTV
- Manned entry at 7 locations to conduct visual assessment and physical tests
- Preliminary finding and recommendations presented to PA – 24 in July 2024

Findings and Final Report

- Pipe segments and MAS appear to be in a similar condition as in 2018 and 2019.
- Unlined concrete surfaces below the liner termination point have moderately deteriorated, meaning the concrete has exposed aggregate.
- Testing results indicate the lined concrete appear to be well protected from the corrosive environment and in good condition.
- Draft Report provided to Member Agency staff for review in August 2024.
- Final Report completed in November 2024

Figure 1: Behind the liner testing

Figure 2: Unlined concrete testing

Project Recommendations

Project	Anticipated Schedule	Project Recommendation	Order of Magnitude Cost
Near-Term	2 years	Man-entry inspections at two key locations, Clean and CCTV 1 pipe segment	$90,000
Mid-Term	5 – 10 years	Clean and CCTV 7 miles of pipeline. Man-entry inspection at 7 locations. Refine useful life estimate.	$900,000
Long-Term Phase 1	10 – 15 years	Rehabilitate 23,000 feet of Brine Line	$28 Million (+/-) Subject to reevaluation
Long-Term Phase 2	20+ years	Rehabilitate 12,000 feet of Brine Line	$15 Million (+/-) Subject to reevaluation

Next Steps

- Include the recommended Projects in the Brine Line CIP.
- Continue to coordinate with City of Chino on potential impacts to this portion of Reach IV-D due to the proposed City of Chino Euclid Bridge Project.

Recommendation

Receive and file the Data Analysis and Summary Report for Brine Line Reach IV-D Rehabilitation Work Plan Mid-Term Recommended Inspection Final Report.

Questions?

Thank You

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Data Analysis and Summary Report
for
Brine Line Reach IV-D
Rehabilitation Work Plan
Mid-Term Recommended Inspections

FINAL REPORT

Prepared by:
Justin Kraetsch, P.E.
Gina Habil

Woodard & Curran

W&C Project No. 0012565.00

November 2024

1. PURPOSE AND TABLE OF CONTENTS

The purpose of this Data Analysis and Summary Report (Report) is to provide the Santa Ana Watershed Project Authority (SAWPA) with a summary of condition assessment findings, observed rate of concrete deterioration, and estimated useful remaining life for the Brine Line Reach 4D, Contract 1 and 2 alignment. This Report also includes recommended actions for near-term, mid-term, and long-term to monitor the condition of Reach 4D of the brine line and provide repairs as necessary in the future. This condition assessment was recommended as part of the mid-term recommendations described in the *Final Reach 4D Rehabilitation Work Plan* prepared by Woodard & Curran, dated November 13, 2018.

This Report is organized as follows:

2. PROJECT BACKGROUND

SAWPA was formed in 1972 as a Joint Powers Authority comprised of five-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 and operates the 72-mile long Inland Empire Brine Line (Brine Line) in Riverside and San Bernardino Counties which serves as critical infrastructure for protecting the inland water quality in the Santa Ana River Watershed. The Brine Line was constructed to receive high salinity discharges from customers within the Santa Ana River Watershed that are not permitted to discharge waste to their local sanitary sewer system. The Brine Line transports this high salinity wastewater to a treatment plant operated by the Orange County Sanitation District.

The Brine Line Reach 4D was constructed between 1990 and 1995 and runs approximately 21 miles from its connection in the City of Chino easterly to the City of Rialto, where it connects to Reach 4E. It primarily collects high salinity discharges from customers within the City of Chino and City of Jurupa Valley. The design and construction of Reach 4D was split up into six separate contracts.

The Brine Line Reach 4D, Contract 1 and 2 alignment is approximately seven miles long and extends from the western point at Pomona Rincon Road in the City of Chino and ends at the intersection of Hamner Avenue and Riverboat Drive within the City of Eastvale at its eastern point (**Figure 1**). The seven-mile alignment consists entirely of 42-inch reinforced concrete pipe (RCP) with T-Lock lining for 270 degrees around the inside diameter of the pipe, leaving the lower 90-degrees unlined. **Table 1** includes a summary of the pipe segments, identified by upstream and downstream maintenance access structures (MAS).

In March 2018, SAWPA contracted Woodard and Curran to perform a condition assessment and estimate the remaining useful life of the Brine Line Reach 4D, Contract 1 and 2 alignment. Woodard & Curran's condition assessment findings and remaining useful life estimate were summarized in the *Final Reach 4D Rehabilitation Work Plan*, dated November 13, 2018 (**Appendix C**). This Work Plan also included recommended inspection and rehabilitation work to be completed in the near-term (within one year of Work Plan), mid-term (within five years of Work Plan), and long-term (within 10 to 20 years of Work Plan) to increase the lifespan of the Brine Line Reach 4D, Contract 1 and 2 alignment.

In May 2019, SAWPA contracted Woodard and Curran to complete the near-term recommendations from the *Final Reach 4D Rehabilitation Work Plan*. This near-term recommended work included inspecting MAS 4D-0060 and 4D-00360 with man-entry physical testing and re-inspecting the pipe segment between MAS 4D-0240 and 4D-0250 with CCTV after sufficient cleaning was performed to expose the unlined concrete. The results of these inspections, including an updated useful remaining life estimate and recommended near-term, mid-term, and long-term work, are documented in the *Reach IV-D Near-Term Recommended Inspections Data Analysis and Summary Report*, dated July 23, 2019 (**Appendix D**).

Based on the condition assessment findings included in the *Final Reach 4D Rehabilitation Work Plan* and the *Reach IV-D Near-Term Recommended Inspections Data Analysis and Summary Report*, in 2019 Woodard & Curran recommended re-inspection of the entire alignment in five years because it would allow SAWPA to characterize the rate of deterioration by comparing the new data with the existing data collected in May 2018 and May of 2019. The original estimated predicated remaining useful life of 10 to 20 years could then be further refined based on the data comparison. Additionally, it was thought that recommending CCTV inspection of the entire alignment would help assess areas of potential concern that could not be inspected via man-entry, such as the pipe segments with rotated T-Lock lining.

Figure 1: Aerial Map of Reach 4D Contract 1 and 2 Alignment

Table 1: Summary of Pipe Segments and MAS in Reach 4D Contract 1 and 2 Alignment

Upstream MAS	Downstream MAS	Approximate Length (ft)[1]	Approximate Slope (ft/ft) [1]
4D-0020	4D-0010	239	0.0010
4D-0030	4D-0020	1,564	0.0010
4D-0060	4D-0030	621	N/A – Siphon
4D-0070	4D-0060	797	0.0056
4D-0080	4D-0070	943	0.0068
4D-0090	4D-0080	1,214	0.0076
4D-0100	4D-0090	450	0.0076
4D-0110	4D-0100	455	0.0010
4D-0118	4D-0110	570	0.0010
4D-0120	4D-0118	43	0.0010
4D-0130	4D-0120	99	0.0024
4D-0140	4D-0130	670	0.0010
4D-0150	4D-0140	609	0.0010
4D-0160	4D-0150	253	0.0600
4D-0170	4D-0160	1,200	0.0024
4D-0180	4D-0170	813	0.0024
4D-0190	4D-0180	451	0.0024
4D-0200	4D-0190	43	N/A – Siphon
4D-0210	4D-0200	303	0.0010
4D-0220	4D-0210	1,080	0.0064
4D-0230	4D-0220	776	0.0068
4D-0240	4D-0230	781	0.0068
4D-0250	4D-0240	1,021	0.0068
4D-0260	4D-0250	1,020	0.0010
4D-0270	4D-0260	1,020	0.0010
4D-0280	4D-0270	1,074	0.0010
4D-0290	4D-0280	1,001	0.0010
4D-0300	4D-0290	205	0.0010
4D-0305[2]	4D-0300[2]	379	0.0008
4D-0310[2]	4D-0305[2]	517	0.0011
4D-0320	4D-0310	499	0.0010
4D-0330	4D-0320	1,001	0.0010
4D-0340	4D-0330	75	N/A – Siphon
4D-0350	4D-0340	244	N/A – Siphon
4D-0360	4D-0350	82	N/A – Siphon
4D-0370	4D-0360	1,110	0.0010
4D-0380	4D-0370	1,401	0.0010
4D-0390	4D-0380	1,189	0.0010
4D-0400	4D-0390	1,429	0.0010
4D-0410	4D-0400	1,272	0.0010
4D-0420	4D-0410	1,329	0.0010

Upstream MAS	Downstream MAS	Approximate Length (ft)[1]	Approximate Slope (ft/ft) [1]
4D-0430	4D-0420	648	0.0010
4D-0440	4D-0430	1,314	0.0010
4D-0450	4D-0440	1,317	0.0010
4D-0460	4D-0450	648	0.0043
4D-0470	4D-0460	1,322	0.0036
4D-0480	4D-0470	1,283	0.0036

(1) From Santa Ana Regional Interceptor Reach IV-D Contract No. 1 Record Drawings (Willdan Associates, February 1990), Santa Ana Regional Interceptor Reach IV-D Contract No. 2 Record Drawings (Willdan Associates, (July 1990), and Relocation of Existing SAWPA Santa Ana Regional Interceptor (SARI) Reach IV-D / Schleisman Road & Hellman Avenue Record Drawings (TMAD, Taylor, & Gaines, September 2011).

(2) Replacement segments installed in 2011 with 360-degree PVC lined RCP, per Relocation of Existing SAWPA Santa Ana Regional Interceptor (SARI) Reach IV-D / Schleisman Road & Hellman Avenue Record Drawings (TMAD, Taylor, & Gaines, September 2011).

2.1 Mid-Term Recommended Inspections

As previously noted, Woodard & Curran's 2018 *Final Reach 4D Rehabilitation Work Plan* and 2019 *Reach IV-D Near-Term Recommended Inspections Data Analysis and Summary Report* recommended re-inspection of the entire alignment in five years. This would allow for the comparison of new data against the existing data collected in 2018 and 2019 to characterize the rate of concrete deterioration and refine the estimated remaining useful life for the alignment.

Recommended re-inspection of the entire alignment included:

- System shutdown to lower flows enough so that the unlined concrete is exposed.
- Cleaning as much of the alignment between MAS 4D-0010 and 4D-0480 as possible within the shutdown period to remove the existing slime layer prior to inspection.
- Perform CCTV inspection of the cleaned segments within the shutdown period, excluding the grit trap segments, the siphons, and the segments already T-Lock lined for 360 degrees. The segments that weren't cleaned would not be inspected.
- Perform man-entry physical testing at the same five locations as completed in May 2018 as well as the two siphon inlet structures inspected as part of the near-term work completed in May of 2019. The seven locations include: MAS 4D-0020, 4D-0060 (siphon inlet), 4D-0118, 4D-0150, 4D-0360 (siphon inlet), 4D-0470, and 4D-0480.

2.2 Flow Conditions

The T-Lock Liner terminates approximately 6.1 inches above the pipe invert on non-rotated pipe segments (see Section 5.1 for discussion of rotated pipe segments). A flow rate of approximately 1.0 MGD within Reach IV-D corresponds to an approximate water depth of 6.1 inches for the segments of 42-inch brine line with a slope of 0.0010 foot per foot (ft/ft), which is the lowest slope in the original Contract 1 and 2 alignment installed from 1990 to 1995. Approximately 59-percent of the alignment was installed at a 0.0010

ft/ft slope, including the 1,054 feet of RCP removed and replaced in 2011. Therefore, the pipeline would have had to experience flows less than approximately 1.0 MGD to expose the liner/concrete interface.

The flow rate in the brine line varies throughout the day. If the daily low flow drops below approximately 1.0 MGD, then the unlined concrete would be exposed. During times of exposure, it is possible that the sulfuric acid that is created as part of the biogenic corrosion process and present in small liquid droplets on the surface of the T-lock liner will flow along the surface of the T-lock liner onto the exposed concrete. If the exposure duration is very short, then the damage is minimal since the sulfuric acid is neutralized as the water surface rises. If the exposure is many hours long, the sulfuric acid will build and react with the exposed concrete before the water surface rises.

The current average and peak dry weather flow in the Reach 4D Contract 1 and 2 alignment is approximately 6.40 MGD and 7.10 MGD respectively. The hydraulic conditions of the pipeline at the current average and peak dry weather flow are summarized in **Table 2** and **Table 3**, respectively.

Table 2: Summary of Conditions at Current Average Dry Weather Flow of 6.40 MGD

	Slope = 0.0010	**0.0020 < Slope < 0.0040**	**0.0040 < Slope < 0.0060**	**0.0060 < Slope < 0.0080**	**Slope = 0.0600**
Water Depth (inches)	15.4	11.0 – 12.2	9.87 – 10.55	9.14 – 9.54	5.52
Percent Full (%)	36.6	26.3 – 29.1	23.5 – 25.1	21.8 – 22.7	13.1
Velocity (ft/s)	3.10	4.25 – 4.91	5.23 – 5.75	6.03 – 6.40	13.3
Percent of Entire Alignment [(1)(2)] (%)	58.5	14.2	3.97	17.2	0.7

(1) Entire Reach 4D Contract 1 and 2 alignment.
(2) The siphons and new pipe segments installed in 2011 with 360-degree PVC T-Lock lined RCP were not included in any of the slope categories. These segments account for approximately 5.4-percent of the entire alignment.

Table 3: Summary of Conditions at Current Peak Dry Weather Flow of 7.10 MGD

	Slope = 0.0010	**0.0020 < Slope < 0.0040**	**0.0040 < Slope < 0.0060**	**0.0060 < Slope < 0.0080**	**Slope = 0.0600**
Water Depth (inches)	16.3	11.6 – 12.9	10.4 – 11.1	9.63 – 10.1	5.80
Percent Full (%)	38.7	27.7 – 30.7	24.8 – 26.5	22.9 – 23.9	13.8
Velocity (ft/s)	3.19	4.38 – 5.06	5.39 – 5.92	6.21 – 6.60	13.7
Percent of Entire Alignment [(1)(2)] (%)	58.5	14.2	3.97	17.2	0.7

(1) Entire Reach 4D Contract 1 and 2 alignment.
(2) The siphons and new pipe segments installed in 2011 with 360-degree PVC T-Lock lined RCP were not included in any of the slope categories. These segments account for approximately 5.4-percent of the entire alignment.

The approximately 252-foot-long pipe segment between MAS 4D-0150 and 4D-0160 was installed at a slope of 0.0600 ft/ft. As shown in **Table 2** and **Table 3**, the water depth in this segment is less than 6.1 inches during current average and peak dry weather flows. Therefore, unlined concrete below the liner termination is exposed to the corrosive gases above the water surface. The water depth in the remainder of the Reach 4D Contract 1 and 2 alignment should be above the concrete/liner interface during current average and peak dry weather flows (excluding the siphons).

3. PROJECT OBJECTIVES AND BENEFITS

The main objectives of the Mid-Term Recommended Inspections were to obtain new condition assessment data for the alignment, characterize the rate of concrete deterioration by comparing the new data with the existing data collected in May 2018 and May of 2019, refine the estimated predicated remaining useful life based on the data comparison, and recommend near-term, mid-term, and long-term assessment and rehabilitation as necessary.

4. FIELD INVESTIGATION SUMMARY

Field investigation work was executed over a single 30-hour shutdown period that was coordinated by SAWPA and performed by SAWPA and its member agencies. The shutdown period began on Tuesday, February 27th, 2024 and ended on Wednesday, February 28th, 2024. The field investigation work discussed in this section includes:

1. Man-entry physical inspections at seven MAS
2. Cleaning and closed-circuit television (CCTV) inspections

4.1 Man-Entry Inspections

Woodard and Curran's subconsultant, V&A Consulting Engineers (V&A), conducted confined-space, manned-entry physical inspections of the pipeline from the following seven MAS: 4D-0020, 4D-0060, 4D-0118, 4D-0150, 4D-0360, 4D-0470, and 4D-0480. The pipeline was accessed within five feet from the MAS for inspections and condition assessment testing of both the concrete/liner interface and the concrete behind the T-Lock liner near the crown of the pipe and below the spring line of the pipe. Inspections were also conducted on the MAS concrete itself. A summary of the condition assessment tests performed on the MAS and pipeline is provided in **Table 4**. Refer to **Appendix A** for a detailed description of these test methods.

Table 4: Summary of Man-Entry Physical Inspection Tests

Man-Entry Tests	Location(s) Performed in Pipe	Location(s) Performed in MAS
Tactile Testing	At the concrete/liner interface.	None.
Visual Assessment	• At the concrete/liner interface. • Behind the liner near the crown and below the spring line.	• Rim • Cone • Walls • Bench • Main pipe connection • Lateral penetrations • Channel

Man-Entry Tests	Location(s) Performed in Pipe	Location(s) Performed in MAS
Concrete Sounding	• At the concrete/liner interface, if above water level. • Behind the liner near the crown and below the spring line.	Unlined concrete channel, if above water level.
Concrete Penetration Testing	• At the concrete/liner interface, if above water level. • Behind the liner near the crown and below the spring line.	This test was not performed inside the maintenance access structures.
Concrete Surface pH Testing	Behind the liner near the crown and below the spring line.	This test was not performed inside the maintenance access structures.
Surface Penetrating Radar	Behind the liner near the crown and below the spring line.	This test was not performed inside the maintenance access structures.

The condition of the concrete was rated according to the VANDA Concrete Condition Index (**Table 5**). Condition of corrosion can vary from Level 1 (best) to Level 5 (worst) based upon visual observations and field measurements from the man-entry physical inspections and testing. V&A updated their proprietary VANDA rating system from a 4-point system to a 5-point system in 2020.

Table 5: Summary of VANDA Concrete Condition Index Rating System. Courtesy of V&A.

Condition Rating	Description	Representative Photograph
Level 1	**Little or no damage to concrete** • Hardness: Hard surface • Surface Profile: smooth, apparently intact • Cracks: Hairline width, minimal frequency • Spalling: None • Reinforcement: Not exposed or damaged	
Level 2	**Minor surface damage** • Hardness: Soft surface layer to 1/8-inch depth • Surface Profile: Fine aggregate exposed • Cracks: Hairline width, moderate frequency • Spalling: Shalow spalling, minimal frequency • Reinforcement: Not exposed or damaged	
Level 3	**Moderate surface damage** • Hardness: Soft surface layer to 1-4-inch depth • Surface Profile: Large aggregate exposed or protruding • Cracks: 1/8- to ¼-inch width, moderate frequency • Spalling: Shallow spalling, minimal frequency • Reinforcement: Exposed, minor damage, minimal frequency	
Level 4	**Loss of concrete mortar and damage to reinforcement** • Hardness: Soft paste beyond ¼-inch depth • Surface Profile: Large aggregate exposed, loose, or missing • Cracks: 1/8- to ¼-inch width, moderate frequency • Spalling: Deep spalling, moderate frequency • Reinforcement: Exposed with damage, moderate frequency	
Level 5	**Bulk loss of concrete and reinforcement** • Hardness: Soft paste beyond 1-inch depth • Surface Profile: Large aggregate exposed, loose, or missing • Cracks: Over ½-inch width, or narrower and frequent • Spalling: Deep spalling, high frequency • Reinforcement: Consumed, loss of structural integrity	
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See **Appendix A** for further information on the man-entry inspections, the VANDA rating system, and individualized results of the condition assessment tests.

4.2 CCTV Inspections

CCTV inspections were performed to visually examine the interior pipe surfaces for defect identification, particularly along the concrete/liner interface. The pipeline was cleaned before CCTV inspection to maximize exposure of the concrete/liner interface, which is typically covered in a heavy slime layer. The cleaning and inspection work was performed by SAWPA's CCTV contractors, Houston and Harris, Innerline, and Performance Pipe, on February 27th and February 28th, 2024.

The Field Investigation Plan purposely excluded cleaning and CCTV for the following segments:

- The siphons listed in Table 1;
- The 360-degree PVC lined RCP segments located between MAS 4D-0300 and 4D-0310;
- The grit trap located approximately 180 feet upstream of MAS 4D-0060 on Euclid Avenue;
- The grit trap located approximately 850 feet upstream of MAS 4D-0370 on Schleisman Road; and
- Approximately 4,014 of total pipe length located in the City of Eastvale due to permit work hour restrictions.

Approximately 14,459 feet of alignment was inspected using CCTV out of a total possible length of approximately 35,203 feet (41%). However, the interface of the concrete and T-lock liner was visible for approximately 10,823 total feet of pipe (31%), due to a heavy slime layer covering the walls up to the 4 o'clock and 8 o'clock positions of the pipe and/or high water level. Cleaning was not able to be performed for the entire alignment prior to CCTV due to time restrictions associated with the shutdown. Pre-cleaning could not be performed prior to the shutdown due to longer than expected city review times and city permit processing times.

See **Appendix B** for a detailed summary of CCTV inspections, organized by upstream and downstream MAS.

4.3 Field Investigation Lessons Learned

The following is a brief discussion of lessons learned during the 2024 CCTV and man-entry inspections of Reach IV-D of the brine line:

- Utilizing a jetter nozzle that performs best in removing the heavy slime layer/scaling on the bottom half of the pipe walls is critical for improving productivity and correctly characterizing the condition of the existing pipeline. During the February 2024 field investigations, SAWPA found that using a combination of dweller nozzles and warthog nozzles worked best. The warthog nozzle worked well at removing the slime/scaling from the pipe walls, while the bottom dweller nozzle worked well at transporting the detached debris to the downstream manhole so that it could be vacuumed out for disposal.
- Performing cleaning activities in live flow prior to the shutdown period would provide more time for CCTV inspections during the shutdown period. SAWPA could not perform cleaning activities prior to the February 27-28 shutdown period because the cities of Chino and Eastvale took significantly longer than expected to review and approve the encroachment permit applications. Woodard & Curran recommends submitting the encroachment permit applications at least six months prior to the shutdown period so that SAWPA crews have ample time to perform cleaning in live flow prior to the next shutdown.
- Innerline Engineering's cleaning and CCTV inspection crews arrived 2 to 3 hours after the shutdown period began on February 27. This caused delays from the onset and resulted in certain segments not being cleaned and inspected. During the next CCTV inspection, ensure that the CCTV contractor will arrive on site either immediately before or at the onset of the shutdown period.
- A minimum of two 24-hour shutdown periods or a single 48-hour shutdown period would likely be required in order to clean and inspect the entire alignment, excluding the siphons.

5. CONDITION ASSESSMENT SUMMARY

This Section includes a summary of the condition of the brine line based on the results of the 2024 man-entry inspections and CCTV inspections. Refer to **Appendix A** for the man-entry condition assessment report. Refer to **Appendix B** for a detailed summary of CCTV inspections.

5.1 Pipelines

5.1.1 Visual Assessment

5.1.1.1 Man-Entry

Data collected from visual assessment of the pipeline from the seven manned entry inspections locations indicated that the most common defects in the inspected pipe segments included liner blisters, undermined and unembedded liner terminations, and exposed aggregate. A summary of the visual assessment from the seven man-entry inspections is provided in **Table 6.** Key comments from the 2018 and 2019 man-entry inspections are included in this table for comparison.

Blisters: Blisters in T-Lock liners commonly occur over time and do not compromise the surface life of the RCP if the blisters are not punctured, which would expose the concrete surface behind the liner to corrosive constituents. None of the observed blisters in the manned entry inspections or CCTV inspections were ruptured.

Undermined and Unembedded Liner Terminations: The liner termination was deemed to be undermined if the concrete below the liner termination had eroded, the lowermost PVC tee along the liner termination point was still embedded in the concrete. Uplifted liner terminations refers to a condition when the lowermost PVC tee has become unembedded, resulting in uplifting of the liner termination point. This condition increases the chance of corrosive gases reacting with the concrete behind the liner when the water surface is below the interface of the concrete and liner. Uplifted liner terminations were observed at MAS 4D-0060, 4D-0150, 4D-0360, and 4D-0470.

Exposed Aggregate: Exposed aggregate was observed at MAS 4D-0060, 4D-0118, 4D-0150, 4D-0360, and 4D-0470. In general, the exposed aggregate can be characterized as large aggregate partially or fully protruding. The locations with exposed aggregate match the locations from the 2018/2019 investigations, as shown in **Table 6**. Therefore, no new aggregate exposure was identified. MAS 4D-0360 and 4D-0470 appeared to have the most significant aggregate exposure, but they have not noticeably degraded over the past five years when compared to the findings from the 2018/2019 investigation.

Table 6: Visual Assessment Summary of Pipe Segments from V&A's Man-Entry Inspections

MAS	Liner					Concrete		General	
	Blisters / Bulges	Failed Weld Strips	Termination Undermined	Termination Uplifted	Tears / Openings	Exposed Aggregate	Exposed Rebar	Slime Layer	Debris
4D-0020 (2018)	X	X	X					X	
4D-0020 (2024)	X		X					X	

MAS	Liner					Concrete		General	
	Blisters / Bulges	Failed Weld Strips	Termination Undermined	Termination Uplifted	Tears / Openings	Exposed Aggregate	Exposed Rebar	Slime Layer	Debris
4D-0060 (2019)	X		X	X	X	X			
4D-0060 (2024)	X	X	X	X	X	X		X	
4D-0118 (2018)	X	X	X			X		X	X
4D-0118 (2024)	X	X	X			X			
4D-0150 (2018)	X		X	X		X		X	X
4D-0150 (2024)	X		X	X		X		X	
4D-0360 (2019)	X		X	X		X			
4D-0360 (2024)	X		X	X		X		X	
4D-0470 (2018)	X		X	X		X	X(1)	X	
4D-0470 (2024)	X		X	X		X	X(1)	X	X
4D-0480 (2018)								X	
4D-0480 (2024)								X	X

(1) Taken directly from the 2018 and 2024 V&A Condition Assessment Report. After further scrutiny, Woodard and Curran does not believe that exposed rebar is present at this location.

5.1.1.2 CCTV Inspection

The February 2024 inspections resulted in significantly more quality CCTV inspection footage compared to 2018 because of the extensive pre-inspection pipe cleaning that was performed. Overall, the pipe segments appeared to be in similar condition as in 2018 and 2019. The unlined concrete surfaces below the liner termination point have moderately deteriorated resulting in exposed aggregate. Longitudinal grooves have formed under the liner termination due to aggregate loss for approximately 50% of the total inspected length. These grooves under the liner will eventually result in uplifting of the liner termination (see **Figure 2**). No exposed rebar was positively identified in the CCTV inspections.

The T-Lock liner appeared to be rotated between individual pipe sticks throughout all of the inspected segments. The rotation varies from approximately one-inch to six-inches, measured from the liner termination at the pipe joints along each side of the pipe (**Figure 3**). The primary issue associated with these rotated segments is liner rotation increases the liner termination height above the pipe invert on one side of the pipe, thereby increasing the likelihood of the water surface dropping below the liner. As a result, the observed concrete corrosion below the liner was not consistent on both sides of the pipe along the segments with rotated sticks.

Figure 2 though **Figure 5** are snapshots of the CCTV inspection footage showing defects in the pipeline. Refer to **Appendix B** for the detailed summary of CCTV inspections, organized by upstream and downstream MAS.

Figure 2: Liner Termination Uplift and Longitudinal Groove from Aggregate Loss Under Liner Between MAS 4D-0260 and 4D-0270

Figure 3: Rotated T-Lock Liner and Liner Detachment at Pipe Joint Between MAS 4D-0090 and 4D-0080

Figure 4: Minor Concrete Loss and Visible Aggregate Below Liner Termination Between MAS 4D-0450 and 4D-0460

Figure 5: Exposed Aggregate and Liner Termination Uplift Between MAS 4D-0360 and 4D-0370

5.1.2 Physical Testing

As discussed in **Section 4.1** and **Appendix A**, during man-entry inspections V&A performed condition assessment tests on the concrete surfaces of the pipeline behind the liner using sounding to investigate for shallow subsurface discontinuities, pH measurements to evaluate environmental corrosivity, and penetration depth measurements to evaluate surface hardness. The results of these in-situ tests are summarized in **Table 7**, along with the results from the same tests performed in 2018/2019.

With the exception of a liner tear and exposed concrete at the crown of the MAS 4D-0060 influent pipe, the test results displayed in **Table 7** indicate that the concrete behind the T-Lock liner is in good condition and currently well protected from the corrosive environment. The 2024 results are consistent with the 2018/2019 results, indicating negligible changes in the condition of the concrete behind the liner over the past five to six years. The concrete surfaces protected from lining received VANDA ratings ranging from 1 to 2. The VANDA rating of 3 at MAS 4D-0150 and 4D-0360 correspond to tests of the unlined concrete below the liner termination. Refer to **Appendix A** for further information on the manned entry condition assessment tests performed at the seven access MAS.

Table 7: Summary of In-Situ Pipeline Condition Assessment Tests Performed on Concrete Behind the T-Lock Liner. Courtesy of V&A.

MAS	Pipe	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
4D-0020 (2018)	Influent	Hard	Solid	12	1/16	1

MAS	Pipe	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
4D-0020 (2024)	Influent	Hard	Solid	12	1/16	1
4D-0020 (2024)	Influent	Hard	Solid	12	1/16	2
4D-0060 (2019)	Influent	Hard	Solid	12	1/16	N/A[3]
4D-0060 (2019)	Influent	Hard	Solid	12	1/8	N/A[3]
4D-0060[1] (2024)	Influent	Softened	Solid	9	3/16	3
4D-0060 (2024)	Influent	Hard	Solid	12	1/16	1
4D-0118 (2018)	Influent	Hard	Solid	12	<1/16	1
4D-0118 (2024)	Effluent	Hard	Solid	12	1/16	1
4D-0118 (2024)	Effluent	Hard	Solid	12	1/16	1
4D-0150 (2018)	Influent	Hard	Solid	12	<1/16	1
4D-0150 (2024)	Effluent	Hard	Solid	12	1/16	1
4D-0150 (2024)	Effluent	Hard	Solid	12	1/16	1
4D-0150[2] (2024)	Influent	Exposed Aggregate	Solid	8 (At-Depth pH)	1/16	3
4D-0360 (2018)	Influent	Hard	Solid	12	1/16	N/A[3]
4D-0360 (2018)	Influent	Hard	Solid	12	1/16	N/A[3]
4D-0360 (2024)	Effluent	Hard	Solid	12	1/16	1
4D-0360 (2024)	Effluent	Hard	Solid	12	1/16	1
4D-0360[2] (2024)	Influent	Exposed Aggregate	Solid	13 (At-Depth pH)	1/8	3
4D-0470 (2018)	Influent	Hard	Solid	11 - 12	1/16 – 1/8	2
4D-0470 (2024)	Influent	Hard	Solid	10	1/16	1
4D-0470 (2024)	Influent	Hard	Solid	10	1/16	1

MAS	Pipe	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
4D-0480 (2018)	Effluent	Hard	Solid	12	<1/16	2
4D-0480 (2024)	Effluent	Hard	Solid	11	1/16	1
4D-0480 (2024)	Effluent	Hard	Solid	11	1/16	1

1. Testing was performed at location where liner had failed and concrete was exposed.
2. Testing performed on concrete below the liner. Surface pH could not be measured due to dirty surface; therefore, pH measurements were taken at the corresponding penetration depth.
3. VANDA ratings were not provided for testing performed at MAS 4D-0060 and 4D-0360 in 2019.

5.1.3 Concrete Cover

As part of the manned entry inspections, the depth of concrete cover over the steel reinforcement in the pipeline was estimated by performing surface penetrating radar (SPR) scans for the concrete behind the T-Lock liner and by measuring the depth of concrete deterioration below the liner termination. SPR scans also provide a measurement of the pipe wall thickness and spacing of steel reinforcement. It is helpful to compare this data against the design criteria for the installed RCP if available. The design criteria for the installed RCP was not available for review, so industry standard values were used. See **Table 8** for a summary of the assumed RCP design criteria.

Table 8: Assumed Design Criteria for 42-inch RCP. Courtesy of V&A.

MAS	D-Load Design Req. (psi)(1)	Assumed Pipe Class(2)	Wall Thickness (based on Assumed Pipe Class) (in.)(2)	Assumed Min. Concrete Cover (in.)(2)	Assumed Max. Circumferential Rebar Spacing (in.)(2)
4D-0020	3,500	V	5.25	1.00	3.94
4D-0060	3,500	V			
4D-0018	2,250	IV			
4D-0150	2,800	IV			
4D-0360	2,250	IV			
4D-0470	1,700	III			
4D-0480	1,700	III			

(1) Per Santa Ana Regional Interceptor Reach IV-D, contract No. 1-3, 1990 Record Drawings (Wildan Associates).
(2) Per ASTM C76, AASHTO M170, and AWWA C302.

The SPR scan results for the seven pipe segments are summarized in **Table 9**, along with the results from the 2018 and 2019 SPR tests. Based on the steel reinforcement depth results, the depth of the concrete cover over the steel reinforcement appears to be greater than the minimum 1-inch requirement provided in **Table 8** and the RCP walls are estimated to be approximately 6-inches thick. Additionally, the average center-to-center spacing for the circumferential reinforcement appears to be less than the maximum requirement per **Table 8**.

Based on a comparison of the average reinforcement depth results between 2024 and 2018/2019, there appears to be minimal change in the depth of concrete cover over the steel reinforcement behind the PVC

T-Lock liner for these pipe segments. It should be noted that the depth and spacing measurements have an accuracy of up to a quarter-inch.

Table 9: Pipeline SPR Results Performed on Concrete Behind T-Lock Liner. Courtesy of V&A.

MAS	Pipe and Clock Position	Bar Dir.[1]	Rebar Depth Max (in)[2]	Rebar Depth Avg. (in)[2]	Rebar Depth Min. (in)[2]	Rebar Spacing Max (in)[2]	Rebar Spacing Avg. (in)[2]	Rebar Spacing Min. (in)[2]
4D-0020 (2018)	Influent 8:00 – 12:00	C	2.3	1.8	1.5	3.1	2.7	2.4
4D-0020 (2018)	Influent 8:00 – 12:00	L	2.3	1.8	1.3	11.8	4.1	1.9
4D-0020 (2024)	Effluent 3:00	C	2.5	1.8	1.1	10.8	3.0	1.6
4D-0020 (2024)	Effluent 11:00 – 4:00	L	1.6	1.5	1.2	11.4	3.7	1.9
4D-0060 (2019)	Influent 12:00 – 3:00	C	4.7	3.3	1.7	2.7	2.2	1.8
4D-0060 (2019)	Influent 9:00 – 3:00	L	3.3	2.7	2.1	7.6	7.0	6.3
4D-0060 (2024)	Influent 5:00	C	5.1	3.8	2.9	4.4	2.3	1.6
4D-0060 (2024)	Influent 12:00 – 4:00	L	2.7	2.1	1.6	24.0	8.9	4.0
4D-0118 (2018)	Influent 9:00 – 12:00	C	3.3	2.4	1.8	12.9	2.6	1.8
4D-0118 (2018)	Influent 9:00 – 12:00	L	3.3	2.3	1.6	6.3	5.4	4.5
4D-0118 (2024)	Effluent 3:00	C	2.3	2.2	2.2	*[3]	*[3]	*[3]
4D-0118 (2024)	Effluent 11:00 – 4:00	L	2.8	2.2	1.5	6.0	5.2	4.1
4D-0150 (2018)	Influent 8:00 – 12:00	C	4.58	3.09	1.69	3.85	2.30	1.50
4D-0150 (2018)	Influent 8:00 – 12:00	L	3.60	2.46	1.62	21.90	8.17	3.85
4D-0150 (2024)	Effluent 1:00, 3:00, 9:00	C	4.2	3.4	2.5	2.9	2.4	2.1
4D-0150 (2024)	Effluent 12:00 – 4:00	L	3.4	2.4	1.5	6.3	4.5	1.3
4D-0360 (2019)	Influent 12:00 – 3:00	C	4.4	3.0	1.9	3.3	2.4	2.0
4D-0360 (2019)	Influent 9:00 – 3:00	L	3.5	2.7	2.0	5.9	5.0	4.3
4D-0360 (2024)	Effluent 2:30, 3:30	C	3.8	3.5	3.2	2.4	2.2	1.8
4D-0360 (2024)	Effluent 11:00 – 3:00	L	3.3	2.5	1.7	17.4	7.8	4.1
4D-0470 (2018)	Influent 9:00 – 12:00	C	4.2	3.0	1.6	3.3	2.4	1.1

MAS	Pipe and Clock Position	Bar Dir.(1)	Rebar Depth Max (in)(2)	Rebar Depth Avg. (in)(2)	Rebar Depth Min. (in)(2)	Rebar Spacing Max (in)(2)	Rebar Spacing Avg. (in)(2)	Rebar Spacing Min. (in)(2)
4D-0470 (2018)	Influent 9:00 – 12:00	L	4.4	3.0	1.8	13.3	8.0	4.1
4D-0470 (2024)	Effluent 3:00	C	3.4	3.3	3.2	3.3	2.5	1.8
4D-0470 (2024)	Effluent 4:00 – 11:00	L	4.1	2.5	1.5	13.3	7.5	4.5
4D-0480 (2018)	Effluent 8:00 – 12:00	C	3.7	2.6	1.1	3.4	2.4	1.2
4D-0480 (2018)	Effluent 8:00 – 12:00	L	3.1	2.3	1.5	23.1	14.9	10.1
4D-0480 (2024)	Effluent 3:00	C	2.9	2.7	2.6	2.8	2.6	2.3
4D-0480 (2024)	Effluent 11:00 – 4:00	L	2.3	1.7	0.8	13.0	11.3	9.4

(1) C=Circumferential, L=Longitudinal.
(2) The depth and spacing measurements have an accuracy of up to ¼-inches.
(3) Spacing could not be calculated because only a single circumferential bar was scanned.

The depth of the concrete deterioration below the liner termination was also measured in the pipe segments at the seven access MAS. These measurements are provided in **Table 10**, along with a summary of the liner termination condition and the corresponding VANDA rating for the seven pipe segments. The measurements from the 2018 and 2019 man-entry testing are also provided in **Table 10**.

The influent pipe at MAS 4D-0060, the influent and effluent pipes at MAS 4D-0360, and the influent pipe at MAS 4D-0470 have the highest concrete deterioration ranging from one half to one and a half inches. The biggest increase in concrete deterioration from the 2018/2019 inspections occurred at the influent pipe for MAS 4D-0470, which went from approximately 1/2-inch of deterioration to approximately 1-5/16 inches of deterioration. However, several locations measured less deterioration in 2024 compared to 2018/2019. Comparing the measured deterioration depths in **Table 10** to the estimated concrete cover in **Table 9**, it is likely that at least one-inch of concrete cover remains along the liner termination at all locations.

Table 10: Condition Assessment Summary for Interface of Concrete and T-Lock Liner. Courtesy of V&A.

MAS	Pipe	Liner		Concrete	
		Termination Condition	Uplifted Liner Length (in.)(1)	Deterioration Depth (in.)	VANDA Rating
4D-0020 (2018)	Influent	Embedded, yet undermined	n/a	1/2	2
4D-0020 (2018)	Effluent	Embedded, yet undermined	n/a	1/2	2
4D-0020 (2024)	Influent	Embedded, yet undermined	n/a	1/4 - 1/2	2
4D-0020 (2024)	Effluent	Embedded, yet undermined	n/a	1/4 - 1/2	2

MAS	Pipe	Liner		Concrete	
		Termination Condition	Uplifted Liner Length (in.)[1]	Deterioration Depth (in.)	VANDA Rating
4D-0060 (2019)	Influent	Uplifted and undermined	3/4	3/4	N/A[2]
4D-0060 (2019)	Influent	Uplifted and undermined	1	3/4	N/A[2]
4D-0060 (2019)	Effluent	Uplifted and undermined	3/4	1	N/A[2]
4D-0060 (2019)	Effluent	Uplifted and undermined	3/4	1	N/A[2]
4D-0060 (2024)	Influent	Embedded, yet undermined	N/A	1 – 1 ½	3
4D-0060 (2024)	Effluent	Uplifted and undermined	2	1/4 – 1/2	2
4D-0118 (2018)	Influent	Embedded, yet undermined	N/A	3/8	2
4D-0118 (2018)	Effluent	Embedded, yet undermined	N/A	3/8	2
4D-0118 (2024)	Influent	Embedded, yet undermined	N/A	1/4 – 1/2	2
4D-0118 (2024)	Effluent	Embedded, yet undermined	N/A	1/4 – 1/2	2
4D-0150 (2018)	Influent	Uplifted and undermined	1	3/4	3
4D-0150 (2018)	Effluent	Uplifted and undermined	1	1/2	3
4D-0150 (2024)	Influent	Uplifted and undermined	1	1/2 – 3/4	3
4D-0150 (2024)	Effluent	Uplifted and undermined	1	1/4 – 1/2	3
4D-0360 (2019)	Influent	Uplifted and undermined	5	1	N/A[2]
4D-0360 (2019)	Influent	Uplifted and undermined	3.5	2	N/A[2]
4D-0360 (2019)	Effluent	Uplifted and undermined	3	2	N/A[2]
4D-0360 (2019)	Effluent	Uplifted and undermined	2	2	N/A[2]
4D-0360 (2024)	Influent	Uplifted and undermined	1 – 1 ½	1/2 – 1	3

MAS	Pipe	Liner		Concrete	
		Termination Condition	Uplifted Liner Length (in.)(1)	Deterioration Depth (in.)	VANDA Rating
4D-0360 (2024)	Effluent	Uplifted and undermined	2 – 3	1/2 – 1	3
4D-0470 (2018)	Influent	Uplifted and undermined	2	1/4 – 1/2	3
4D-0470 (2018)	Effluent	Uplifted and undermined	1	1/4 – 1/2	3
4D-0470 (2024)	Influent	Uplifted and undermined	2	1-5/16	3 – 4
4D-0470 (2024)	Effluent	Embedded and not undermined	N/A	1/2	3
4D-0480 (2018)	Influent	N/A (Vitrified Clay Pipe)	N/A	N/A	N/A
4D-0480 (2018)	Effluent	Embedded, yet undermined	N/A	0	1
4D-0480 (2024)	Influent	N/A (Vitrified Clay Pipe)	N/A	N/A	N/A
4D-0480 (2024)	Effluent	Embedded and not undermined	N/A	Negligible	1

(1) Uplifted liner length measured from lower termination of 270-degree pipe liner towards the 3:00 or 9:00 position.
(2) VANDA ratings were not provided for testing performed at MAS 4D-0060 and 4D-0360 in 2019.

Refer to **Appendix A** for additional results of the SPR scans and concrete deterioration measurements completed as part of the manned entry physical inspections.

5.2 Maintenance Access Structures

5.2.1 Visual Assessment

Visual assessment of MAS from the seven manned entry inspections and CCTV inspections indicated that the structures remain in good condition. The most common defects include uplifted liner termination along the channel, exposed and missing aggregate in the unlined concrete channel below the liner, failed weld strips, minor unopened blisters, and small lining failures. The condition of the liner and concrete surfaces of the MAS were found to be similar to the conditions observed in 2018 and 2019.

The approximately 6 cubic inches of missing concrete in the MAS 4D-0060 cone was created by SAWPA in order to remove the blind flange, which was originally installed in 2020 as part of the Euclid Avenue Maintenance Access Structure Rehabilitation Project.

The visual assessment findings from the seven manned entry inspections are summarized in **Table 11**. Key condition findings from the 2018 and 2019 manned entry inspections are also summarized in this table. Refer to **Appendix C** and **Appendix D** for the full 2018 and 2019 manned entry inspection results, respectively.

Refer to **Appendix A** for the full condition assessment of the seven MAS completed as part of the February 2024 manned entry inspections. Refer to **Appendix B** for the CCTV inspections of the MAS.

Table 11: Visual Assessment Summary for MAS. Courtesy of V&A.

MAS	Rim	Cone	Walls	Bench	Main Pipe Connection	Lateral Penetrations	Channel
4D-0020 **(2018)**	Moderate corrosion	Liner in good condition	Liner in good condition	Liner unembedded, yet covering concrete	Good condition	Good condition	Slime layer. Exposed concrete aggregate.
4D-0020[(1)] **(2024)**	Good condition	Good condition	Liner in good condition	Good condition	Good condition	Good condition	Slime layer, minor exposed concrete aggregate.
4D-0060 **(2019)**	Moderate corrosion and poor gasket	1 to 2-inch open slit in liner on chimney	Liner in good condition	Liner unembedded, yet covering concrete	Good condition	Good condition	Uplifted liner, exposed aggregate. 1 to 2-inch open slit in liner.
4D-0060[(1)] **(2024)**	Good condition	Good overall condition, 6-in^3 of missing concrete in cone.	Liner in good condition	Good condition	Good condition	Good condition, plugged	Slime layer, minor exposed concrete aggregate, uplifted liner.
4D-0118 **(2018)**	Liner termination loose	Failed liner weld strips	Liner in good condition	Liner unembedded, yet covering concrete	Good condition	Encrustation	Slime layer. Exposed concrete aggregate.
4D-0118 **(2024)**	Rim and lining in good condition	Liner in good condition	Liner in good overall condition, failed weld strip at bottom of structure, infiltration at liner joint	Small area of liner failure on bench wall. A second layer of PVC is still protecting the concrete	Good condition	Heavy mineral deposits coming from drop-inlet	Slime layer, minor exposed concrete aggregate
4D-0150 **(2018)**	Good condition	Liner in good condition	Minor liner blisters	Liner unembedded, yet covering concrete	Good condition	Good condition	Slime layer. Exposed concrete aggregate.
4D-0150 **(2024)**	Rim and lining in good condition	Blisters typical	Blisters typical	Good condition	Good condition	Good condition	Slime layer, minor exposed concrete aggregate
4D-0360 **(2019)**	Good condition	Liner in good condition	Liner in good condition	Liner unembedded, yet covering concrete	Good condition	Good condition	Uplifted liner, exposed aggregate
4D-0360[(2)] **(2024)**	6-in cut in liner near rim	½-in puncture in lining at one location	Blisters typical	Good condition	Good condition	Good condition	Slime layer, minor exposed concrete aggregate

MAS	Rim	Cone	Walls	Bench	Main Pipe Connection	Lateral Penetrations	Channel
4D-0470 **(2018)**	Good condition	Minor hole in liner	Liner blisters and bulges	Liner unembedded, yet covering concrete	Good condition	Cuts in liner due to CCTV crawler camera cable	Slime layer.
4D-0470 **(2024)**	Rim and lining in good condition	Liner in good condition. Small 3-in cut found	Liner embedded. Blisters around throughout wall	Liner not embedded in bench. Concrete remained covered	Good condition with minor abrasion at lining joint	Small tear in south flap. Flaps appear operable. Liner in good condition.	Liner embedded with blisters throughout. Minor cuts in liner were observed.
4D-0480 **(2018)**	Good condition	Liner in good condition	Liner in good condition	Liner in good condition	Good condition	Good condition	Channel lined and in good condition
4D-0480 **(2024)**	Rim and lining in good condition	Liner in good condition	Liner in good condition	Bench in good condition. Layer of sediment observed.	Good condition	Good condition	Good condition, slime layer

(1) MAS 4D-0020 and 4D-0060 were rehabilitated in 2020 as part of the Euclid Avenue Maintenance Access Structure Rehabilitation Project.
(2) SAWPA replaced the frame and cover at MAS 4D-0360 in July 2024.

5.3 Observed Rate of Deterioration

The new CCTV and man-entry condition assessment data collected as part of the February 2024 inspections were compared against the condition assessment data collected in 2018 and 2019 to characterize the general rate of concrete deterioration. Overall, the pipe segments and MAS appeared to be in similar condition as in 2018 and 2019. The condition of the concrete surfaces behind the cut liner locations matched the conditions observed in 2018 and 2019, indicating no measurable deterioration has occurred to the concrete protected by lining.

It appears only minor deterioration occurred to the liner termination condition and unlined concrete condition since 2018/2019. Based on the man-entry testing, the liner termination conditions did not worsen at any location since 2018/2019 and concrete deterioration is within 1/8-inch of the deterioration depths recorded in 2018/2019 for most locations. The concrete deterioration measured at the influent pipe at MAS 4D-0060 increased by approximately 3/4-inch compared to 2019; however, several locations measured less deterioration in 2024 compared to 2018/2019. CCTV results indicated that the liner uplift and concrete deterioration has worsened to some extent between segments 4D-0450 to 4D-0440, 4D-0440 to 4D-0430, 4D-0250 to 4D-0240, and 4D-0090 to 4D-0080. However, the limited amount of quality CCTV footage of the unlined concrete and liner termination from 2018 prevents a robust comparison. Based on the available information, the rate of degradation is considered mild and may range from 0 to 1/8 inches of concrete loss under the liner termination over the last five years.

Based on the above comparison, the original estimated predicated remaining useful life of 10 to 20 years has been further refined based on the data comparison in **Section 6**.

6. REMAINING USEFUL LIFE

Based on a comparison of the condition of the concrete and T-Lock liner from the manned entry and CCTV inspection results collected in 2018 and 2019 to the results collected in 2024, the unlined concrete in the pipeline segments likely have experienced a rate of degradation ranging from 0 to 1/8 inches of concrete loss over the past five years. There has been negligible degradation of the concrete behind the liner within the pipelines and within the MAS. The CCTV and man-entry inspection data indicate that portions of the alignment have experienced more deterioration than others, resulting in some variability of the predicted remaining useful life.

The estimated remaining useful life for the Brine Line Reach IV-D Contract 1 and 2 alignment is summarized in **Table 12**. This remaining useful life estimate assumes the observed rate of deterioration remains constant over time and the average dry weather flows do not decrease to the point of exposing the liner termination. Data collected from future inspections (see **Section 7**) should be used to further refine the rate of deterioration and remaining useful life.

Table 12: Summary of Estimated Remaining Useful Life

Upstream MAS	Downstream MAS	Approximate Length (ft)	Estimated Remaining Useful Life
4D-0020	4D-0010	239	20 – 30 years
4D-0030	4D-0020	1,564	20 – 30 years
4D-0060	4D-0030	621	N/A – Siphon(1)
4D-0070	4D-0060	797	10 – 15 years
4D-0080	4D-0070	943	10 – 15 years
4D-0090	4D-0080	1,214	10 – 15 years
4D-0100	4D-0090	450	20 – 30 years
4D-0110	4D-0100	455	20 – 30 years
4D-0118	4D-0110	570	20 – 30 years
4D-0120	4D-0118	43	20 – 30 years
4D-0130	4D-0120	99	20 – 30 years
4D-0140	4D-0130	670	20 – 30 years
4D-0150	4D-0140	609	20 – 30 years
4D-0160	4D-0150	253	10 – 15 years
4D-0170	4D-0160	1,200	20 – 30 years
4D-0180	4D-0170	813	20 – 30 years
4D-0190	4D-0180	451	20 – 30 years
4D-0200	4D-0190	43	N/A – Siphon(1)
4D-0210	4D-0200	303	20 – 30 years
4D-0220	4D-0210	1,080	20 – 30 years
4D-0230	4D-0220	776	20 – 30 years
4D-0240	4D-0230	781	10 – 15 years
4D-0250	4D-0240	1,021	10 – 15 years
4D-0260	4D-0250	1,020	10 – 15 years
4D-0270	4D-0260	1,020	10 – 15 years
4D-0280	4D-0270	1,074	10 – 15 years

Upstream MAS	Downstream MAS	Approximate Length (ft)	Estimated Remaining Useful Life
4D-0290	4D-0280	1,001	10 – 15 years
4D-0300	4D-0290	205	20 – 30 years
4D-0305(2)	4D-0300(2)	379	50+ years
4D-0310(2)	4D-0305(2)	517	50+ years
4D-0320	4D-0310	499	20 – 30 years
4D-0330	4D-0320	1,001	20 – 30 years
4D-0340	4D-0330	75	N/A – Siphon(1)
4D-0350	4D-0340	244	N/A – Siphon(1)
4D-0360	4D-0350	82	N/A – Siphon(1)
4D-0370	4D-0360	1,110	10 – 15 years
4D-0380	4D-0370	1,401	10 – 15 years
4D-0390	4D-0380	1,189	10 – 15 years
4D-0400	4D-0390	1,429	10 – 15 years
4D-0410	4D-0400	1,272	10 – 15 years
4D-0420	4D-0410	1,329	10 – 15 years
4D-0430	4D-0420	648	10 – 15 years
4D-0440	4D-0430	1,314	10 – 15 years
4D-0450	4D-0440	1,317	10 – 15 years
4D-0460	4D-0450	648	10 – 15 years
4D-0470	4D-0460	1,322	10 – 15 years
4D-0480	4D-0470	1,283	10 – 15 years

(1) Estimated remaining useful life is not provided for the siphon segments because there are no condition assessment data to base the estimate on.

(2) Replacement segments installed in 2011 with 360-degree PVC lined RCP, per Relocation of Existing SAWPA Santa Ana Regional Interceptor (SARI) Reach IV-D / Schleisman Road & Hellman Avenue Record Drawings (TMAD, Taylor, & Gaines, September 2011).

7. RECOMMENDATIONS UPDATE

This Section includes a description of recommendations for completion in the near-term (within 1 to 2 years of Report), mid-term (within 8 to 10 years of Report), and long-term (within 10 to 20 years of Report) to increase the lifespan of the Reach 4D Contract 1 and 2 brine line. See **Section 9** for the planning level cost estimates associated with these recommendations. See **Section 10** for an implementation schedule for each of these recommendations.

7.1 Near-Term

Woodard & Curran recommends completing minor concrete and PVC T-Lock liner repair work and performing additional CCTV inspections within 1 to 2 years of this Report as described herein.

7.1.1 Concrete and PVC T-Lock Liner Repairs

Woodard & Curran recommends that SAWPA perform the following concrete and PVC T-Lock liner repairs to address the defects identified in this Report:

- MAS 4D-0060: Repair the large void in the concrete cone (approximately 6 cubic inches) directly beneath the chimney (see MAS 4D-0060 Field Report in **Appendix A** for photo). Restore concrete to original surface by applying a repair mortar and perform a liner spot repair.
- Repair the tears in the PVC T-Lock liner located along the crown of the pipeline near the first joint upstream of MAS 4D-0060. The tears vary in length from two to four inches.
- MAS 4D-0360: Repair the approximately 6-inch long cut in the PVC T-Lock liner on the chimney and approximate 1/2-inch puncture in the liner on the cone.
- MAS 4D-0470: Repair the approximately 3-inch long tear in the PVC T-Lock liner on the cone and the tear in the liner along the effluent pipe crown.

The concrete and PVC T-Lock liner repairs could be completed via man-entry in live flow, assuming the flow velocity does not exceed the maximum allowable for worker safety (approximately three feet per second). It is recommended that SAWPA plan for night work when flows are lowest.

7.1.2 Additional Cleaning and CCTV Inspection

As previously stated, the primary objectives of the 2024 Work Plan mid-term recommended inspections were to characterize the rate of deterioration in the unlined concrete and refine the estimated remaining useful life for the SAWPA Brine Line Reach IV-D, Contract 1 and 2 Alignment. This was accomplished by comparing the new condition assessment data collected during the February 2024 inspections against the existing data collected in 2018 and 2019. The MAS 4D-0400 to 4D-0390 and MAS 4D-0390 to 4D-0380 pipe segments were cleaned and inspected with CCTV in 2018, but could not be inspected in February 2024 due to time constraints. Notable concrete deterioration and liner termination defects were identified in these two segments in 2018 (see **Appendix B**). Woodard & Curran recommends cleaning and inspecting these two segments, and subsequently characterizing the concrete deterioration rate to refine the useful remaining life estimate by comparing against the 2018 inspection data.

As described in **Appendix B**, there may be potentially significant liner detachment and concrete deterioration defects in the pipe segments between MAS 4D-0250 to 4D-0240 and MAS 4D-0240 to 4D-0230, but heavy debris/slime remaining in the pipe made it difficult to properly assess the condition of these segments. Woodard & Curran recommends thoroughly cleaning these two pipe segments to remove all debris/slime from the pipe surfaces and performing CCTV inspection to properly assess potentially significant liner detachment and concrete deterioration. The condition assessment data should then be compared against the 2018/2019 data to characterize the rate of concrete deterioration and to refine the useful remaining life estimate for these segments.

A minimum 12-hour shutdown period is recommended to reduce flow rates enough to lower the water level below the liner termination for the pipe segments between MAS 4D-0230 to 4D-0250 and MAS 4D-0380 to 4D-0400. Woodard & Curran recommends exposing a minimum of one inch of unlined concrete below the liner termination, which corresponds to a water depth of approximately 5.1 inches above the invert. Based on hydraulic calculations for gravity flow pipelines using manning's equation, the flow rate should be less than approximately 1.83 MGD between MAS 4D-0230 to 4D-0250 and less than approximately 0.70 MGD between MAS 4D-0380 to 4D-0400 to not exceed a water depth of 5.1 inches. The MAS 4D-0230 to 4D-0250 pipe segments have a steeper slope (0.0068 ft/ft) compared to the MAS 4D-0380 to 4D-0400 pipe segments (0.0010 ft/ft), as shown in **Table 1**.

7.2 Mid-Term

Woodard & Curran recommends that SAWPA reinspect the Reach IV-D Contract 1 and 2 alignment again in 8 to 10 years. Based on the cleaning and CCTV inspection productivity from the 2018 and 2024 field inspections, the scope of re-inspection work should be based on the shutdown duration as described below.

If all work must be completed within a single shutdown period of 30 hours and heavy cleaning cannot be performed prior to the shutdown period (i.e., matching the February 2024 investigations), Woodard & Curran recommends completing the same inspection plan that was performed in February 2024. The same segments that were excluded for the February 2024 investigations due to time, access, and man-power limitations would be excluded again for the mid-term re-inspections. We believe it is not realistic to thoroughly clean and inspect the entirety of the alignment within a single 30-hour shutdown period.

If SAWPA can arrange two separate minimum 24-hour shutdown periods or a single 48-hour shutdown period, it is recommended that the entire alignment be cleaned and inspected with CCTV, with the exception of the siphons and grit traps. Cleaning in live flow prior to the shutdown would still be recommended as this would help ensure no segments are left too dirty to inspect during the shutdown period.

Woodard & Curran also recommends cleaning, dewatering, and performing CCTV inspection of the siphon segments between MAS 4D-0060 and 4D-0030 (approx. 621 LF), MAS 4D-0200 and 4D-0190 (approx. 43 LF), and between MAS 4D-0360 and 4D-0330 (approx. 401 LF total). A bypass pumping system would be required to maintain flows while the siphons are isolated from service. This work could be completed without a shutdown.

7.3 Long-Term

Based on the observed concrete deterioration that has occurred at the interface of the concrete and T-Lock liner along the pipeline, it is recommended that SAWPA plan on a phased approach to structural rehabilitation of the Reach IV-D Contract 1 and 2 alignment. The segments with the highest degree of deterioration based on the CCTV and man-entry condition assessments would be addressed in "Phase 1" with a timeline of 10 to 15 years (2034 to 2039). The remainder of the alignment would be addressed in "Phase 2" with a timeline 20+ years, excluding the 360-degree PVC lined RCP segments installed in 2011. Cured-in-Place Pipe (CIPP) lining is the recommended structural rehabilitation method (see **Section 8**).

A summary of the segments designated for structural rehabilitation in Phase 1 and Phase 2 are provided below in **Table 13** and **Table 14**, respectively. Refer to **Figure 6** for a map of the segments designated for structural rehabilitation in Phase 1 and Phase 2.

Table 13: Phase 1 Structural Rehabilitation Pipeline Segments (Timeline: 10 to 15 Years)

Upstream MAS	Downstream MAS	Approximate Length (ft)
4D-0070	4D-0060	797
4D-0080	4D-0070	943
4D-0090	4D-0080	1,214
4D-0160	4D-0150	253
4D-0240	4D-0230	781
4D-0250	4D-0240	1,021
4D-0260	4D-0250	1,020

Upstream MAS	Downstream MAS	Approximate Length (ft)
4D-0270	4D-0260	1,020
4D-0280	4D-0270	1,074
4D-0290	4D-0280	1,001
4D-0370	4D-0360	1,110
4D-0380	4D-0370	1,401
4D-0390	4D-0380	1,189
4D-0400	4D-0390	1,429
4D-0410	4D-0400	1,272
4D-0420	4D-0410	1,329
4D-0430	4D-0420	648
4D-0440	4D-0430	1,314
4D-0450	4D-0440	1,317
4D-0460	4D-0450	648
4D-0470	4D-0460	1,322
4D-0480	4D-0470	1,283
Total Length		**23,386**

Table 14: Phase 2 Structural Rehabilitation Pipeline Segments (Timeline: 20+ Years)

Upstream MAS	Downstream MAS	Approximate Length (ft)
4D-0020	4D-0010	239
4D-0030	4D-0020	1,564
4D-0060	4D-0030	621 (siphon)
4D-0100	4D-0090	450
4D-0110	4D-0100	455
4D-0118	4D-0110	570
4D-0120	4D-0118	43
4D-0130	4D-0120	99
4D-0140	4D-0130	670
4D-0150	4D-0140	609
4D-0170	4D-0160	1,200
4D-0180	4D-0170	813
4D-0190	4D-0180	451
4D-0200	4D-0190	43 (siphon)
4D-0210	4D-0200	303
4D-0220	4D-0210	1,080
4D-0230	4D-0220	776
4D-0300	4D-0290	205
4D-0320	4D-0310	499
4D-0330	4D-0320	1,001
4D-0340	4D-0330	75 (siphon)
4D-0350	4D-0340	244 (siphon)
4D-0360	4D-0350	82 (siphon)
Total Length		**12,092**

Figure 6: Reach 4D Contract 1 and 2 Alignment Segments Designated for Structural Rehabilitation in Phase 1 and Phase 2

8. LONG-TERM REHABILITATION ALTERNATIVES UPDATE

An alternatives analysis of structural rehabilitation options for the 42-inch diameter RCP brine line was completed as part of the 2018 *Final Reach 4D Rehabilitation Work Plan* (**Appendix C**) to determine the most cost-effective rehabilitation option that adequately increases the lifespan of the RCP and minimizes impact to its existing hydraulic capacity. The structural rehabilitation alternatives that were evaluated included the following:

1. Segmental Sliplining
2. Continuous Sliplining
3. Cured-in-Place Pipe (CIPP) Lining
4. Spiral Wound Pipe Lining
5. Man-Entry Repairs

As shown in **Appendix C**, the alternatives were evaluated against seven criteria: Constructability / Work Area Requirements, Impacts to Hydraulic Capacity, Traffic/Public Disruption, Permitting, Planning Level Cost, Risk of SSO, and Solution Longevity. The evaluation criteria were assigned a weighting based on importance, with hydraulic capacity impacts receiving the highest weighting. The CIPP lining alternative received the highest score and was the recommended alternative.

CIPP lining remains the recommended structural rehabilitation option for the 42-inch Reach IV-D RCP brine line. Therefore, the planning level cost estimate and construction schedule for the recommended Phase 1 and Phase 2 long-term rehabilitation projects are based on CIPP lining. The thickness of the fully structural CIPP liner would vary along the alignment based on the external live and dead loads. The approximate liner thicknesses were estimated based on the depth of cover variation along the alignment as shown in the record drawings, while keeping the other variables constant. The estimated liner thickness would vary between approximately 0.70 to 1.04 inches, which corresponds to an inside diameter between 39.92 and 40.60 inches. Refer to the 2018 *Final Reach 4D Rehabilitation Work Plan* in **Appendix C** for the detailed alternatives analysis of structural rehabilitation options.

9. COST ESTIMATES

9.1 Components and Assumptions

Development of the planning level cost estimates for the near-term, mid-term, and long-term recommendations was based on several sources of information. These included the costs to perform the February 2024 field inspections, engineering fees associates with the current Project, review of bids for rehabilitation of similar sized piping systems in California, standard estimating guides, discussions with rehabilitation technology suppliers, consultation with bypass equipment suppliers, and the knowledge of some of the potential construction constraints related to the Reach 4D Contract 1 and 2 alignment. Descriptions of the components and assumptions specific to the near, mid, and long-term project cost estimates are provided in the following sections.

9.2 Near-Term

The cost estimate to complete the recommended near-term project includes the labor and engineering associated with cleaning and CCTV of approximately 4,411 total feet of pipe between MAS 4D-0400 to 4D-0380 and MAS 4D-0250 to 4D-0230, the development of a report summarizing the collected data, and budgetary construction costs for minor concrete and liner repairs. The following notes and assumptions were used in calculating the quantities and unit costs:

- SAWPA will provide the traffic control plans; encroachment permits from Caltrans, City of Chino, and City of Eastvale; and will coordinate the minimum 12-hour shut-down with the dischargers. SAWPA project management and other costs associated with coordination and permit acquisition are not provided as part of this estimate.
- The unit cost for pipe cleaning with hydro-jetting was based on the hourly rates from SAWPA's contract with their current service provider:
    - Cleaning jetter: $388 per hour
    - Water truck: $281 per hour
- The cleaning duration was assumed to be 1 hour per 300 feet of pipe.
- The CCTV inspection unit cost was based on SAWPA's current CCTV Contractor (approximately $2.16 per foot).
- Traffic control will be required during the cleaning, CCTV, and concrete/liner repairs. The unit cost for traffic control was based on an aggregate of the total cost from the February 2024 field inspections ($29,900), which included traffic control design plans and implementation.
- Estimate includes oversight of the CCTV crews in the field for up to 4 hours, analysis of the CCTV and man-entry inspection data, and development of a summary report. The hourly labor rates match those from the current Project (Task Order No. W&C327-03).
- Field work will be performed over a single night and occur during the work week (Monday through Friday) to avoid overtime work requirements.
- Task 5 costs include project management fees.
- Estimate is provided in November 2024 dollars.

The cost estimate for the recommended near-term work is displayed in **Table 15**.

Table 15: Cost Estimate for Recommended Near-Term Inspection Work

Task No.	Estimated Qty	Unit	Item Description	Unit Cost	Total Cost
1	1	Lump Sum	Traffic Control	$14,700	$14,700
2	15	Hour	Cleaning (Hydro-Jetting)	$669	$9,800
3	4,411	Linear Foot	CCTV Inspection (MAS 4D-0400 TO 4D-0390, 4D-0390 to 4D-0380, 4D-0250 to 4D-0240, 4D-0240 to 4D-0230)	$2.16	$9,526
4	1	Lump Sum	Concrete and Liner Repairs	$24,000	$24,000
5	1	Lump Sum	CCTV Inspection Data Analysis and Report Preparation	$35,410	$35,400
				TOTAL	**$94,000**

9.3 Mid-Term

The cost estimate to complete the recommended mid-term project includes the planning and execution of re-inspecting the entire seven-mile Reach 4D Contract 1 and 2 alignment, including the siphon segments, as described in Section 7.2. This recommended project is similar to the current Reach 4D Rehabilitation Work Plan Project but adds cleaning, dewatering, and CCTV inspection of the siphon segments and installation of a temporary bypass pumping system to isolate the siphons.

The following notes and assumptions were used in calculating the quantities and unit costs:

- SAWPA will provide the traffic control plans, encroachment permits from Caltrans, City of Chino, and City of Eastvale, and will coordinate the two separate 24-hour shutdowns or single 48-hour shutdown with the dischargers. SAWPA project management and other costs associated with coordination and permit acquisition are not provided as part of this estimate.
- The unit cost for pipe cleaning with hydro-jetting was based on the hourly rates from SAWPA's contract with their current service provider:
    - Cleaning jetter: $388 per hour and water truck: $281 per hour
- The cleaning duration was assumed to be 1 hour per 300 feet of pipe.
- The CCTV inspection unit cost was based on SAWPA's current CCTV Contractor (approximately $2.16 per foot).
- Traffic control will be required during the cleaning, CCTV, and man-entry inspections. The unit cost was based on an aggregate of the total cost from the February 2024 field inspections ($29,900), which includes traffic control design plans and implementation. An additional $10,000 was included for traffic control during the siphon cleaning, dewatering, and CCTV inspections which will require installation of a temporary bypass pumping system.

- It is recommended to perform seven man-entry inspections and develop a condition assessment report matching the level of detail from the Brine Line Reach IV-D Condition Assessment Report, dated May 2024 (**Appendix A**). The unit cost was based on V&A's fee for the current project.
- Scope of work, project team, and hourly rates match those of the current project (Task Order No. W&C327-03). The level of effort was increased to account for additional data analysis from the siphon CCTV inspections and supervise the CCTV inspections of the non-siphon segments during a longer shutdown period.
- Field work will be performed over two separate 24-hour shutdown periods or a single 48-hour shutdown period.
- The bypass pumping system costs for the siphon cleaning, dewatering, and CCTV inspections were based on an estimate provided by Sunbelt with the following assumptions:
    - Assumed to be sized for a total peak capacity of 11.0 MGD.
    - A total of three bypass systems will be assembled, operated, and dissembled in sequence to rehabilitate the siphons. The cost to assemble, test, and dismantle the three bypass systems is equivalent to the cost of a single one-mile setup as described in **Section 9.4**.
    - A 24/7 pump watch crew will be required while the bypass systems are in operation. The crew will not be required during assembly and disassembly of each bypass system setup. The 24/7 pump watch crew will be required for a total of five days.
- Task 6 costs include Consultant's estimated project management fees.
- Estimate is provided in November 2024 dollars.

The cost estimate for the recommended mid-term work is displayed in **Table 16**.

Table 16: Cost Estimate for Recommended Mid-Term Inspection Work

Task No.	Estimated Qty	Unit	Item Description	Unit Cost	Total Cost
1	1	Lump Sum	Traffic Control Design + Implementation	$39,900	$39,900
2	121	Hour	Cleaning (Hydro-Jetting)	$669	$81,081
3	36,359	Linear Foot	CCTV Inspection of Entire 7-Mile Alignment, Including Siphons	$2.16	$78,518
4	1	Lump Sum	Bypass Pumping System for Siphon Cleaning, Dewatering, and CCTV Inspection	$431,905	$431,905
5	1	Lump Sum	Man-Entry Inspections and Condition Assessment at 7 MAS Locations	$131,139	$131,139
6	1	Lump Sum	Consultant Fee to Provide Engineering Services Matching Task Order No. W&C327-03	$136,315	$136,315
				Total	**$899,000**

9.4 Long-Term

Planning level construction cost estimates were prepared for the recommended Phase 1 and Phase 2 long-term rehabilitation projects. The Phase 1 project includes the installation of fully structural CIPP lining in the segments listed in **Table 13**, for a total length of 23,386 feet. The Phase 2 project includes the installation of fully structural CIPP lining in the segments listed in Table 14, for a total length of 12,092 feet. The only segments excluding from rehabilitation are the 360-degree PVC lined RCP segments that were installed in 2011 between MAS 4D-0300 and 4D-0310.

The following notes and assumptions were used in calculating the planning level construction cost estimates for the recommended Phase 1 and Phase 2 long-term rehabilitation projects:

- A 30-percent planning level contingency was added to the construction cost subtotal.
- A lump sum cost for mobilization and demobilization was assumed to be equal to five percent of the summation of all other bid items except traffic control.
- The traffic control lump sum cost was assumed to be equal to seven percent of the summation of all other bid items except mobilization and demobilization, based on the City of Chino's and City of Eastvale's traffic control requirements from the field work performed in February 2024. Additionally, it was assumed that night work will be required for the CIPP liner curing process.
- The permitting allowances of $25,000 (Phase 1) and $20,000 (Phase 2) and the water pollution control work allowances of $20,000 (Phase 1) and $15,000 (Phase 2) were based on past rehabilitation projects for similar sized piping systems located in primarily in street rights-of-way.
- The potholing lump sum cost of $32,400 for Phase 1 was based on an assumed quantity of 18 potholes at $1,800 each. The potholing lump sum cost of $16,200 for Phase 2 was based on an assumed quantity of 9 potholes at $1,800 each. Potholing would be required at each CIPP liner launch manhole because excavation will be required to remove the manhole cones.
- The brine line bypass pumping system costs for Phase 1 and Phase 2 were based on an estimate provided by Sunbelt with the following assumptions:
    - Assumed to be sized for a total peak capacity of 11.0 MGD.
    - The maximum length for each bypass system was assumed to be approximately one mile. A total of six 11 MGD bypass setups will be assembled, operated, and dissembled in order to rehabilitate the 23,386 feet of pipe as part of Phase 1. A total of four 11 MGD bypass setups will be assembled, operated, and dissembled in order to rehabilitate the 12,092 feet of pipe as part of Phase 2. See the construction schedule in **Section 10.2** for further information.
    - A 24/7 pump watch crew will be required while the bypass systems are in operation. The crew will not be required during assembly and disassembly of each bypass system setup.
    - The total duration of bypass operations is approximately ten months for Phase 1 and eight months for Phase 2. See the construction schedule in **Section 10.2** for further information, including the estimated duration for each individual bypass system.
    - Refer to **Appendix E** for the bypass pumping system estimate.

- The CIPP lining unit cost of $578 per foot for both Phases 1 and 2 was based on a review of recent project bids for CIPP installation in a similar sized trunk sewer. The unit cost includes cleaning, pre-CIPP CCTV inspection, existing pipe surface preparation including stopping active infiltration, CIPP liner installation, and post-CIPP CCTV inspection. It was assumed that the existing uplifted PVC T-Lock liner does not need to be cut back prior to CIPP liner insertion because the T-Lock is not stiff nor sharp enough to damage the liner.
- CIPP was assumed to be either steam or water cured with use of polyester resin.
- CIPP access was assumed to be through existing manholes with cones removed.
- Phase 1 and Phase 2 estimates are provided in November 2024 dollars.

The planning level construction cost estimates for the recommended Phase 1 and Phase 2 long-term work are displayed in **Table 17** and **Table 18**.

Table 17: Planning Level Construction Cost Estimate for Recommended Phase 1 Long-Term Rehabilitation Work with CIPP Lining

Bid Item No.	Estimated Qty	Unit	Item Description	Unit Cost	Total Cost
1	1	Lump Sum	Mobilization / Demobilization (5%)	$952,899	$952,899
2	1	Lump Sum	Traffic Control (7%)	$1,334,058	$1,334,058
3	1	Allowance	Permitting	$25,000	$25,000
4	1	Allowance	Water Pollution Control Work	$20,000	$20,000
5	1	Lump Sum	Potholing	$32,400	$32,400
6	1	Lump Sum	Brine Line Bypassing	$5,463,464	$5,463,464
7	23,386	Feet	CIPP Lining of Existing 42-inch Pipe	$578	$13,517,108
				Subtotal	**$21,345,000**
			Planning Level Contingency (30% of Bid Items)	$6,403,500	$6,404,000
				TOTAL	**$27,749,000**

Table 18: Planning Level Construction Cost Estimate for Recommended Phase 2 Long-Term Rehabilitation Work with CIPP Lining

Bid Item No.	Estimated Qty	Unit	Item Description	Unit Cost	Total Cost
1	1	Lump Sum	Mobilization / Demobilization (5%)	$492,744	$492,744
2	1	Lump Sum	Traffic Control (7%)	$689,842	$689,842
3	1	Allowance	Permitting	$20,000	$20,000
4	1	Allowance	Water Pollution Control Work	$15,000	$15,000
5	1	Lump Sum	Potholing	$16,200	$16,200
6	1	Lump Sum	Brine Line Bypassing	$2,814,512	$2,814,512
7	12,209	Feet	CIPP Lining of Existing 42-inch Pipe	$578	$6,989,176
				Subtotal	**$11,038,000**
			Planning Level Contingency (30% of Bid Items)	30%	$3,311,000
				TOTAL	**$14,349,000**

10. SCHEDULE

10.1 Implementation Schedules for Near-Term, Mid-Term, and Long-Term Recommendations

The implementation schedules for the recommended near-term, mid-term, and long-term projects are provided in **Figure 7** through **Figure 10**, respectively. The near-term and mid-term project implementation schedules are organized by "planning & preparation" and "execution". The long-term project schedule is organized by "planning", "design", and "construction". Descriptions of each are provided below.

- Planning & Preparation – for near-term and mid-term schedules
    - The planning and preparation task includes the kickoff meeting between SAWPA and Engineering Consultant, data collection and review, development of a field investigation plan and schedule, permit acquisition, and cleaning of the brine line.
    - The near-term and mid-terms schedules assume the discharger shutdown periods will occur during the month of February.
    - The acquisition of encroachment permits from Caltrans, City of Chino, and City of Eastvale is on the critical path. This task was assumed to take 65 days to complete, based on the duration required to obtain all three permits for the February 2024 inspections. Cleaning of the brine line may begin after all three permits are in hand.

- Execution – for near-term and mid-term schedules
    - The execution task includes the concrete and liner repairs, field work inspections, preparation of the collected CCTV and man-entry condition assessment data, and data analysis. For the near-term project, it is assumed that a brief memo summarizing the CCTV results is sufficient. For the mid-term project, it is assumed the same deliverables as the current Project would be required.
- Planning, Design, and Construction – for long-term phase 1 and phase 2 schedules
    - The planning phase includes the development of a Preliminary Design Report, which would involve an analysis of structural rehabilitation liners available on the market at that time.
    - The design phase includes the development of final design plans and specifications that will be delivered in three packages (60%, 90%, and 100%), and the bid phase.
    - The construction phase begins at Contractor notice-to-proceed and ends at the completion of final site cleanup/restoration activities.
    - See **Section 10.2** for a detailed project schedule.

Figure 7: Implementation Schedule for Recommended Near-Term Work

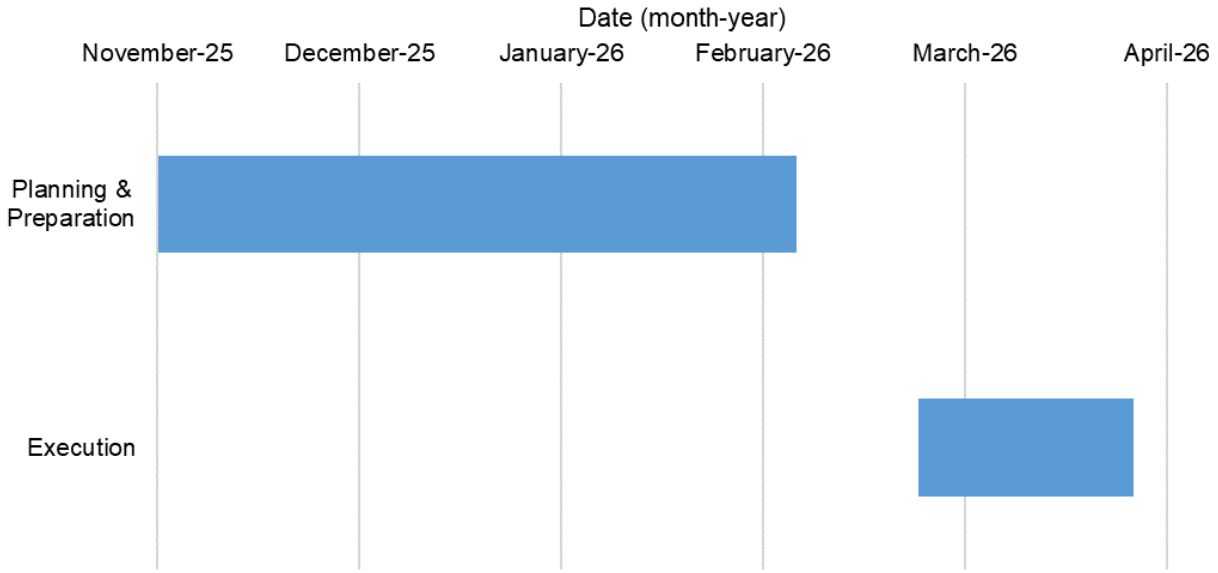


Figure 8: Implementation Schedule for Recommended Mid-Term Work

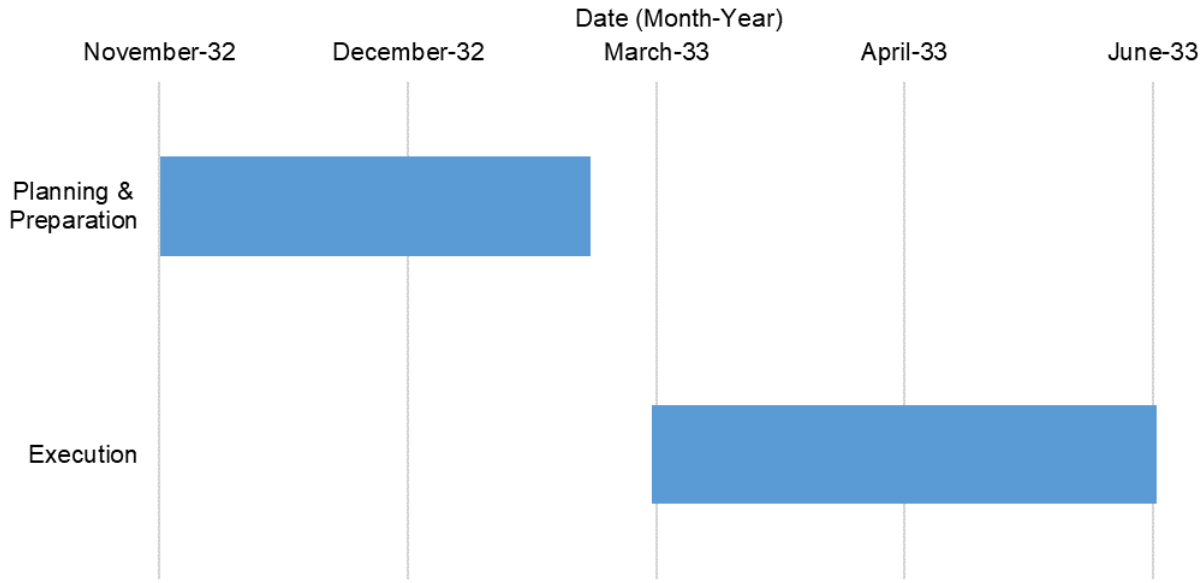


Figure 9: Implementation Schedule for Recommended Phase 1 Long-Term Rehabilitation Project

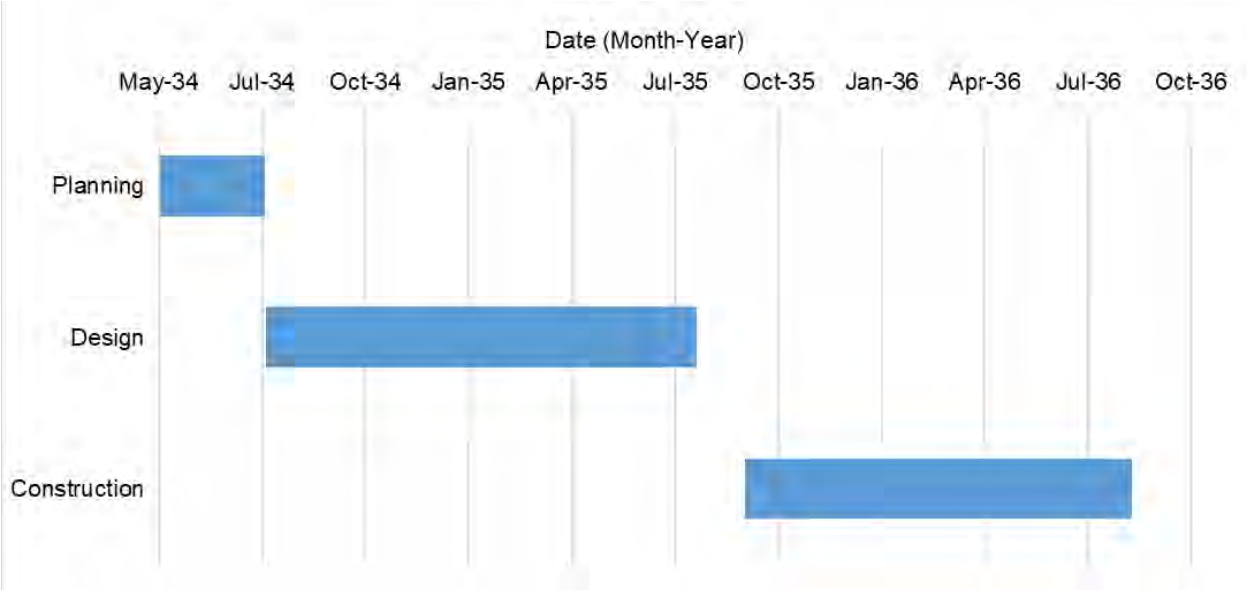
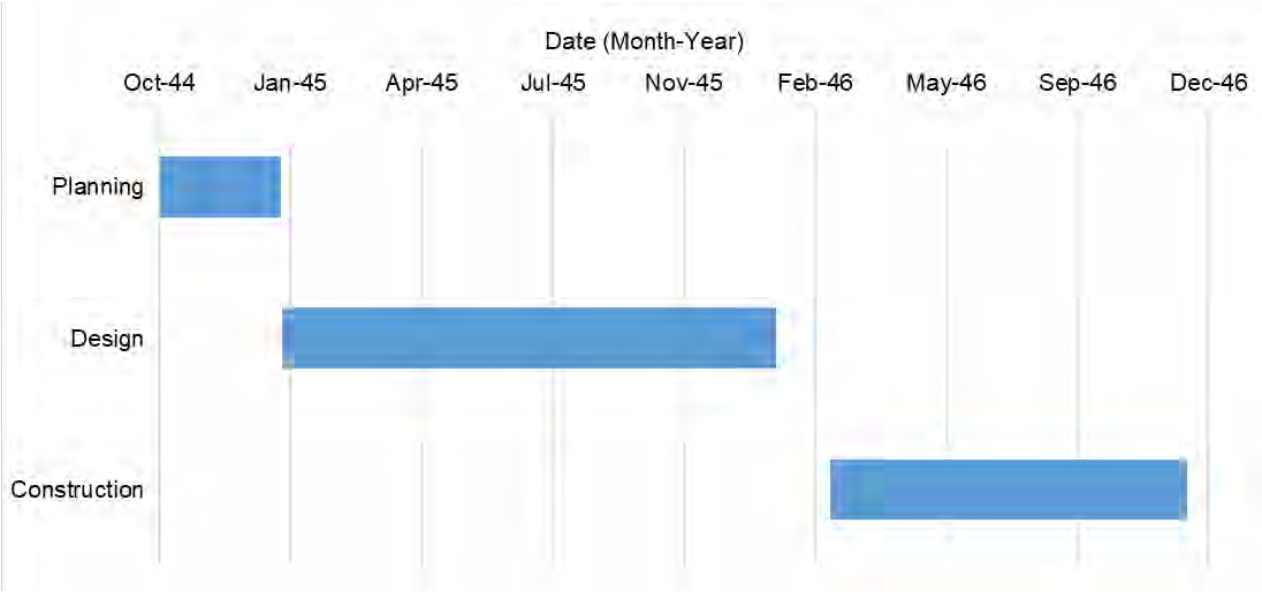


Figure 10: Implementation Schedule for Recommended Phase 2 Long-Term Rehabilitation Project



10.2 Project Schedule for Long-Term Rehabilitation Project

Example project schedules for the recommended long-term Phase 1 and Phase 2 rehabilitation projects involving CIPP lining of the entire Reach 4D Contract 1 and 2 alignment are shown in Figures 11 and 12. Both schedules are comprised of four main components – Preliminary Design Phase, Design Phase, Bid Phase, and Construction Phase. Each of the schedule components was based on previous project experience with CIPP lining of similar sized piping systems. Based on the assumed durations of each task, the Phase 1 project is expected to take approximately 607 working days (2.3 years) and the Phase 2 project is expected to take approximately 561 working days (2.1 years).

Figure 10. Reach 4D Contract 1 and 2 Recommended Long-Term Phase 1 Rehabilitation Project Schedule
2024-06-28

ID	Task Name	Duration	Start	Finish
0	**Reach 4D Phase 1 Rehabilitation**	**607 days**	**Mon 5/1/34**	**Tue 8/26/36**
1	**Task 1 - Project Management**	**0 days**	**Mon 5/1/34**	**Mon 5/1/34**
2	Notice to Proceed	0 days	Mon 5/1/34	Mon 5/1/34
3	**Task 2 - Preliminary Design**	**65 days**	**Tue 5/2/34**	**Tue 8/1/34**
4	Kickoff Meeting & Site Visit	0 days	Tue 5/2/34	Tue 5/2/34
5	Develop Design Memo	40 days	Wed 5/3/34	Tue 6/27/34
6	W&C QA/QC Review	3 days	Wed 6/28/34	Fri 6/30/34
7	Update Memo	5 days	Mon 7/3/34	Fri 7/7/34
8	Deliver Design Memo	0 days	Mon 7/10/34	Mon 7/10/34
9	SAWPA review	15 days	Tue 7/11/34	Mon 7/31/34
10	Design Memo review meeting	0 days	Tue 8/1/34	Tue 8/1/34
11	**Task 3 - Design Plans and Specifications**	**218 days**	**Wed 8/2/34**	**Fri 6/1/35**
12	Develop 60% Design Package	60 days	Wed 8/2/34	Tue 10/24/34
13	W&C QA/QC Review	5 days	Wed 10/25/34	Tue 10/31/34
14	Update 60% Design Package	10 days	Wed 11/1/34	Tue 11/14/34
15	Deliver 60% Design Package to SAWPA	0 days	Wed 11/15/34	Wed 11/15/34
16	SAWPA review	20 days	Thu 11/16/34	Wed 12/13/34
17	60% Design review meeting	0 days	Wed 12/13/34	Wed 12/13/34
18	Develop 90% Design Package	45 days	Thu 12/14/34	Wed 2/14/35
19	W&C QA/QC Review	5 days	Thu 2/15/35	Wed 2/21/35
20	Update 90% Design Package	10 days	Thu 2/22/35	Wed 3/7/35
21	Deliver 90% Design Package to SAWPA	0 days	Wed 3/7/35	Wed 3/7/35
22	SAWPA review	20 days	Thu 3/8/35	Wed 4/4/35
23	90% Design review meeting	0 days	Thu 4/5/35	Thu 4/5/35
24	Develop 100% Design Package	25 days	Fri 4/6/35	Thu 5/10/35
25	W&C QA/QC Review	5 days	Fri 5/11/35	Thu 5/17/35
26	Update 100% Design Package	10 days	Fri 5/18/35	Thu 5/31/35
27	Deliver 100% Design Package	0 days	Fri 6/1/35	Fri 6/1/35
28	**Task 4 -Bid and Construction Assistance**	**30 days**	**Tue 7/3/35**	**Mon 8/13/35**
29	Assist SAWPA during bidding	30 days	Tue 7/3/35	Mon 8/13/35
30	**Task 5 - Engineering Services During Construction**	**241 days**	**Mon 9/24/35**	**Tue 8/26/36**
31	Construction NTP	0 days	Mon 9/24/35	Mon 9/24/35
32	**Construction**	**241 days**	**Tue 9/25/35**	**Tue 8/26/36**
33	Submittals review	20 days	Tue 9/25/35	Mon 10/22/35
34	Measure Internal Diameter of segments (all segments)	10 days	Tue 9/25/35	Mon 10/8/35
35	Order/Delivery of Lining (for first bypass setup)	15 days	Tue 10/2/35	Mon 10/22/35
36	**Inspection and Lining MAS 4D-0480 to 4D-0440 - 4,570 ft (1st Bypass Setup)**	**54 days**	**Tue 10/9/35**	**Fri 12/21/35**
37	Setup bypass	12 days	Tue 10/9/35	Wed 10/24/35
38	Clean 4 Pipe Segments	10 days	Thu 10/25/35	Wed 11/7/35
39	CCTV 4 Pipe Segments	5 days	Thu 11/8/35	Wed 11/14/35
40	Line 4 Pipe Segments	12 days	Thu 11/15/35	Fri 11/30/35
41	Post Lining CCTV Inspection	5 days	Mon 12/3/35	Fri 12/7/35
42	Dismantle bypass	5 days	Mon 12/10/35	Fri 12/14/35
43	Site Cleanup/Restoration	5 days	Mon 12/17/35	Fri 12/21/35
44	**Inspection and Lining MAS 4D-0400 to 4D-0440 - 4,560 ft (2nd Bypass Setup)**	**64 days**	**Mon 12/3/35**	**Thu 2/28/36**
45	Order/Delivery of Lining (for 2nd bypass setup)	15 days	Mon 12/3/35	Fri 12/21/35

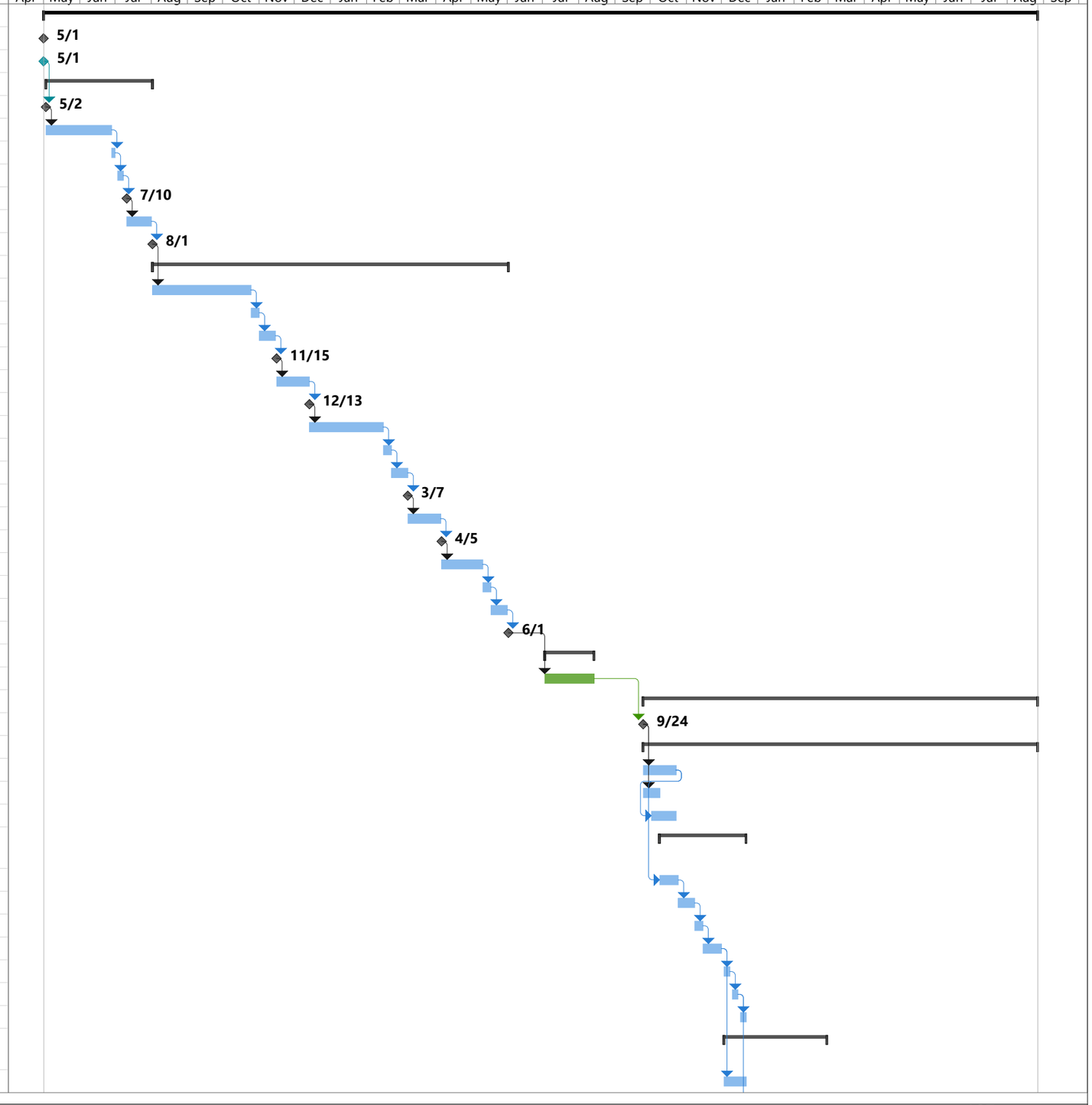


Figure 10. Reach 4D Contract 1 and 2 Recommended Long-Term Phase 1 Rehabilitation Project Schedule
2024-06-28

ID	Task Name	Duration	Start	Finish
46	Setup bypass	12 days	Mon 12/17/35	Tue 1/1/36
47	Clean 4 Pipe Segments	10 days	Wed 1/2/36	Tue 1/15/36
48	CCTV 4 Pipe Segments	5 days	Wed 1/16/36	Tue 1/22/36
49	Line 4 Pipe Segments	12 days	Wed 1/23/36	Thu 2/7/36
50	Post Lining CCTV and inspection	5 days	Fri 2/8/36	Thu 2/14/36
51	Dismantle bypass	5 days	Fri 2/15/36	Thu 2/21/36
52	Site Cleanup/Restoration	5 days	Fri 2/22/36	Thu 2/28/36
53	**Inspection and Lining MAS 4D-0360 to 4D-0400 - 5,130 ft (3rd Bypass Setup)**	**70 days**	**Wed 2/6/36**	**Tue 5/13/36**
54	Order/Delivery of Lining (for 3rd bypass setup)	15 days	Wed 2/6/36	Tue 2/26/36
55	Setup bypass	15 days	Fri 2/22/36	Thu 3/13/36
56	Clean 4 Pipe Segments	10 days	Fri 3/14/36	Thu 3/27/36
57	CCTV 4 Pipe Segments	5 days	Fri 3/28/36	Thu 4/3/36
58	Line 4 Pipe Segments	12 days	Fri 4/4/36	Mon 4/21/36
59	Post Lining CCTV Inspection	5 days	Tue 4/22/36	Mon 4/28/36
60	Dismantle bypass	6 days	Tue 4/29/36	Tue 5/6/36
61	Site Cleanup/Restoration	5 days	Wed 5/7/36	Tue 5/13/36
62	**Inspection and Lining MAS 4D-0260 to 4D-0290 - 3,095 ft (4th Bypass Setup)**	**53 days**	**Tue 4/15/36**	**Thu 6/26/36**
63	Order/Delivery of Lining (for 4th bypass setup)	15 days	Tue 4/15/36	Mon 5/5/36
64	Setup bypass	10 days	Wed 5/7/36	Tue 5/20/36
65	Clean 3 Pipe Segments	5 days	Wed 5/21/36	Tue 5/27/36
66	CCTV 3 Pipe Segments	2 days	Wed 5/28/36	Thu 5/29/36
67	Line 3 Pipe Segments	8 days	Fri 5/30/36	Tue 6/10/36
68	Post Lining CCTV Inspection	3 days	Wed 6/11/36	Fri 6/13/36
69	Dismantle bypass	4 days	Mon 6/16/36	Thu 6/19/36
70	Site Cleanup/Restoration	5 days	Fri 6/20/36	Thu 6/26/36
71	**Inspection and Lining MAS 4D-0160 to 4D-0150 - 253 ft (5th Bypass Setup)**	**23 days**	**Fri 6/6/36**	**Tue 7/8/36**
72	Order/Delivery of Lining (for 5th bypass setup)	15 days	Fri 6/6/36	Thu 6/26/36
73	Setup bypass	5 days	Fri 6/20/36	Thu 6/26/36
74	Clean Pipe Segment	1 day	Fri 6/27/36	Fri 6/27/36
75	CCTV Pipe Segment	1 day	Mon 6/30/36	Mon 6/30/36
76	Line Pipe Segment	1 day	Tue 7/1/36	Tue 7/1/36
77	Post Lining CCTV Inspection	1 day	Wed 7/2/36	Wed 7/2/36
78	Dismantle bypass	2 days	Thu 7/3/36	Fri 7/4/36
79	Site Cleanup/Restoration	2 days	Mon 7/7/36	Tue 7/8/36
80	**Inspection and Lining MAS 4D-0060 to 4D-0090 - 2,954 ft (6th Bypass Setup)**	**41 days**	**Tue 7/1/36**	**Tue 8/26/36**
81	Order/Delivery of Lining (for 6th bypass setup)	15 days	Tue 7/1/36	Mon 7/21/36
82	Setup bypass	10 days	Mon 7/7/36	Fri 7/18/36
83	Clean 3 Pipe Segments	5 days	Mon 7/21/36	Fri 7/25/36
84	CCTV 3 Pipe Segments	2 days	Mon 7/28/36	Tue 7/29/36
85	Line 3 Pipe Segments	8 days	Wed 7/30/36	Fri 8/8/36
86	Post Lining CCTV Inspection	3 days	Mon 8/11/36	Wed 8/13/36
87	Dismantle bypass	4 days	Thu 8/14/36	Tue 8/19/36
88	Site Cleanup/Restoration	5 days	Wed 8/20/36	Tue 8/26/36

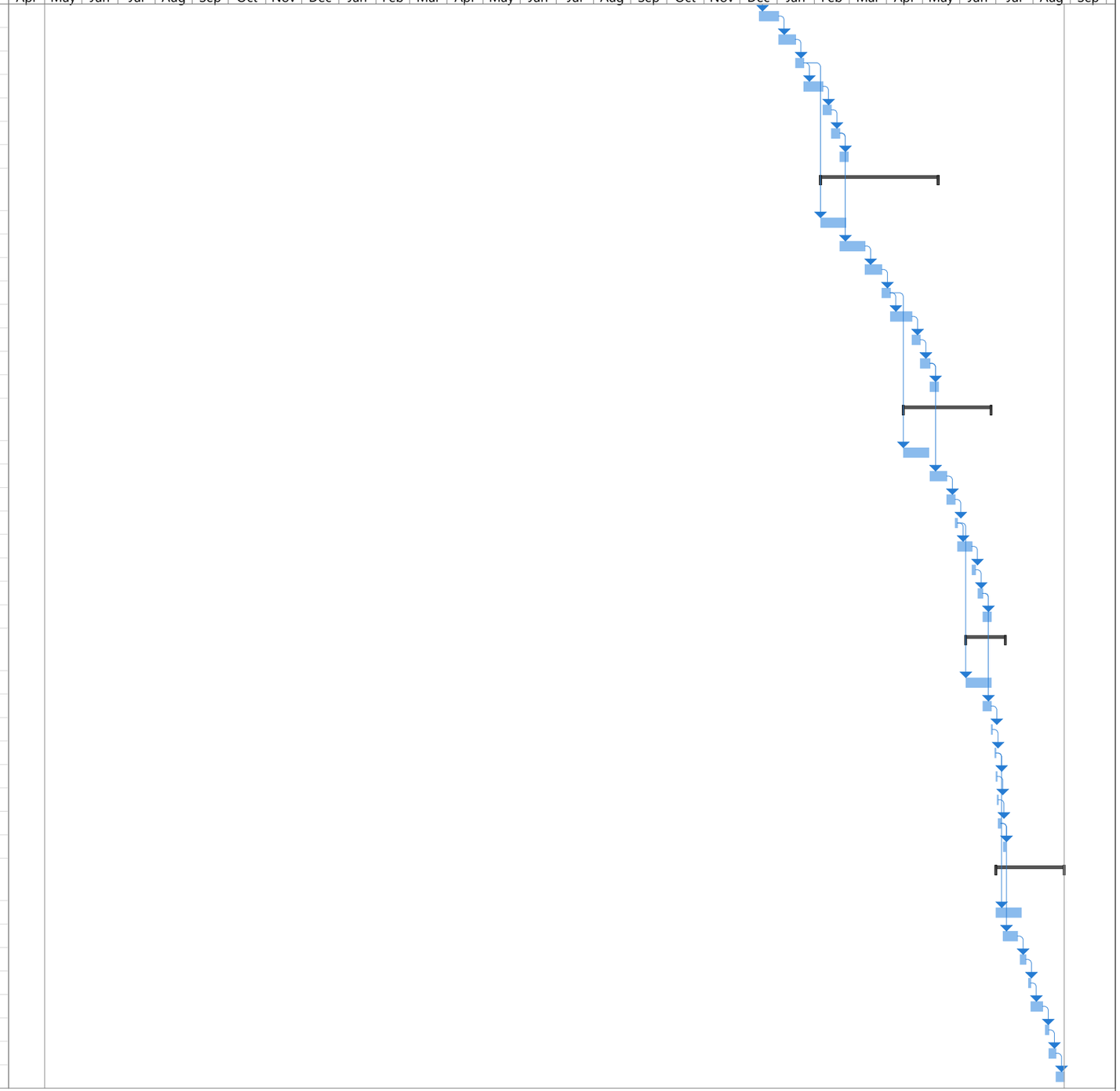


Figure 11. Reach 4D Contract 1 and 2 Recommended Long-Term Phase 2 Rehabilitation Project Schedule
2024-06-28

ID	Task Name	Duration	Start	Finish
0	**Reach 4D Phase 2 Rehabilitation**	**561 days**	**Mon 10/3/44**	**Mon 11/26/46**
1	**Task 1 - Project Management**	**1 day**	**Mon 10/3/44**	**Mon 10/3/44**
2	Notice to Proceed	1 day	Mon 10/3/44	Mon 10/3/44
3	**Task 2 - Preliminary Design**	**65 days**	**Wed 10/5/44**	**Wed 1/4/45**
4	Kickoff Meeting & Site Visit	0 days	Wed 10/5/44	Wed 10/5/44
5	Develop Design Memo	40 days	Thu 10/6/44	Wed 11/30/44
6	W&C QA/QC Review	3 days	Thu 12/1/44	Mon 12/5/44
7	Update Memo	5 days	Tue 12/6/44	Mon 12/12/44
8	Deliver Design Memo	0 days	Tue 12/13/44	Tue 12/13/44
9	SAWPA review	15 days	Wed 12/14/44	Tue 1/3/45
10	Design Memo review meeting	0 days	Wed 1/4/45	Wed 1/4/45
11	**Task 3 - Design Plans and Specifications**	**218 days**	**Thu 1/5/45**	**Mon 11/6/45**
12	Develop 60% Design Package	60 days	Thu 1/5/45	Wed 3/29/45
13	W&C QA/QC Review	5 days	Thu 3/30/45	Wed 4/5/45
14	Update 60% Design Package	10 days	Thu 4/6/45	Wed 4/19/45
15	Deliver 60% Design Package to SAWPA	0 days	Thu 4/20/45	Thu 4/20/45
16	SAWPA review	20 days	Fri 4/21/45	Thu 5/18/45
17	60% Design review meeting	0 days	Thu 5/18/45	Thu 5/18/45
18	Develop 90% Design Package	45 days	Fri 5/19/45	Thu 7/20/45
19	W&C QA/QC Review	5 days	Fri 7/21/45	Thu 7/27/45
20	Update 90% Design Package	10 days	Fri 7/28/45	Thu 8/10/45
21	Deliver 90% Design Package to SAWPA	0 days	Thu 8/10/45	Thu 8/10/45
22	SAWPA review	20 days	Fri 8/11/45	Thu 9/7/45
23	90% Design review meeting	0 days	Fri 9/8/45	Fri 9/8/45
24	Develop 100% Design Package	25 days	Mon 9/11/45	Fri 10/13/45
25	W&C QA/QC Review	5 days	Mon 10/16/45	Fri 10/20/45
26	Update 100% Design Package	10 days	Mon 10/23/45	Fri 11/3/45
27	Deliver 100% Design Package	0 days	Mon 11/6/45	Mon 11/6/45
28	**Task 4 -Bid and Construction Assistance**	**30 days**	**Wed 12/6/45**	**Tue 1/16/46**
29	Assist SAWPA during bidding	30 days	Wed 12/6/45	Tue 1/16/46
30	**Task 5 - Engineering Services During Construction**	**194 days**	**Tue 2/27/46**	**Mon 11/26/46**
31	Construction NTP	0 days	Tue 2/27/46	Tue 2/27/46
32	**Construction**	**194 days**	**Wed 2/28/46**	**Mon 11/26/46**
33	Submittals review	20 days	Wed 2/28/46	Tue 3/27/46
34	Measure Internal Diameter of segments (all segments)	10 days	Wed 2/28/46	Tue 3/13/46
35	Order/Delivery of Lining (for first bypass setup)	15 days	Wed 3/7/46	Tue 3/27/46
36	**Inspection and Lining MAS 4D-0290 to 4D-0360 - 2,106 ft (1st Bypass Setup) (4D-0300 to 4D-0310 won't be lined)**	**51 days**	**Wed 3/14/46**	**Wed 5/23/46**

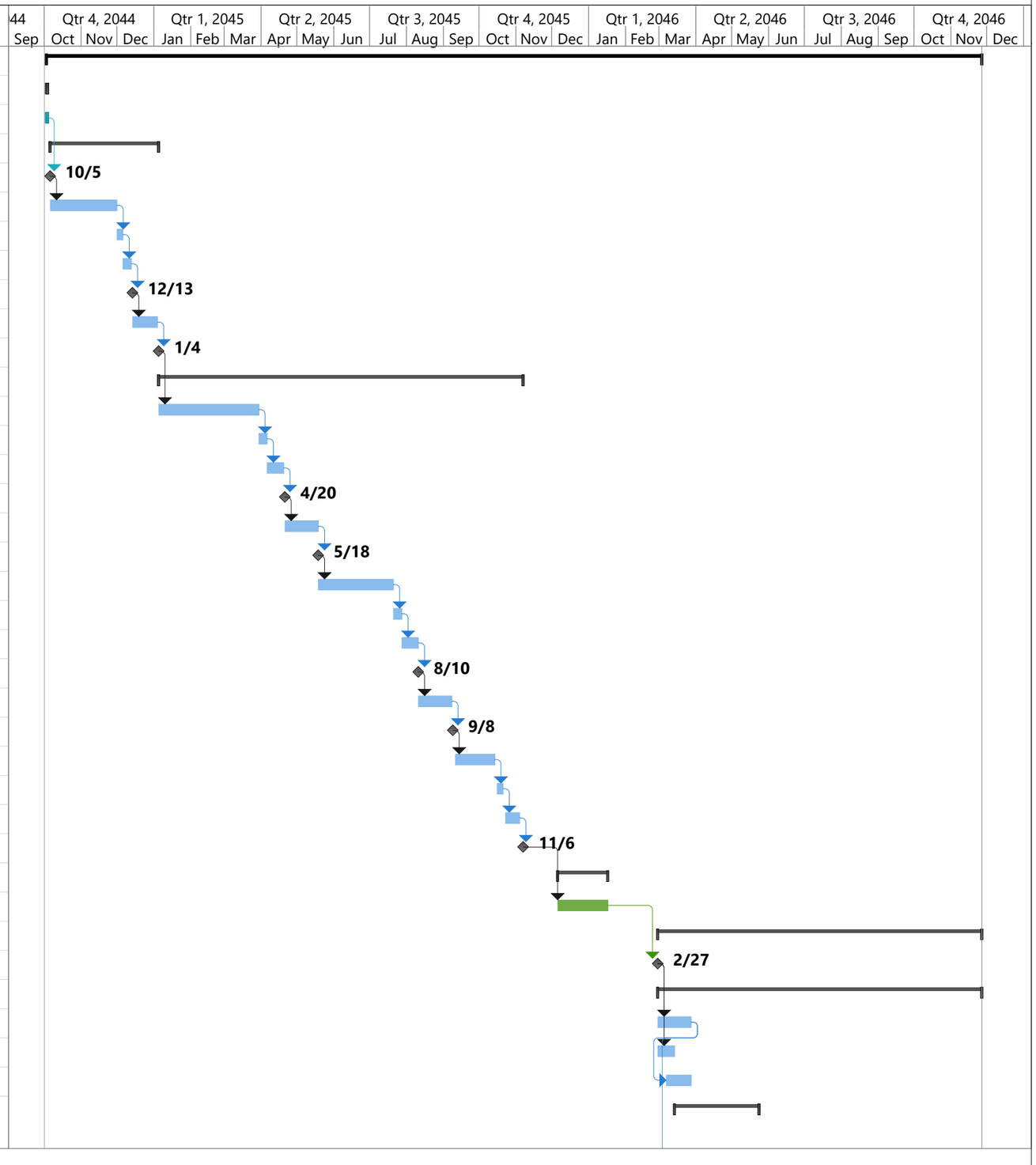
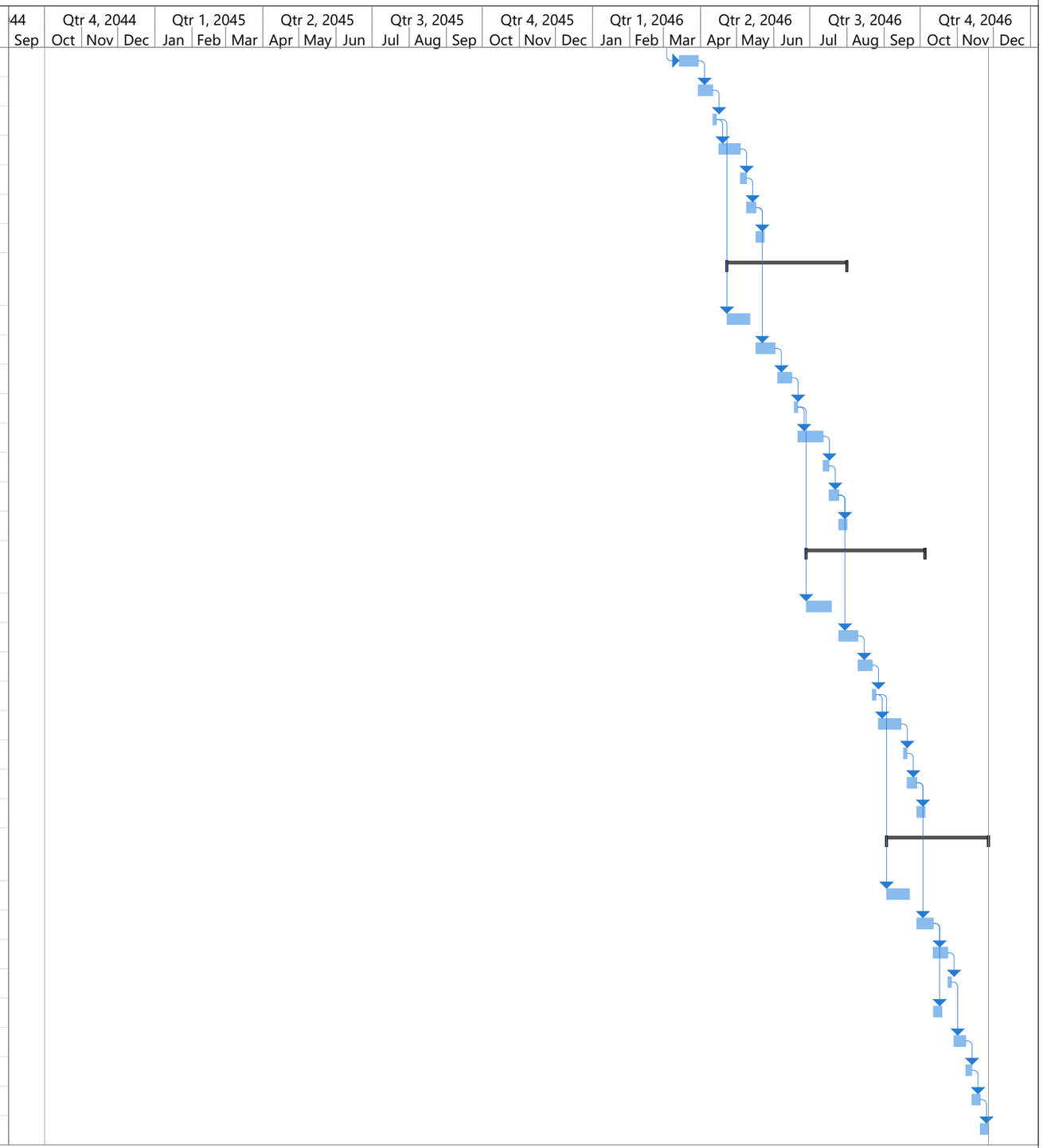


Figure 11. Reach 4D Contract 1 and 2 Recommended Long-Term Phase 2 Rehabilitation Project Schedule
2024-06-28

ID	Task Name	Duration	Start	Finish
37	Setup Bypass	12 days	Wed 3/14/46	Thu 3/29/46
38	Clean 6 Pipe Segments (Incl. Siphon Dewatering)	8 days	Fri 3/30/46	Tue 4/10/46
39	CCTV 6 Pipe Segments	3 days	Wed 4/11/46	Fri 4/13/46
40	Line 6 Pipe Segments	14 days	Mon 4/16/46	Thu 5/3/46
41	Post Lining CCTV Inspection	3 days	Fri 5/4/46	Tue 5/8/46
42	Dismantle bypass	6 days	Wed 5/9/46	Wed 5/16/46
43	Site Cleanup/Restoration	5 days	Thu 5/17/46	Wed 5/23/46
44	**Inspection and Lining MAS 4D-0160 to 4D-0230 - 4,666 ft (2nd Bypass Setup)**	**72 days**	**Mon 4/23/46**	**Tue 7/31/46**
45	Order/Delivery of Lining (for 2nd bypass setup)	15 days	Mon 4/23/46	Fri 5/11/46
46	Setup bypass	12 days	Thu 5/17/46	Fri 6/1/46
47	Clean 7 Pipe Segments	10 days	Mon 6/4/46	Fri 6/15/46
48	CCTV 7 Pipe Segments	3 days	Mon 6/18/46	Wed 6/20/46
49	Line 7 Pipe Segments	15 days	Thu 6/21/46	Wed 7/11/46
50	Post Lining CCTV Inspection	3 days	Thu 7/12/46	Mon 7/16/46
51	Dismantle bypass	6 days	Tue 7/17/46	Tue 7/24/46
52	Site Cleanup/Restoration	5 days	Wed 7/25/46	Tue 7/31/46
53	**Inspection and Lining MAS 4D-0090 to 4D-0150 - 2,896 ft (3rd Bypass Setup)**	**71 days**	**Thu 6/28/46**	**Thu 10/4/46**
54	Order/Delivery of Lining (for 3rd bypass setup)	15 days	Thu 6/28/46	Wed 7/18/46
55	Setup bypass	12 days	Wed 7/25/46	Thu 8/9/46
56	Clean 7 Pipe Segments	8 days	Fri 8/10/46	Tue 8/21/46
57	CCTV 7 Pipe Segments	3 days	Wed 8/22/46	Fri 8/24/46
58	Line 7 Pipe Segments	15 days	Mon 8/27/46	Fri 9/14/46
59	Post Lining CCTV Inspection	3 days	Mon 9/17/46	Wed 9/19/46
60	Dismantle bypass	6 days	Thu 9/20/46	Thu 9/27/46
61	Site Cleanup/Restoration	5 days	Fri 9/28/46	Thu 10/4/46
62	**Inspection and Lining MAS 4D-0010 to 4D-0060 - 2,424 ft (4th Bypass Setup)**	**61 days**	**Mon 9/3/46**	**Mon 11/26/46**
63	Order/Delivery of Lining (for 4th bypass setup)	15 days	Mon 9/3/46	Fri 9/21/46
64	Setup bypass	10 days	Fri 9/28/46	Thu 10/11/46
65	Clean 3 Pipe Segments (Incl. Siphon Dewatering)	8 days	Fri 10/12/46	Tue 10/23/46
66	CCTV 3 Pipe Segments	3 days	Wed 10/24/46	Fri 10/26/46
67	Excavate 1 temporary access pit	5 days	Fri 10/12/46	Thu 10/18/46
68	Line 3 Pipe Segments	8 days	Mon 10/29/46	Wed 11/7/46
69	Post Lining CCTV Inspection	3 days	Thu 11/8/46	Mon 11/12/46
70	Dismantle bypass	5 days	Tue 11/13/46	Mon 11/19/46
71	Site Cleanup/Restoration	5 days	Tue 11/20/46	Mon 11/26/46



APPENDIX A:

SAWPA Inland Empire Brine Line Reach IV-D Condition Assessment Report

Santa Ana Watershed Project Authority

Inland Empire Brine Line Reach IV-D Condition Assessment Report

Prepared for:

Justin Kraetsch, PE
Woodard & Curran
530 Technology Drive, Suite 100
Irvine, CA 92618

Date: May 2, 2024

Prepared by:

V&A consulting engineers

V&A Project No. 23-0225

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Abbreviations and Acronyms

Brine Line	Inland Empire Brine Line
CPR	Cardiopulmonary Resuscitation
CSE	Confined Space Entry
FT	Feet
JEC	Jamison Engineering Contractors
LOTO	Lockout/Tagout
MAS	Maintenance Access Structures
MG	Million Gallons
NASSCO	National Association of Sewer Service Companies
PACP	Pipeline Assessment Certification Program
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
SAWPA	Santa Ana Watershed Project Authority
SPR	Surface Penetrating Radar
UT	Ultrasonic Thickness
V&A	V&A Consulting Engineers, Inc.
VANDA®	VANDA® Concrete Condition Indices
W&C	Woodard & Curran

Executive Summary

V&A Consulting Engineers, Inc. (V&A) was retained by Woodard & Curran (W&C) for condition assessment services to support the Santa Ana Watershed Project Authority's (SAWPA) Inland Empire Brine Line Reach IV-D Condition Assessment Project. The Inland Empire Brine Line (Brine Line), which includes Reaches I, II, III, IV, IV-A, IV-B, IV-D. IV-E and V consist of approximately 93 miles of pipeline that was constructed to provide for a safe discharge of highly saline wastewater to protect the water quality of the Santa Ana River Watershed. The Brine Line carries the highly saline wastewater to a wastewater treatment plant in Huntington Beach that is operated by Orange County Sanitation District.

V&A performed a condition assessment of Reach IV-D on February 27-28, 2024. This report includes V&A's approach, findings, conclusions, and recommendations for the Reach IV-D segment. The condition assessment findings were compared to the findings from the 2018 and 2019 assessments performed by V&A.

The condition assessment indicated that the 270-degree liner termination is undermined and uplifted for Reach IV-D. The concrete surfaces currently lined were in good condition. The condition of the liner and concrete surfaces of the pipe segments was similar to the condition observed in 2018 and 2019. V&A recommends minor spot repairs on the existing lining and rehabilitating the exposed concrete invert to extend the useful life of the pipeline.

The condition assessment indicated the Reach IV-D MAS were in good condition. The condition of the liner and concrete surfaces of the MAS was similar to the condition observed in 2018 and 2019. V&A recommends minor spot repairs on the existing lining to seal holes and repair weld strips. At MAS 4D-0060, V&A recommends repairing the large void at the interface between the cone and the chimney by applying a repair mortar and performing a liner spot repair.

1 Introduction

V&A Consulting Engineers, Inc. (V&A) was retained by Woodard & Curran (W&C) for condition assessment services to support the Santa Ana Watershed Project Authority's (SAWPA) Inland Empire Brine Line Reach IV-D Condition Assessment Project. The Inland Empire Brine Line (Brine Line) includes Reaches I, II, III, IV, IV-A, IV-B, IV-D. IV-E and V. The Brine Line carries highly saline wastewater to a wastewater treatment plant in Huntington Beach that is operated by the Orange County Sanitation District.

The 21-mile Reach IV-D alignment, constructed between 1990 and 1995, incorporates reinforced concrete pipe (RCP), vitrified clay pipe, and high-density polyethylene pipes ranging between 36- to 42-inches in diameter. Reach IV-D was designed and constructed as part of six (6) separate contracts. This project is assessing Contracts 1 and 2 of the Reach IV-D alignment. Reach IV-D of the Contracts 1 and 2 alignments is comprised of approximately 37,000 linear feet (LF) of 42-inch RCP with 270-degree T-Lock PVC liner. The invert of the pipe is unlined. The Brine Line IV-D, Contract 1 and 2 alignment spans from the junction of California 83 and Pomona Rincon Road and turns east along Pine Avenue, Schleisman Road, Orange Street, Riverboat Drive and culminates at Hamner Avenue encompassing areas within the City of Chino and Eastvale in San Bernardino County.

V&A completed the confined space entry condition assessment of Reach IV-D on February 27-28th, 2024. The field work was performed at night during a planned shutdown that was coordinated by SAWPA and its member agencies. V&A entered the pipe at the seven (7) maintenance access structures (MAS) along the alignment, which were selected by W&C and SAWPA. The seven MAS were selected to match locations inspected in 2018 and 2019. All 7 MAS were previously inspected by V&A in 2018 and 2019. The purpose of the assessment was to determine the extent of lining and concrete degradation within the RCP and MAS in order to compare the findings to the 2018 and 2019 assessments and to provide recommendations for repairs and rehabilitation. V&A assessed the condition of Reach IV-D using the following methods:

- Background review of available records and existing documentation.
- Visual assessment.
- Removal of the liner to assess concrete underneath.
- Concrete feels test to assess the magnitude of concrete that has corroded at the interface with the T-lock liner.
- Concrete penetration test and sounding to characterize concrete surface degradation.
- Surface and at-depth pH measurements to characterize concrete surface degradation.
- Surface penetrating radar (SPR) to identify reinforcing steel depth and spacing in concrete.
- VANDA® concrete condition ratings.

An aerial view of the Reach IV-D alignment with the MAS entered by V&A is shown in Figure 1-1. This report includes V&A's approach, findings, conclusions, and recommendations for the Reach IV-D segment. The condition assessment findings were compared to the findings from the 2018 and 2019 assessments performed by V&A. CCTV of the pipeline was performed by SAWPA contractors; CCTV findings are not discussed in this report.

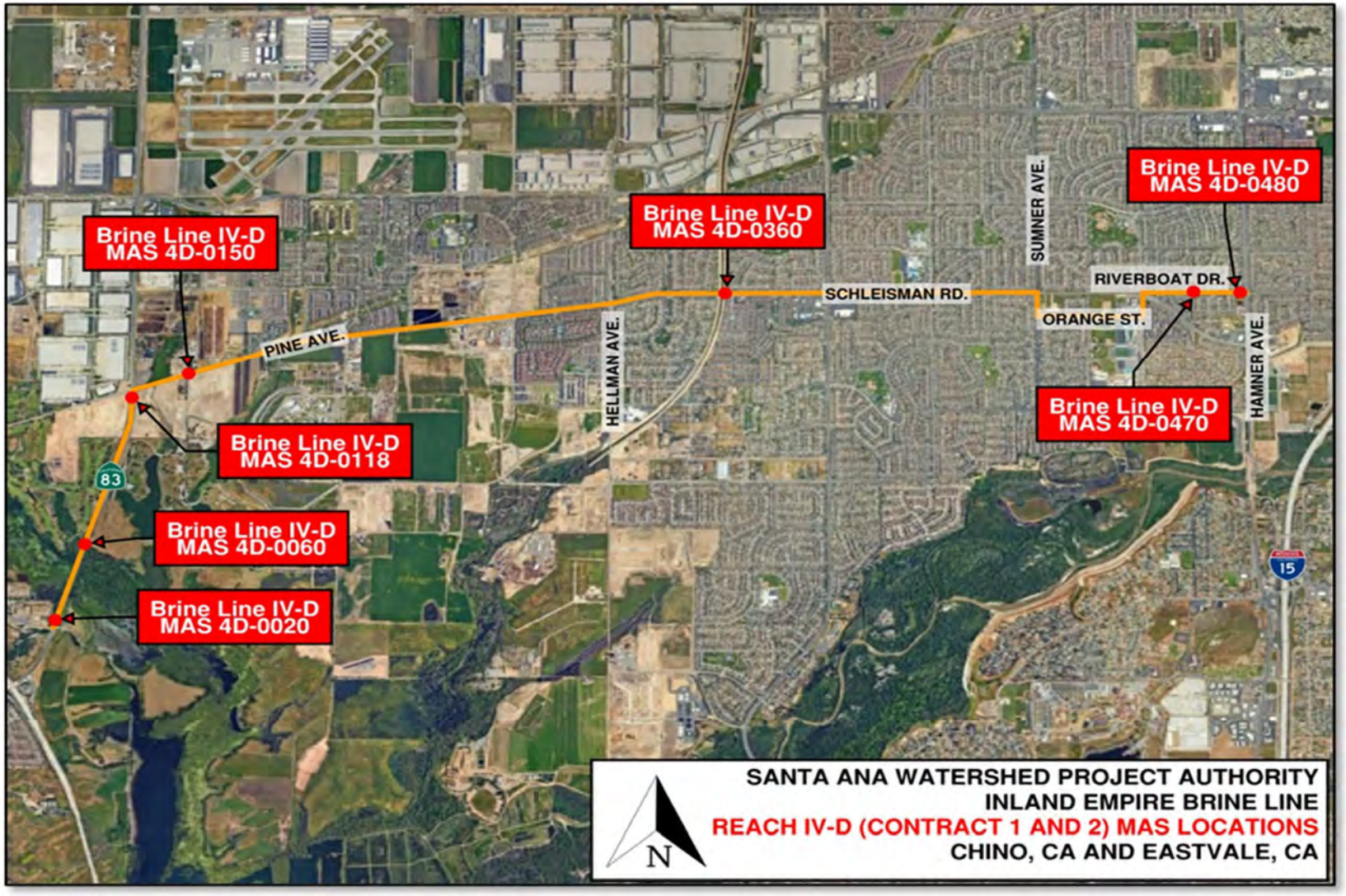


Figure 1-1. Reach IV-D Contract 1 and 2 MAS Locations

2 Approach

V&A used both qualitative and quantitative means to evaluate the condition of the pipes and MAS. The methods and techniques used to assess the condition of the Reach IV-D Brine Line are described in this section.

2.1 Document Review

Prior to performing the condition assessments, V&A reviewed available data provided by Woodard & Curran including the 1990 as-built drawings titled Santa Ana Watershed Project Authority, Santa Ana Regional Interceptor Reach IV-D from Contracts No. 1 and 2 and Euclid Avenue (Reach IVA and IVD) Maintenance Access Structure (MAS) Rehabilitation Project, June 2020, Project No. 7616.0013.

2.2 Health & Safety Plan

Prior to any on-site work at the Brine Line, V&A employees read and acknowledged the Brine Line Reach IV-D field work Health and Safety Plan. As with all projects, safety is of the highest priority and is an integral part of our work. V&A has developed an independent Health and Safety Program, which complies with federal and California Occupational Safety and Health Act (Cal/OSHA) regulations. V&A's field services staff were trained in CPR and First Aid, and certified for confined space entry.

2.3 Manned Entry Assessments

Manned entry assessments were performed by V&A with confined space entry support provided by Jamison Engineering Contractors (JEC). Table 2-1 identifies the access MAS and locations for the manned entry assessments.

Table 2-1. List of Access MAS & Coordinates Used for Manned Entry Assessments

MAS No.	Coordinates	Street
4D-0020	33°56'8.15"N 117°39'21.54"W	Pomona Rincon Rd. and S Euclid Ave
4D-0060	33°56'28.55"N 117°39'13.98"W	Euclid Ave.
4D-0118	33°57'11.10"N 117°39'0.70"W	Euclid Ave. and Pine Rd.
4D-0150	33°57'15.96"N 117°38'45.60"W	Pine Ave and Johnson Ave
4D-0360	33°57'39.13"N 117°36'4.63"W	Vernazza Pl. and Schleisman Rd.
4D-0470	33°57'39.26"N 117°33'45.67"W	Lancelot Dr. and Riverboat Dr.
4D-0480	33°57'39.25"N 117°33'30.35"W	Hamner Ave. and Riverboat Dr.

2.4 Visual Assessment

Qualitative evaluations of pipe segments and MAS were conducted from inside the MAS, focusing on the condition of exposed concrete surfaces. Cracks, delamination, corrosion, and other defects referenced in American Concrete Institute (ACI) 201.1R-92, "Guide for Making a Condition Survey of Concrete in Service" were documented with digital, still photographs. Clock positions noted in this report are facing in the downstream direction.

2.5 Concrete Assessment Methods

2.5.1 Pipe Lining and Concrete Surface Feel Tests

The pipe segments were constructed with a PVC lining system over the upper 270 degrees of the pipe (Figure 2-1). The PVC lining is embedded in the concrete pipe using T-shaped ribs. This type of system is commonly referred to as T-Lock. V&A determined if the lowermost PVC tee (the liner termination point) was still embedded in the concrete and if the concrete surrounding the tee had eroded, undermining the liner. The depth of concrete deterioration was measured at the liner termination point to evaluate the severity of liner undermining.

V&A also assessed the concrete surface behind the T-Lock liner at two locations for each of the seven evaluated pipe segments: one location near the pipe crown and one location below the pipe spring line. The concrete was exposed by cutting out a rectangle, removing the liner, assessing the concrete, and then repairing the liner. Condition assessment of the concrete included visual assessment, sounding, penetration testing, surface pH testing, and surface penetrating radar. V&A retained JEC for T-Lock liner repair.

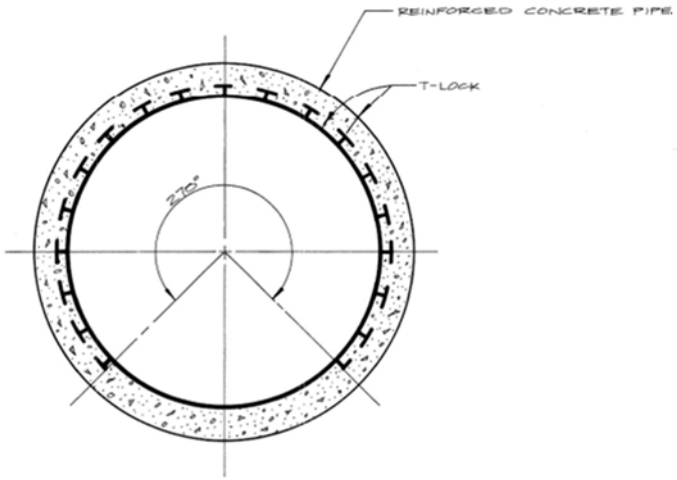


Figure 2-1. Reinforced Concrete Pipe with PVC (T-Lock) Liner
(Willdan Associates, Santa Ana Regional Interceptor Reach IV-D, Contract No. 1 – 3, 1990 Record Drawings)

2.5.2 Sounding

Sounding was performed at two (2) locations within the pipe at each confined space entry location to investigate shallow, subsurface discontinuities. Using a hammer to strike accessible concrete surfaces, the sound can indicate if defects such as voids, delamination, or honeycombing are present. The sound returned from solid concrete without subsurface discontinuities is a sharp "ping" noise. A "hollow" sound generally means a discontinuity exists beneath the sounding location. A soft "thud" typically results from deteriorated concrete.

2.5.3 Penetration Testing

Penetration testing was performed at two (2) locations within the pipeline at each confined space location to estimate the depth of degradation from the existing surface of concrete. Typically, as concrete deteriorates, the cement paste begins to lose alkalinity. A chipping hammer was used to remove loose and degraded material from the concrete surface until highly alkaline (solid) concrete is reached; the depth of the resulting cavity was measured. Unless the concrete has become soft and chalky, V&A's penetration testing typically does not exceed 1/2-in in depth. The correlation between

penetration measurements and concrete surface hardness is presented in Table 2-2.

Table 2-2. Concrete Surface Hardness Index

Penetration Depth (in.)	Surface Texture	Scaling[1]
< 1/16	Hard surface	No scaling
1/16 – 1/8	Softened surface and/or loose cementitious material	Light scaling
1/8 – 1/4	Soft surface and/or exposed and loose fine aggregate	Medium scaling
> 1/4	Soft paste and/or exposed and loose coarse aggregate	Severe scaling

(1) Scaling is defined by flaking or peeling away of near surface portion of hardened concrete or mortar, per ACI 201R, Condition Survey Guide.

2.5.4 Surface pH Measurements

V&A performed in-situ pH measurements on exposed concrete surfaces using a pH-sensitive pencil at up to two (2) locations within the pipeline at each confined space entry location. The pH of concrete exposed to brine water is commonly altered by carbonation and hydrogen sulfide-induced acid attack (biogenic corrosion). Concrete carbonation refers to the reaction of atmospheric CO_2 with cement hydrates in the concrete, which can lower the pH of the concrete to as low as 8.5. Carbonation is typically a slow process and is harmless until its depth reaches embedded reinforcing steel. Hydrogen sulfide-induced corrosion, on the other hand, can be an aggressive mechanism of concrete degradation where gaseous hydrogen sulfide is oxidized to sulfuric acid on surfaces within the sewer headspace. This process can severely deteriorate concrete and reduce the surface pH to as low as pH 1.

The surface pH of the concrete can indicate the rate of concrete deterioration due to environmental exposure. The generally accepted ranges for corrosion categories and surface pH values are listed below:

- **Severe Corrosion.** This category of concrete corrosion is characterized by significant measurable concrete loss or active corrosion. There is exposed aggregate and occasionally exposed reinforcing steel. The original concrete surface is not distinguishable. The surface is covered with soft, pasty corrosion products where active scouring is not present. There is generally a depressed wall pH (< 3.0), indicating active corrosion.
- **Moderate Corrosion.** This category of concrete corrosion is characterized by some concrete loss with aggregate slightly exposed, but the original concrete surface is still distinguishable. The surface may have a thin covering of pasty material which is easily penetrated. There is generally a depressed wall pH (< 5.0) indicating moderately corrosive conditions.
- **Light Corrosion.** This category of concrete corrosion is characterized by a slightly depressed pH (< 6.0) and a concrete surface that can be scratched with a sharp instrument under moderate hand pressure with the removal of some concrete material. The original concrete surface is fully recognizable, and aggregate may or may not be exposed.
- **Negligible Corrosion.** This category of concrete corrosion is characterized by normal pH ranges (6.0-14.0) and a normal concrete surface which cannot be penetrated or removed by a sharp instrument under moderate hand pressure. The surface of the concrete may have biological growth and moisture, but the concrete is normal and the aggregate is not exposed.

Concrete pH levels below 10 at the depth of reinforcing steel bars can cause corrosion of the bars.

2.5.5 Surface Penetrating Radar

Concrete cover depth is an essential element in the corrosion protection of reinforced concrete

structures. The greater the thickness of the concrete cover, the less likely corrosive constituents have reached the embedded reinforcing steel.

Per ACI 350-06, "Code Requirements for Environmental Engineering Concrete Structures," the minimum concrete cover depth for corrosion protection of reinforcing steel in formed concrete surfaces exposed to earth, water, sewage, weather, or in contact with the ground, should be at least 2-in.

Surface penetrating radar was used at one (1) location within the pipeline or MAS to measure the depth and spacing of reinforcing steel and investigate coarse voids and defects within the evaluated concrete walls. Scanning is typically performed over a 3-ft by 3-ft area, and a radar beam scans up to 16-in into the concrete. The unit generates a 2-dimensional image of the underlying concrete member based on the measured radar reflections. The depth and spacing measurements have an accuracy of up to 1/4-in. Figure 2-2 shows a sample two-dimensional image of the SPR scan with the distance scanned plotted on the x-axis and the depth scanned plotted on the y-axis.

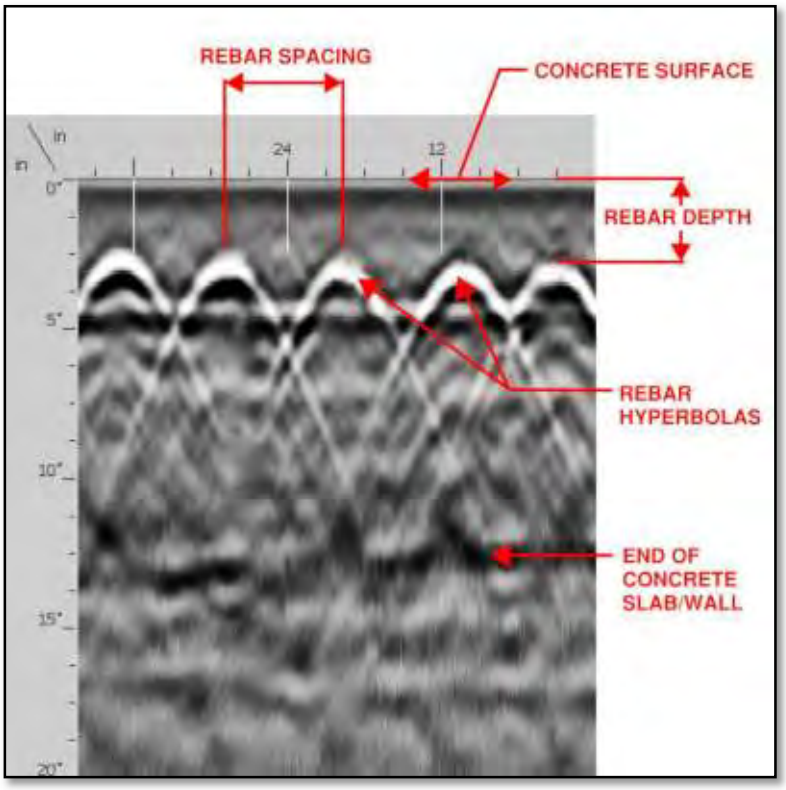


Figure 2-2. Sample Surface Penetrating Radar Scan.

Per ASTM C76, “Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe,” the minimum wall thickness of 42-inch internal diameter pipe varies between 3.50 and 5.25 inches depending on the pipe class. AWWA C302, “Reinforced Concrete Pressure Pipe, Noncylinder Type” and ASTM C76 recommend a minimum distance between the circumferential reinforcement and the interior surface of the pipe of 1 inch when the wall thickness exceeds 2.5 and 3 inches, respectively. Per AWWA C302, for piping with a wall thickness of 3 inches or more, the maximum center-to-center spacing for circumferential reinforcement is three-fourths of the wall thickness or 4 inches, whichever is smaller. The assumed pipe segment design information used for the condition assessment analysis is presented in Table 2-3.

Table 2-3. Assumed 42-inch Reinforced Concrete Pipe Design Information

MH	D-Load Design Req. (psi)[a]	Assumed Pipe Class[b]	Assumed Wall Thickness (in.)[b]	Assumed Min. Concrete Cover (in.)[b]	Assumed Min. Circumferential Rebar Spacing (in.)[b]
4D-0020	3,500	V	5.25	1.00	3.94
4D-0060	2,250	IV			
4D-0118	2,250	IV			
4D-0150	2,800	IV			
4D-0360	2,200	IV			
4D-0470	1,700	III			
4D-0480	1,700	III			

(a) Per Willdan Associates, Santa Ana Regional Interceptor Reach IV-D, Contract No. 1 – 3, 1990 Record Drawings.
(b) Per ASTM C76, AASHTO M170, and AWWA C302.

2.6 VANDA® Concrete Condition Index

V&A created the VANDA® Concrete Condition Index (Table 2-4) to provide consistent reporting of corrosion damage based on objective criteria. Concrete condition was rated from Level 1 to Level 5 based upon field observations and measurements, with Level 1 indicating little or no damage and Level 5 indicating severe damage. The individual criteria were applied based on engineering judgment to arrive at the overall rating.

Table 2-4. VANDA® Concrete Condition Index

Condition Rating	Description	Representative Photograph
Level 1	**Little or no damage to concrete** ▪ Hardness..... hard surface ▪ Surface profile ..... smooth, apparently intact ▪ Cracks ..... hairline width, minimal frequency ▪ Spalling ..... none ▪ Reinforcement ..... not exposed or damaged	
Level 2	**Minor surface damage** ▪ Hardness..... soft surface layer to 1/8-inch depth ▪ Surface profile ..... fine aggregate exposed ▪ Cracks ..... hairline width, moderate frequency ▪ Spalling ..... shallow spalling, minimal frequency ▪ Reinforcement ..... not exposed or damaged	
Level 3	**Moderate surface damage** ▪ Hardness..... soft surface layer to 1/4-inch depth ▪ Surface profile ..... large aggregate exposed or protruding ▪ Cracks ..... up to 1/32-inch width, moderate frequency ▪ Spalling ..... shallow spalling, minimal frequency ▪ Reinforcement ..... exposed; minor damage, minimal frequency	
Level 4	**Loss of concrete mortar and damage to reinforcement** ▪ Hardness..... soft paste beyond 1/4-inch depth ▪ Surface profile ..... large aggregate exposed, loose, or missing ▪ Cracks ..... 1/8- to 1/4-inch width, moderate frequency ▪ Spalling ..... deep spalling, moderate frequency ▪ Reinforcement ..... exposed with damage, moderate frequency	
Level 5	**Bulk loss of concrete and reinforcement** ▪ Hardness..... soft paste beyond 1-inch depth ▪ Surface profile ..... large aggregate exposed, loose, or missing ▪ Cracks ..... over 1/2-inch width, or narrower and frequent ▪ Spalling ..... deep spalling, high frequency ▪ Reinforcement ..... consumed; loss of structural integrity	

3 Findings

After coordinating with SAWPA to isolate and lockout all discharges into Reach IV-D, V&A performed confined space entries into MAS 4D-0020, 4D-0060, 4D-0118, 4D-0150, 4D-0360, 4D-0470, and 4D-0480 to assess the condition of the MAS as well as the upstream and downstream RCP and lining within five (5) feet of each MAS. The findings, including a comparison to the 2018 and 2019 findings, are discussed below; it should be noted that V&A updated the proprietary VANDA® rating system to a 5-point system in 2020.

3.1 Visual Assessment

3.1.1 Pipe Segments

Visual assessment findings for the pipe segments are summarized in Table 3-1. Representative photos of observation types are shown in Photo 3-1 through Photo 3-6. Complete observations and field data for each evaluated pipe segment and MAS are presented in Appendix A.

The visual assessment indicated the 270-degree liner termination was undermined and uplifted, and the unlined concrete invert was moderately deteriorated. The concrete surfaces still lined, however, were in good condition, despite minor unopened blisters, several failed weld strips, and small lining failures.

Table 3-1. Visual Assessment Summary – Reach IV-D Pipe Segments

MAS	Liner				Concrete		General	
	Blisters / Bulges	Failed Weld Strips	Termination Undermined	Termination Uplifted	Exposed Aggregate	Exposed Rebar	Slime Layer	Debris
4D-0020	X		X				X	
4D-0060	X	X	X	X	X		X	
4D-0118	X	X	X					
4D-0150	X		X	X	X		X	
4D-0360	X		X	X	X		X	
4D-0470	X		X	X	X	X	X	X
4D-0480							X	X

Photo 3-1. Typical lining blisters.

Photo 3-2. Failed weld strip (seen at 4D-0060 and 4D-0118).

Photo 3-3. Typical lining termination undermined and unembedded.

Photo 3-4. Reinforcement corrosion staining (only seen at 4D-0470)

Photo 3-5. Typical exposed concrete aggregate.

Photo 3-6. Typical slime layer.

3.1.2 Maintenance Access Structures (MAS)

Visual assessment findings for the MAS are summarized in Table 3-2. Representative photos of

observation types are shown in Photo 3-7 through Photo 3-12. Complete observations and field data for each evaluated pipe segment and MAS are presented in Appendix A.

The visual assessment indicated the MAS were still lined and in good condition, despite minor unopened blisters, several failed weld strips, and small lining failures. The condition of the liner and concrete surfaces of the MAS was found to be similar to the condition observed in 2018.

Table 3-2. Visual Assessment Summary – MAS

MAS	*Rim*	*Cone*	*Walls*	*Bench*	*Main Pipe Connection*	*Lateral Penetrations*	*Channel*
4D-0020	Rim and lining in good condition	Composite material in good condition	Liner in good condition	Good condition	Good condition	Good condition	Slime layer, minor exposed concrete aggregate
4D-0060	Rim and lining in good condition	PVC lining in good overall condition, 6-in^3 of missing concrete in one location	Liner in good condition	Good condition	Good condition	Good condition, plugged	Slime layer, exposed concrete aggregate
4D-0118	Rim and lining in good condition	Liner in good condition	Liner in good overall condition, failed weld strip at bottom of structure, infiltration at liner joint	8-in x 5-in area of liner failure on bench wall. A second layer of PVC is still protecting the concrete	Good condition	Heavy mineral deposits coming from drop-inlet	Slime layer, minor exposed concrete aggregate
4D-0150	Rim and lining in good condition	Blisters typical	Blisters typical	Good condition	Good condition	Good condition	Slime layer, exposed concrete aggregate
4D-0360	6-in cut-in liner near rim	½-in puncture in lining at one location	Blisters typical	Good condition	Good condition	Good condition	Slime layer, exposed concrete aggregate
4D-0470	Rim and lining in good condition	Liner is in good condition. Small 3-in cut found	Liner embedded. Blisters around throughout wall	Liner not embedded in bench. Concrete remained covered	Good condition with minor abrasion at lining joint	Small tear in south flap. Flaps appear operable. Liner in good condition	Liner embedded with blisters throughout. Minor cuts in liner were observed
4D-0480	Rim and lining in good condition	Liner in good condition	Liner in good condition	Bench in good condition. Layer of sediment observed	Good condition	Good condition	Good condition, slime layer

Photo 3-7. Typical failed weld strip.

Photo 3-8. Typical blisters in lining on MAS walls.

Photo 3-9. Cut in liner (only seen at 4D-4360 and 4D-0470).

Photo 3-10. Typical termination at pipe and MAS interface.

Photo 3-11. Typical exposed aggregate in channel.

Photo 3-12. Typical exposed aggregate in channel.

3.2 Lining and Concrete Assessment

Using the methods described in Section 2.5, V&A evaluated the liner termination point for the T-lock liner within the pipe segments connected to each accessed MAS. Assessment results are summarized in Table 3-3 and are presented in Appendix A for the piping at each of the accessed MAS.

Results typically indicated the concrete surface has moderately deteriorated at the liner termination. Moderate deterioration means the concrete has exposed aggregate, limited or no cover over reinforcement, and that the termination point of the PVC liner may be compromised. Based on visual observations and field testing, the worst-case condition of the concrete reinforcement appeared to be only minor damage. Minor damage means that corrosion staining is present, but the reinforcement is not exposed and there is no spalling of the surrounding concrete Condition assessment results indicated the liner termination may be almost or is already uplifted for the remainder of the Reach IV-D pipeline.

Table 3-3. Condition Summary – Pipe Liner Termination Point

MH	Pipe	Liner		Concrete	
		Termination Condition	Uplifted Liner Length (in.)[(a)]	Deterioration Depth (in.)	VANDA Rating
4D-0020	Influent	Embedded, yet undermined	n/a	1/4 – 1/2	2
4D-0020	Effluent	Embedded, yet undermined	n/a	1/4 – 1/2	2
4D-0060	Influent	Uplifted and undermined	n/a	1 – 1-1/2	3
4D-0060	Effluent	Uplifted and undermined	2	1/4 – 1/2	2
4D-0118	Influent	Embedded, yet undermined	n/a	1/4 – 1/2	2
4D-0118	Effluent	Embedded, yet undermined	n/a	1/4 – 1/2	2
4D-0150	Influent	Uplifted and undermined	1	1/2 – 3/4	3
4D-0150	Effluent	Uplifted and undermined	1	1/4 – 1/2	3
4D-0360	Influent	Uplifted and undermined	1 – 1-1/2	1/2 – 1	3
4D-0360	Effluent	Uplifted and undermined	2 – 3	1/2 – 1	3
4D-0470	Influent	Uplifted and undermined	2	1-5/16	3 – 4
4D-0470	Effluent	Embedded and not undermined	n/a	1/2	3
4D-0480	Influent	N/A (Vitrified Clay Pipe)	n/a	n/a	n/a
4D-0480	Effluent	Embedded and not undermined	n/a	Negligible	1

(a) Uplifted liner length measured from lower termination of 270-degree pipe liner towards the 3:00 or 9:00 position.

V&A evaluated the concrete surfaces beneath the cut liner using visual assessment, sounding to investigate for shallow subsurface discontinuities, pH measurements to evaluate environment corrosivity, and penetration depth measurements to evaluate surface hardness. In-situ concrete surface testing results are summarized in Table 3-4 and are presented in Appendix A for each accessed MAS. Based on the surface evaluation results, the concrete surfaces were rated VANDA 1 to 3. With the exception of the liner tear and exposed concrete at the crown of the 4D-0060 influent pipe, results indicated the lined concrete appeared to be well protected from the corrosive environment and in good condition at the assessed portions of Reach IV-D.

Table 3-4. Condition Summary – Concrete Behind Pipe Liner

MAS	Pipe	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
4D-0020	Influent	Hard	Solid	12	1/16	1
4D-0020	Influent	Hard	Solid	12	1/16	2
4D-0060[1]	Influent	Softened	Solid	9	3/16	3
4D-0060	Influent	Hard	Solid	12	1/16	1
4D-0118	Effluent	Hard	Solid	12	1/16	1
4D-0118	Effluent	Hard	Solid	12	1/16	1
4D-0150	Effluent	Hard	Solid	12	1/16	1
4D-0150	Effluent	Hard	Solid	12	1/16	1
4D-0150[2]	Influent	Exposed Aggregate	Solid	8 (At-Depth pH)	1/16	3
4D-0360	Effluent	Hard	Solid	12	1/16	1
4D-0360	Effluent	Hard	Solid	12	1/16	1
4D-0360[2]	Influent	Exposed Aggregate	Solid	13 (At-Depth pH)	1/8	3
4D-0470	Influent	Hard	Solid	10	1/16	1
4D-0470	Influent	Hard	Solid	10	1/16	1
4D-0480	Effluent	Hard	Solid	11	1/16	1
4D-0480	Effluent	Hard	Solid	11	1/16	1

[1]Testing performed at location where liner had failed and concrete was exposed.

[2]Testing performed below liner. Surface pH could not be measured due to dirty surface. At-depth pH measurements taken.

V&A performed SPR scans on the pipe segments chosen to cut the liner and perform in-situ concrete testing. The SPR results for the pipe segments are summarized in Table 3-5. The following observations were indicated by the scans:

1. The average concrete cover appeared to be thicker than the minimum 1-inch requirement discussed in Section 2.5.5.
2. The average center-to-center spacing for the circumferential reinforcement appeared to be less than the maximum requirement discussed in Section 2.5.5.
3. The pipe appeared to be manufactured with one mat of circumferential (C) and longitudinal (L) reinforcing bars.
4. The concrete walls appeared to be approximately 6-inches thick.

Table 3-5. Surface Penetrating Radar Summary – Pipe Segments

MH	Scan Location	Bar Dir.[a]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
4D-0020	Effluent Pipe 3:00	C	2.5	1.8	1.1	10.8	3.0	1.6
4D-0020	Effluent Pipe 11:00 – 4:00	L	1.6	1.5	1.2	11.4	3.7	1.9
4D-0060	Influent Pipe 5:00	C	5.1	3.8	2.9	4.4	2.3	1.6
4D-0060	Influent Pipe 12:00 – 4:00	L	2.7	2.1	1.6	24.0	8.9	4.0
4D-0118	Effluent Pipe 3:00	C	2.3	2.2	2.2	*[b]	*	*
4D-0118	Effluent Pipe 11:00 – 4:00	L	2.8	2.2	1.5	6.0	5.2	4.1
4D-0150	Effluent Pipe 1:00, 3:00, 9:00	C	4.2	3.4	2.5	2.9	2.4	2.1
4D-0150	Effluent Pipe 12:00 – 4:00	L	3.4	2.4	1.5	6.3	4.5	1.3
4D-0360	Effluent Pipe 2:30, 3:30	C	3.8	3.5	3.2	2.4	2.2	1.8
4D-0360	Effluent Pipe 11:00 – 3:00	L	3.3	2.5	1.7	17.4	7.8	4.1
4D-0470	Effluent Pipe 3:00	C	3.4	3.3	3.2	3.3	2.5	1.8
4D-0470	Effluent Pipe 4:00 – 11:00	L	4.1	2.5	1.5	13.3	7.5	4.5
4D-0480	Effluent Pipe 3:00	C	2.9	2.7	2.6	2.8	2.6	2.3
4D-0480	Effluent Pipe 11:00 – 4:00	L	2.3	1.7	0.8	13.0	11.3	9.4

(a) C = Circumferential, L = Longitudinal

(b) Spacing could not be calculated because only a single Circumferential Bar was scanned.

3.3 Condition Comparison to 2018 and 2019 Assessments

The seven (7) MAS were assessed in 2018 and 2019, and reassessed in 2024. V&A compared the visual assessment and field testing findings from the 2018 and 2019 assessments to the 2024 assessments. The pipe segments and MAS appeared to be in similar condition as in 2018 and 2019. The liner termination condition within the pipe segments matched the conditions observed in 2018 and 2019, and the deterioration depth of the concrete at the pipe liner termination point was within 1/16-inch of the deterioration depths recorded in 2018 and 2019. The condition of the concrete surfaces beneath the cut liner locations also matched the conditions observed in 2018 and 2019. The rate of degradation is considered mild considering there has been between 0-inch to 1/16-inch of concrete loss over the last five years.

4 Conclusions and Recommendations

Based on the condition assessment results, V&A presents the following conclusions and recommendations for the pipeline and MAS. Recommendations are only intended for the evaluated MAS and pipe segments. V&A assumed condition ratings and recommendations provided in this report would be used by others in conjunction with the CCTV video to extrapolate condition ratings to other portions of the pipeline and develop overall recommendations.

4.1 Remaining Service Life Estimates

V&A presents remaining service life estimates in Table 4-1 for the MAS and pipe segments that V&A entered and evaluated. The MAS is considered the portion of the structure above the tied in pipe segment, as shown in Figure 4-1. Service life is defined as the expected length of time an asset is projected to last based on current conditions with the assumption that conditions will stay the same over time. If repairs or rehabilitation are implemented, this can extend the useful life, or the expected length of time an asset is projected to last based on current conditions with management to control known conditions to prolong the service life. Service life considered the factors noted in the table: lining condition, concrete condition (both lined and unlined), and hydraulic (water level) condition.

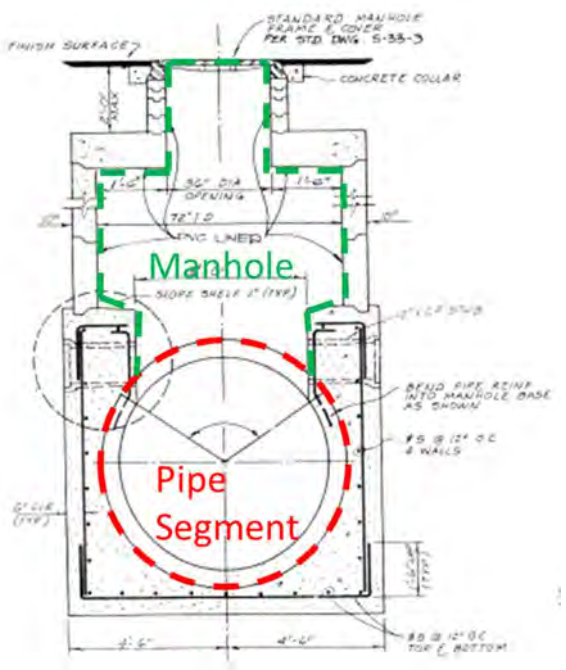


Figure 4-1. Standard Manhole Detail – Section View
(Willdan Associates, Santa Ana Regional Interceptor Reach IV-D, Contract No. 1 – 3, 1990 Record Drawings)

Table 4-1. Remaining Service Life Estimates for V&A Evaluated Structures

	Manhole Structure	Influent Pipe	Effluent Pipe
MAS 4D-0020			
Lining Condition[a]	Good condition	Termination point undermined	Termination point undermined
Concrete Condition[b]	Lined (VANDA 1)	Lined (VANDA 1) Channel (VANDA 2)	Lined (VANDA 1) Channel (VANDA 2)
Typical Water Level[c]	Above liner termination	Above liner termination	Above liner termination
Remaining Service Life Estimate[d]	30+	15 – 20	15 – 20
MAS 4D-0060			
Lining Condition[a]	Minor damage	Termination point uplifting	Termination point uplifting
Concrete Condition[b]	Lined (VANDA 1)	Lined (VANDA 1) Channel (VANDA 3)	Lined (VANDA 1) Channel (VANDA 2)
Typical Water Level[c]	Above liner termination	Above liner termination	Above liner termination
Remaining Service Life Estimate[d]	20 – 30	10 – 15	15 – 20
MAS 4D-0118			
Lining Condition[a]	Minor damage	Termination point undermined	Termination point undermined
Concrete Condition[b]	Lined (VANDA 1)	Lined (VANDA 1) Channel (VANDA 2)	Lined (VANDA 1) Channel (VANDA 2)
Typical Water Level[c]	Above liner termination	Above liner termination	Above liner termination
Remaining Service Life Estimate[d]	20 – 30	15 – 20	15 – 20
MAS 4D-0150			
Lining Condition[a]	Good condition	Termination point uplifting	Termination point uplifting
Concrete Condition[b]	Lined (VANDA 1)	Lined (VANDA 1) Channel (VANDA 3)	Lined (VANDA 1) Channel (VANDA 3)
Typical Water Level[c]	Above liner termination	Above liner termination	Above liner termination
Remaining Service Life Estimate[d]	30+	10 – 15	10 – 15
MAS 4D-0360			
Lining Condition[a]	Minor damage	Termination point uplifting	Termination point uplifting
Concrete Condition[b]	Lined (VANDA 1)	Lined (VANDA 1) Channel (VANDA 3)	Lined (VANDA 1) Channel (VANDA 3)
Typical Water Level[c]	Above liner termination	Above liner termination	Above liner termination
Remaining Service Life Estimate[d]	20 – 30	10 – 15	10 – 15

	Manhole Structure	Influent Pipe	Effluent Pipe
MAS 4D-0470			
Lining Condition[a]	Minor damage	Termination point uplifting	Termination point undermined
Concrete Condition[b]	Lined (VANDA 1)	Lined (VANDA 1) Channel (VANDA 3-4)	Lined (VANDA 1) Channel (VANDA 3)
Typical Water Level[c]	Above liner termination	Above liner termination	Above liner termination
Remaining Service Life Estimate[d]	20 – 30	5 – 10	5 – 10
MAS 4D-0480			
Lining Condition[a]	Good condition	N/A (Vitrified Clay Pipe)	Good condition
Concrete Condition[b]	Lined (VANDA 1)	N/A (Vitrified Clay Pipe)	Lined (VANDA 1) Channel (VANDA 1)
Typical Water Level[c]	Above liner termination	N/A (Vitrified Clay Pipe)	Above liner termination
Remaining Service Life Estimate[d]	30+	30+	30+

(a) Only significant defects that would compromise liner function noted.
(b) Condition noted for lined and unlined concrete surfaces.
(c) Only used to evaluate physical condition, not hydraulic condition.
(d) Based on physical condition of the MAS and pipe segments within five feet of the MAS. Operation, level of service, and economic failure modes may affect results.

4.2 Reach IV-D Pipe Segments

The condition assessment indicated the 270-degree liner termination was undermined and uplifted, and the unlined concrete invert was moderately deteriorated. The concrete surfaces still lined, however, were in good condition, despite minor unopened blisters, several failed weld strips, and small lining failures. The condition of the liner and concrete surfaces of the pipe segments was found to be similar to the condition observed in 2018 and 2019. It is recommended that close attention is paid to CCTV footage for similar observations in the unentered pipe segments. V&A recommends performing the following three actions:

1. Maintaining the flow inside the pipe so that the lower termination edge is continuously immersed and not exposed to the headspace in the pipe.
2. Repair and line the exposed concrete invert to extend the useful life of the pipeline. Lining considerations are discussed in Section 4.4.
3. Perform minor liner spot repairs to seal holes and repair weld strips. Lining considerations are discussed in Section 4.4.

4.3 Reach IV-D MAS

The condition assessment indicated the MAS were still lined and in good condition despite minor unopened blisters, several failed weld strips, and small lining failures. The condition of the liner and concrete surfaces of the MAS was found to be similar to the condition observed in 2018 and 2019. V&A recommends the following:

1. For MAS 4D-0060, repair the large void at the interface between the cone and the chimney. Restore concrete to original surface by applying a repair mortar and perform a liner spot repair.

No other action is recommended for the assessed MAS at this time. It is recommended that close attention is paid to CCTV footage for similar observations in the unentered MAS. V&A recommends minor liner spot repairs to seal holes and repair weld strips. Lining considerations are discussed in Section 4.4.

4.4 Lining Considerations

A successful lining project depends on selecting products that fit the field conditions. A few options for rehabilitating the Reach IV-D pipe segments and MAS are presented in this section.

4.4.1 Flow Bypass

The candidate concrete lining systems will require the pipeline to be isolated and dewatered to allow surfaces to be prepared and coated in a dry environment. Flow will need to be diverted out of the pipeline using bypass pumps and piping. Flow bypass will not be needed for minor spot repairs in the MAS.

4.4.2 Cured-in-Place Pipe

Cured-in-place pipe (CIPP) is a common trenchless pipeline renewal method. The CIPP method involves a liquid thermostat resin-saturated material that is inserted into the host pipeline and then inflated. Several advantages and limitations of CIPP are listed below. Typically, CIPP design is intended to extend useful life by 50 years.

Advantages

- Jointless system creating a smooth interior surface, which may improve flow capacity of the host pipe.
- Only slight decrease in internal diameter.

Limitations

- Laterals would have to be restored after host pipe is restored.
- Maximum pipe bend able to be accommodated is 45 degrees.
- Excavation may be required for host pipe access.
- Defects in the host pipe may cause defects in the CIPP, such as obstructions and protrusions.

4.4.3 Slip Lining (HDPE or Fusible PVC)

Slip lining is one of the oldest forms of trenchless pipe renewal. The slip lining method involves accessing the pipeline at strategic locations within the system and inserting fused HDPE or PVC pipe sections joined into a continuous pipe. Several advantages and limitations of slip lining are listed below. The slip line design life depends on the pipe material used. Typically, PVC or HDPE pipe have a design life of 50 years.

Advantages

- Long, maintenance-free service life.
- Pipe material is rugged and durable.
- Hydraulic conditions remain virtually unchanged with time.

- Compared to open trench construction, excavation is limited to sending/receiving pits and making connections to appurtenances.
- Bottle-tight joints result in reduced risk of infiltration and exfiltration.
- Smooth constant outside diameter results in lower forces required to insert pipe into deteriorated pipelines.
- Minimum confined space entries will be required.

Limitations

- Laterals would have to be restored after host pipe is restored.
- Sending and receiving pits will be long and deep due to the pipe diameter.
- Construction staging and laydown areas will be required to accommodate storage of the pipe prior to inserting into the host pipe.
- Potential reduction in the flow capacity of the host pipe.

4.4.4 Spray-Applied Polyurethane Coating

Another option to rehabilitate the unlined channel is to clean and resurface the substrate and then install a spray-applied polyurethane coating. Depending on the length of pipe to rehabilitate, this approach may be very expensive and time consuming to implement. Typically, spray-applied polyurethane coating systems have a design life of 25 years.

The coating application would include:

- Establish how much of the T-Lock within the pipe needs to be removed.
- Resurface the concrete with a repair mortar, such as Tnemec MortarCrete Series 217 or approved equal, to cover any exposed aggregate or exposed reinforcing steel. The existing concrete should be prepared per Society of Protective Coatings (SSPC) WJ-4 high pressure water jetting at 5,000 psi to remove loose debris, followed by SSPC SP13 abrasive blasting to remove contaminated concrete and provide concrete surfaces with a surface profile of CSP 5 per International Concrete Repair Institute (ICRI) 310.2. Depending on reinforcing steel bar cross-sectional loss, the steel bar may need to be replaced or coated with a corrosion inhibitor.
- Recoat the repaired areas with a 6-inch overlap over the sound T-Lock with 125 mils of Warren Environmental Polyurethane or approved equal.

4.4.5 Arrow-Lock PVC Lining

Arrow-Lock may be used for MAS spot repairs. Using Arrow-Lock to repair the 270-degree pipe liner termination point may be very expensive and time consuming to implement depending on the length of pipe to rehabilitate. Arrow-Lock has a design life of 50 years.

Arrow-Lock PVC liners function the same way as T-Lock; however, Arrow-Lock is primarily used as a rehabilitation product and not for new construction. Unlike T-Lock, Arrow-Lock can be applied on vertical or horizontal concrete surfaces that have already been cured. The installation requires a six-step process:

1. Remove damaged T-Lock.

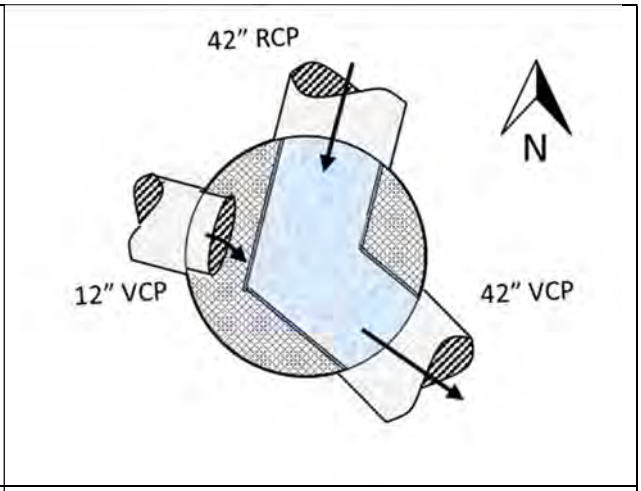
2. Clean and abrade concrete surface.
3. Spray application of a waterborne epoxy primer.
4. Trowel application of an epoxy mastic.
5. Embedment of the Arrow-Lock sheet into the epoxy mastic before it is cured.
6. Weld joint strips over seams.

Appendix A
Field Reports

MAS 4D-0020

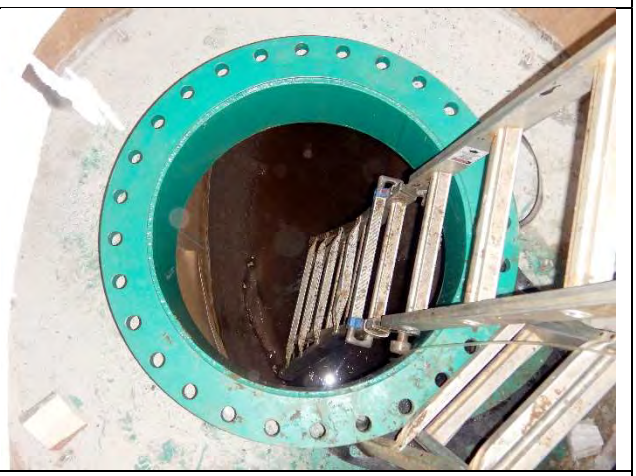
MAS:	4D-0020	**Overall Condition:**
Location:	Pomona Rincon Road and Euclid Avenue	**MAS:** The MAS composite cover and framing constructed during a 2020 rehabilitation project were in good overall condition. Two small tears in the lining were observed beneath the steel cover plate, including one instance where an epoxy anchor was exposed. Liner terminations at pipe connections and pipe penetrations were in good condition. **Pipe Segments**: 270-degree T-Lock liner had minor blisters, typically between 1 to 2-in in diameter. Liner termination was embedded, yet undermined up to 1-in on the effluent side. The concrete exposed for testing below the springline and at the crown were in good condition. The liner and exposed concrete below the springline were stained.
Date:	02.28.2024	
Time:	04:00 AM – 06:30 AM	
Engineers:	Farshad Malek	
Flow Level:	8 inches	
Location Description	On the west shoulder of Euclid Ave, approximately 200-ft north of Pomona Rincon Rd in Chino, CA. The MAS has a 36-in fiberglass cam-lock cover and a secondary 30-in, 28-hole patterned epoxy coated steel blind flange, which required SAWPA's assistance for removal. The MAS is located in an unpaved area prone to muddy conditions after rain.	

Aerial Map



Flow Diagram (Not to Scale)

Street View



Plan View

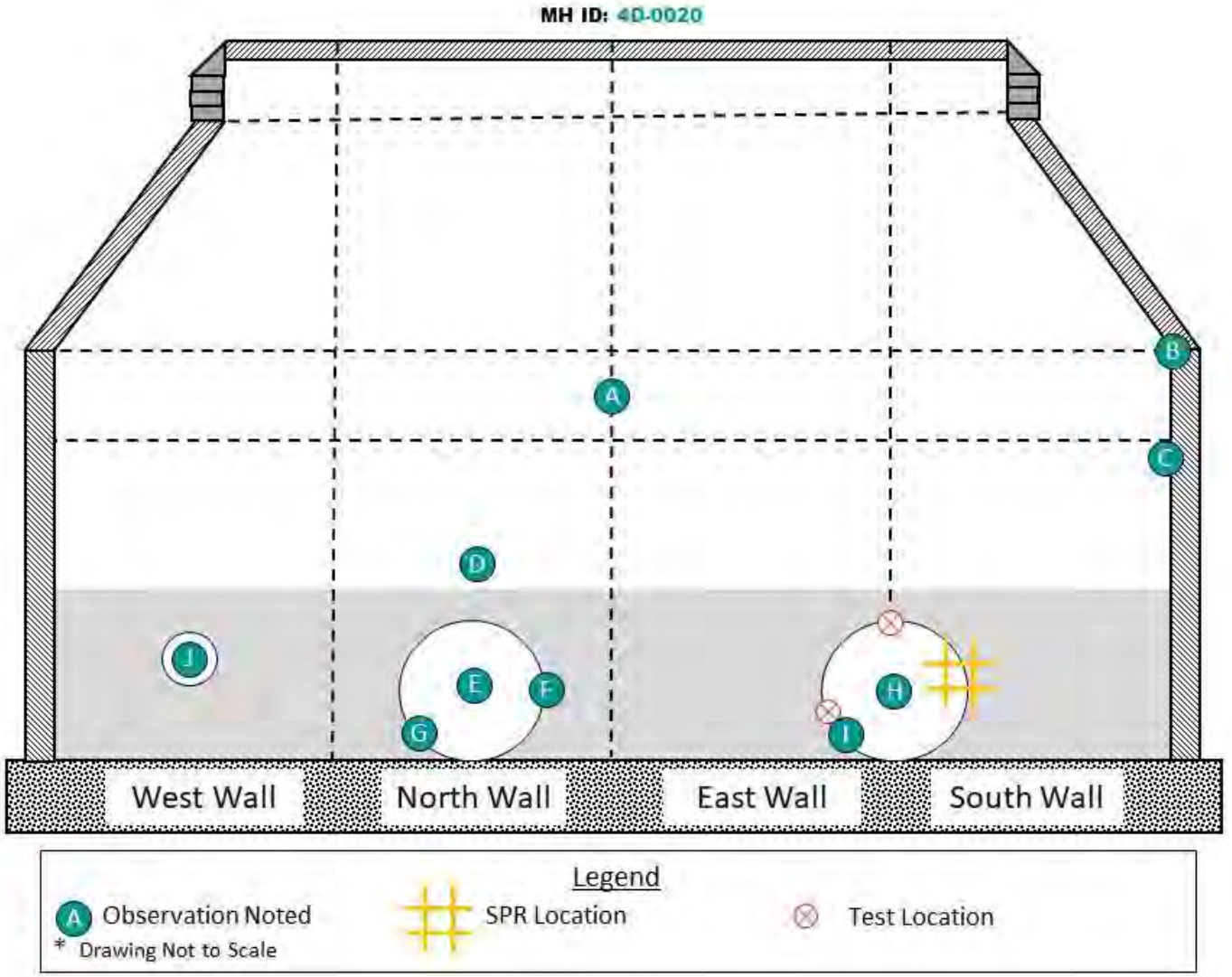
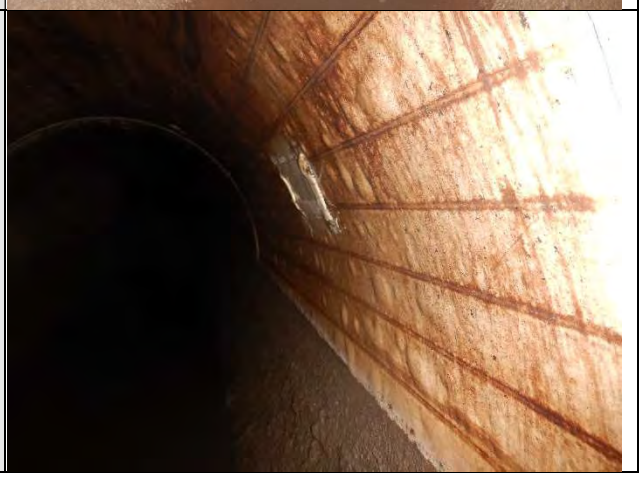
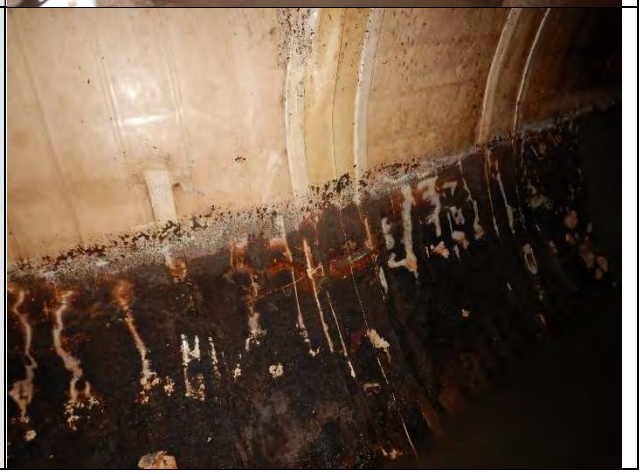


Figure A-2. Observations Diagram – MAS 4D-0020

	Observations:	
A	Interior of the access framing and cover added in the 2020 rehabilitation project. Composite material and epoxy coated blind flange in good condition with no defects noted.	
B	Closeup of waterproofing at MAS joint between the wall and chimney.	
C	Exposed epoxy anchor beneath steel cover plate.	

D	Liner termination at pipe and MAS interface in good condition (typical).	
E	Influent pipe. sludge layer nearly reaches the springline.	
F	Influent pipe. Minor blisters between 1 to 2-in in diameter (typical).	

G	Influent pipe. Liner stained behind sludge layer (typical).	
H	Effluent Pipe. Sludge layer up to the springline was scraped away, liner termination is underwater.	
I	Effluent Pipe. Heavy staining on liner beneath the sludge layer.	

J	Lining at the lateral penetration was in good overall condition, beginning to stain and show signs of wear.	

Table A-2. Pipe Liner Termination Testing Results – MAS 4D-0020

Location	Liner Condition	Concrete Deterioration Depth (in.)	VANDA Concrete Rating
Influent Pipe	Embedded, yet undermined.	1/4 - 1/2	2
Effluent Pipe	Embedded, yet undermined.	1/4 - 1/2	2

Influent pipe liner termination

Effluent pipe liner termination (underwater)

Table A-3. Exposed Concrete Testing Results – MAS 4D-0020 Influent Pipe Liner Cut

Location	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
Crown (12:00)	Hard	Solid	12	1/16	1
Below Spring line (8:00)	Hard	Solid	12	1/16	2

Effluent pipe liner cut at the crown (12:00)

Effluent pipe liner cut below the spring line (8:00)

Liner repair at crown (12:00)

Liner repair below spring line (8:00)

Table A-4. Surface Penetrating Radar Scan Results – MAS 4D-0020

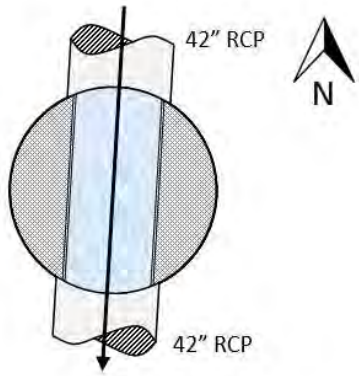
Location	Bar Dir.[a]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
Effluent Pipe 3:00	C	2.5	1.8	1.1	10.8	3.0	1.6
Effluent Pipe 11:00 → 4:00	L	1.6	1.5	1.2	11.4	3.7	1.9

(a) C = Circumferential, L = Longitudinal

MAS 4D-0060

MAS:	4D-0060	**Overall Condition:**
Location:	Euclid Avenue, north of Pomona Rincon Road	**MAS:** The MAS composite cover and framing constructed during a 2020 rehabilitation project were in good overall condition. The interior of the MAS was PVC-lined and the liner terminations were generally in good condition. A 6-in^3 section was missing from the cone beneath the chimney, resulting in exposed concrete. **Pipe Segments**: The liner was cut in multiple locations at the crown of the influent pipe, up to the first joint; the concrete was exposed at one of these locations and was determined to be in VANDA 3 condition with a softened surface and exposed aggregate. The concrete exposed below the springline was in good condition with no defects noted (VANDA 1). Blisters up to 2-in were observed as typical on the influent and effluent piping.
Date:	02.28.2024	
Time:	01:30 AM – 03:30 AM	
Engineers:	Farshad Malek	
Flow Level:	1-2 inches	
Location Description	On the west shoulder of Euclid Ave, approximately 400-ft north of the Chino Creek crossing in Chino, CA. The MAS has a 36-in fiberglass cam-lock cover and a secondary 30-in, 28-hole patterned epoxy coated steel blind flange, which required SAWPA's assistance for removal. The MAS is located in an unpaved area prone to muddy conditions after rain.	

Aerial Map



Flow Diagram (Not to Scale)

	
Street View	Topside View

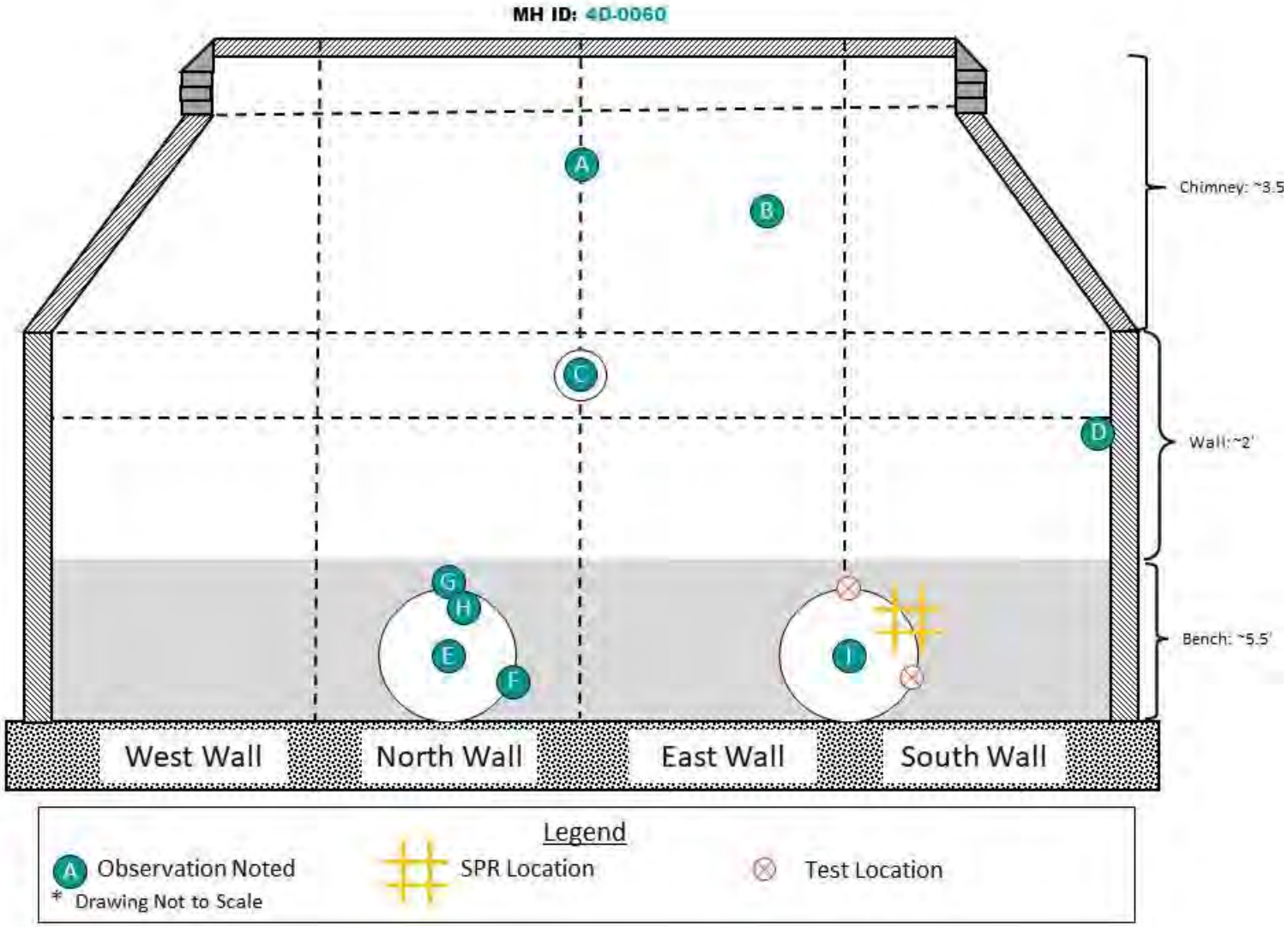
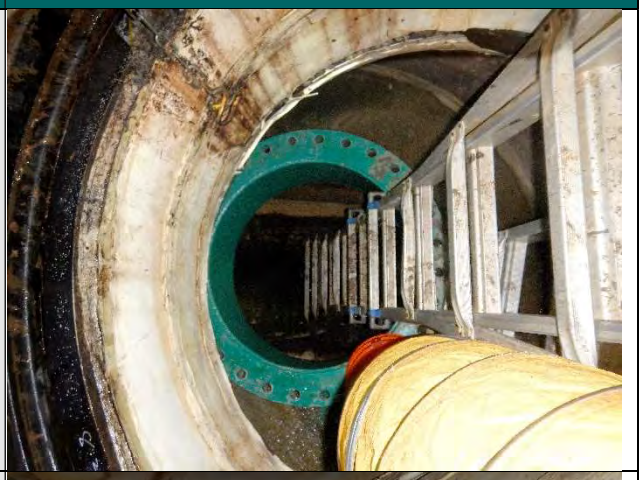


Figure A-3. Observations Diagram – MAS 4D-0060

	Observations:	
A	Interior of the access framing and cover added in the 2020 rehabilitation project. Interior lining and epoxy coated blind flange in good condition with no defects noted.	
B	Missing 6-in^3 area at the interface between the cone and the chimney, resulting in exposed concrete.	
C	Plugged lateral connection on the south wall, above the blind flange.	

D	Stainless steel hardware and epoxy coated steel cover plate in good overall condition.	
E	Influent pipe, facing north.	
F	Large blisters up to 2-in on influent pipe walls, typical throughout.	

G	5-in tear in liner at the crown. This location was later selected for concrete testing.	
H	Multiple tears up to 4-in near first joint upstream of the MAS.	
I	Effluent piping, facing south. Large blisters up to 1.5-in typical throughout. Steep slope.	

Table A-5. Pipe Liner Termination Testing Results – MAS 4D-0060

Location	Liner Condition	Concrete Deterioration Depth (in.)	VANDA Concrete Rating
Influent Pipe	Uplifted and undermined.	1 – 1 ½	3
Effluent Pipe	Uplifted and undermined.	1/4 – 1/2	2

Influent pipe liner termination

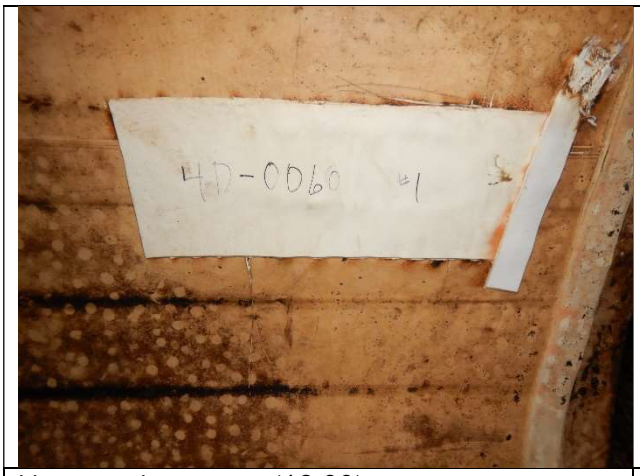
Effluent pipe liner termination

Table A-6. Exposed Concrete Testing Results – MAS 4D-0060 Influent Pipe Liner Cut

Location	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
Crown, at liner failure (12:00)	Softened	Solid	9	3/16	3
Below Spring line (5:00)	Hard	Solid	12	1/16	1

Effluent pipe liner cut at the crown (12:00)

Influent pipe liner cut below the spring line (5:00)



Liner repair at crown (12:00)

Liner repair below the springline (5:00)

Table A-7. Surface Penetrating Radar Scan Results – MAS 4D-0060

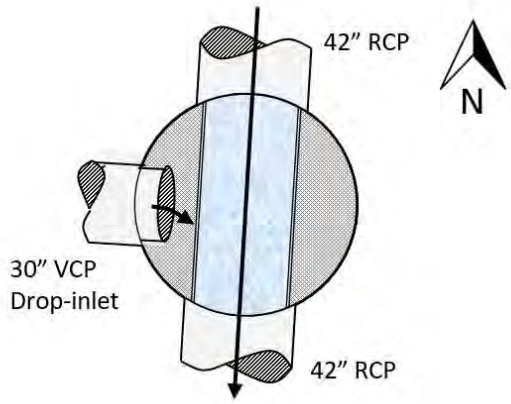
Location	Bar Dir.[(a)]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
Influent Pipe 5:00	C	5.1	3.8	2.9	4.4	2.3	1.6
Influent Pipe 12:00 → 4:00	L	2.7	2.1	1.6	24.0	8.9	4.0

(a) C = Circumferential, L = Longitudinal

MAS 4D-0118

MAS:	4D-0118	**Overall Condition:**
Location:	Pine Avenue and Euclid Avenue	**MAS:** The MAS cover, framing, and concrete collar were in good condition with no defects noted. The interior liner was in good overall condition with localized defects. Heavy mineral deposits were observed in the 30-in VCP drop-inlet pipe. Liner terminations at pipe connections and pipe penetrations appeared to be in good condition; however, moderate infiltration was observed entering the MAS from beneath the drop-inlet pipe as well as at joints in the liner, beginning approximately 8-ft-1-in from the channel invert. Per discussion with SAWPA O&M staff, the infiltration is believed to be groundwater. **Pipe Segments**: 270-degree T-Lock liner had blisters, typically 2-in in diameter on the west side of the pipe [12:00 to 6:00, facing downstream] both upstream and downstream of the MAS. Due to apparent infiltration into the MAS and potentially MAS upstream, the level in the pipe was above the liner termination point during the assessment. Because the liner termination could not be directly seen, the values were estimated based on a feel test. The liner termination was determined to be embedded, yet undermined up to 3/8-in. The concrete exposed for testing below the springline and at the crown were in good condition. The liner and exposed concrete appeared to be in good condition. An apparent drop (or step) in elevation was observed approximately 50-ft downstream of the MAS; this drop appears to be intentional, though not apparent from the provided record drawings.
Date:	02.27.2024 – 02.28.2024	
Time:	10:00 PM – 01:00 AM	
Engineers:	Farshad Malek	
Flow Level:	10 inches	
Location Description	On the southwest corner/shoulder of the Pine Avenue and Euclid Avenue intersection in Chino, CA. The MAS is located in a dirt area with a concrete collar and slab at ground level.	

Aerial Map



Flow Diagram (Not to Scale)

Street View

Topside View

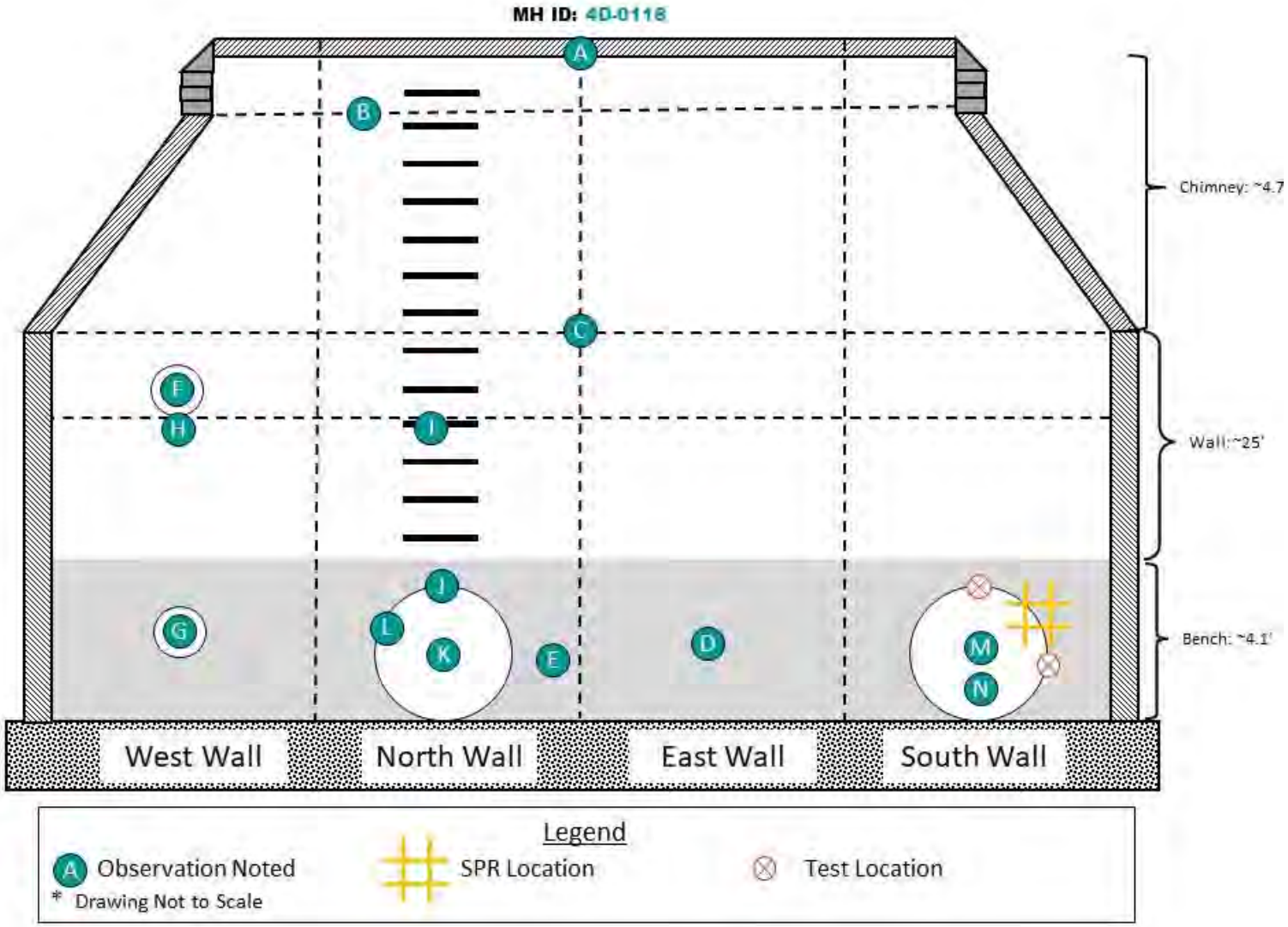
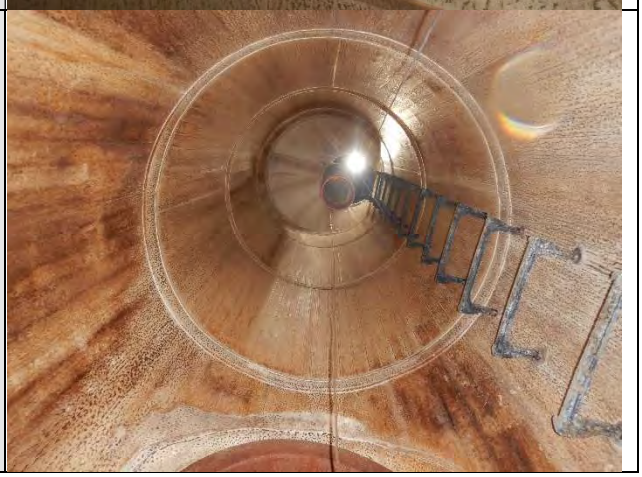
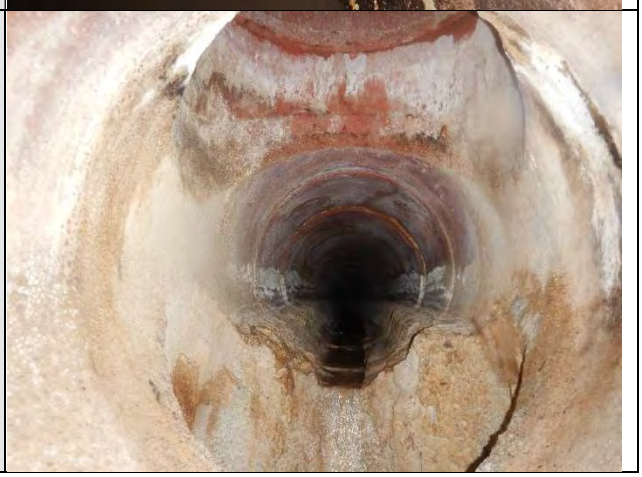
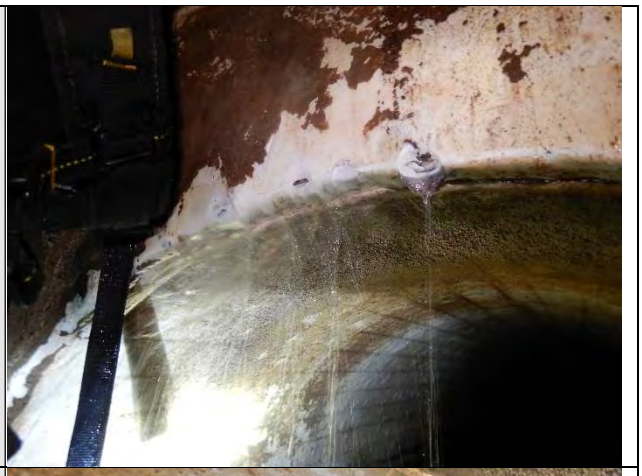
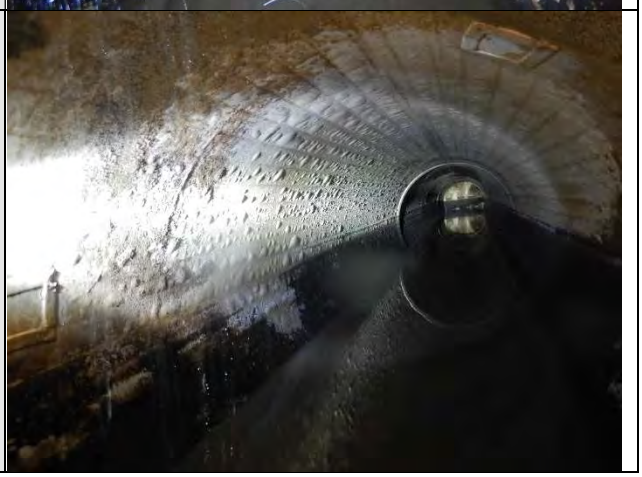


Figure A-4. Observations Diagram – MAS 4D-0118

	Observations:	
A	Access cover, framing and concrete collar in good condition with no defects noted.	
B	Minor blisters up to 1-in in diameter near the top of the MAS. Blisters were intact and concrete was not exposed.	
C	Liner in chimney and cone sections in great overall condition.	

D	8-in wide x 5-in tall delamination on the east MAS wall, 3-ft from the invert. A second layer of PVC lining was observed beneath the delamination.	
E	12-in vertical segment of weld strip that was detached in the northeast corner of the MAS, centered near the springline of the pipe.	
F	Heavy mineral deposits were observed in the 30-in VCP drop-inlet pipe.	

G	Heavy mineral deposits were observed at the bottom of the drop-inlet.	
H	Infiltration entering the MAS from beneath the 30-in VCP drop-inlet pipe penetration.	
I	Infiltration shown entering the MAS from behind liner joint, approximately 8-ft-1-in from the invert.	

J	Liner termination at pipe connections are in good condition (typical). Infiltration shown running down the MAS structure on the north wall.	
K	Influent Pipe, facing north. Sludge layer up to the springline. Liner termination is underwater.	
L	Influent Pipe, facing north. Blisters up to 3-in (typically 2-in) in diameter were observed on the west side of the pipe. Blisters appear to be intact and the concrete was not exposed.	

M	Effluent Pipe, facing south. Sludge layer up to the springline. Liner termination is underwater. Blisters up to 3-in (typically 2-in) in diameter were observed on the west side of the pipe. Blisters appear to be intact and the concrete was not exposed.	
N	Drop in elevation in the effluent pipe, approximately 50-ft downstream of the MAS.	

Table A-8. Pipe Liner Termination Testing Results – MAS 4D-0118

Location	Liner Condition	Concrete Deterioration Depth (in.)	VANDA Concrete Rating
Influent Pipe	Embedded, yet undermined.	1/4 – 1/2	2
Effluent Pipe	Embedded, yet undermined.	1/4 – 1/2	2

Table A-9. Exposed Concrete Testing Results – MAS 4D-0118 Effluent Pipe Liner Cut

Location	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
Crown (12:00)	Hard	Solid	12	1/16	1
Below Spring line (3:30)	Hard	Solid	12	1/16	1

Effluent pipe liner cut at the crown (12:00)

Influent pipe liner cut below the spring line (3:30)

Liner repair at crown (12:00)

Liner repair below spring line (3:30)

Table A-10. Surface Penetrating Radar Scan Results – MAS 4D-0118

Location	Bar Dir.[a]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
Effluent Pipe 3:00	C	2.3	2.2	2.2	*[b]	*	*
Effluent Pipe 11:00 → 4:00	L	2.8	2.2	1.5	6.0	5.2	4.1

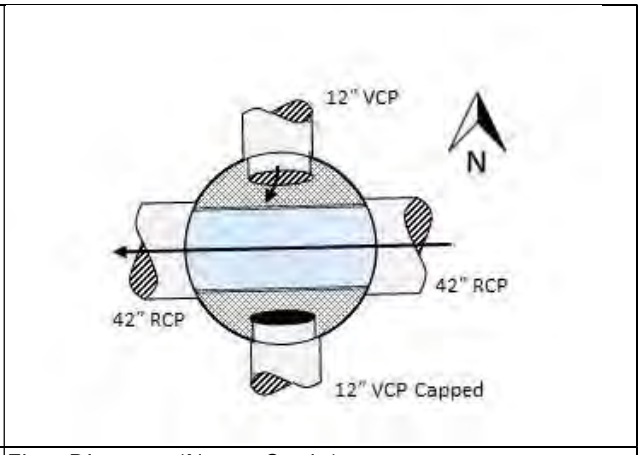
(a) C = Circumferential, L = Longitudinal

(b) Spacing could not be calculated because only a single Circumferential Bar was scanned.

MAS 4D-0150

MAS:	4D-0150	**Overall Condition:**
Location:	Pine Avenue and Johnson Avenue	**MAS:** The MAS composite cover and framing were in good overall condition. Excessive blistering was observed on the cone, and first and third barrels, but the weld strips were intact. Liner terminations at pipe connections and pipe penetrations were in good condition. **Pipe Segments**: The 270-degree T-Lock liner had blisters, typically between 1 and 3 inches in diameter. Liner termination was uplifted and undermined up to 1 inch. Exposed aggregate was observed below the liner termination in the influent line. The concrete exposed for testing below the springline and at the crown was in good condition. The liner and exposed concrete below the springline were stained.
Date:	02.28.2024	
Time:	02:00 AM – 06:00 AM	
Engineers:	Clay Shaffer	
Flow Level:	8 inches	
Location Description	The north-most lane of Pine Ave intersected with Johnson Ave in Chino, CA. The MAS has a 36-in fiberglass cam-lock cover, which required SAWPA's assistance for removal.	

Aerial Map



Flow Diagram (Not to Scale)


Street View


Plan View

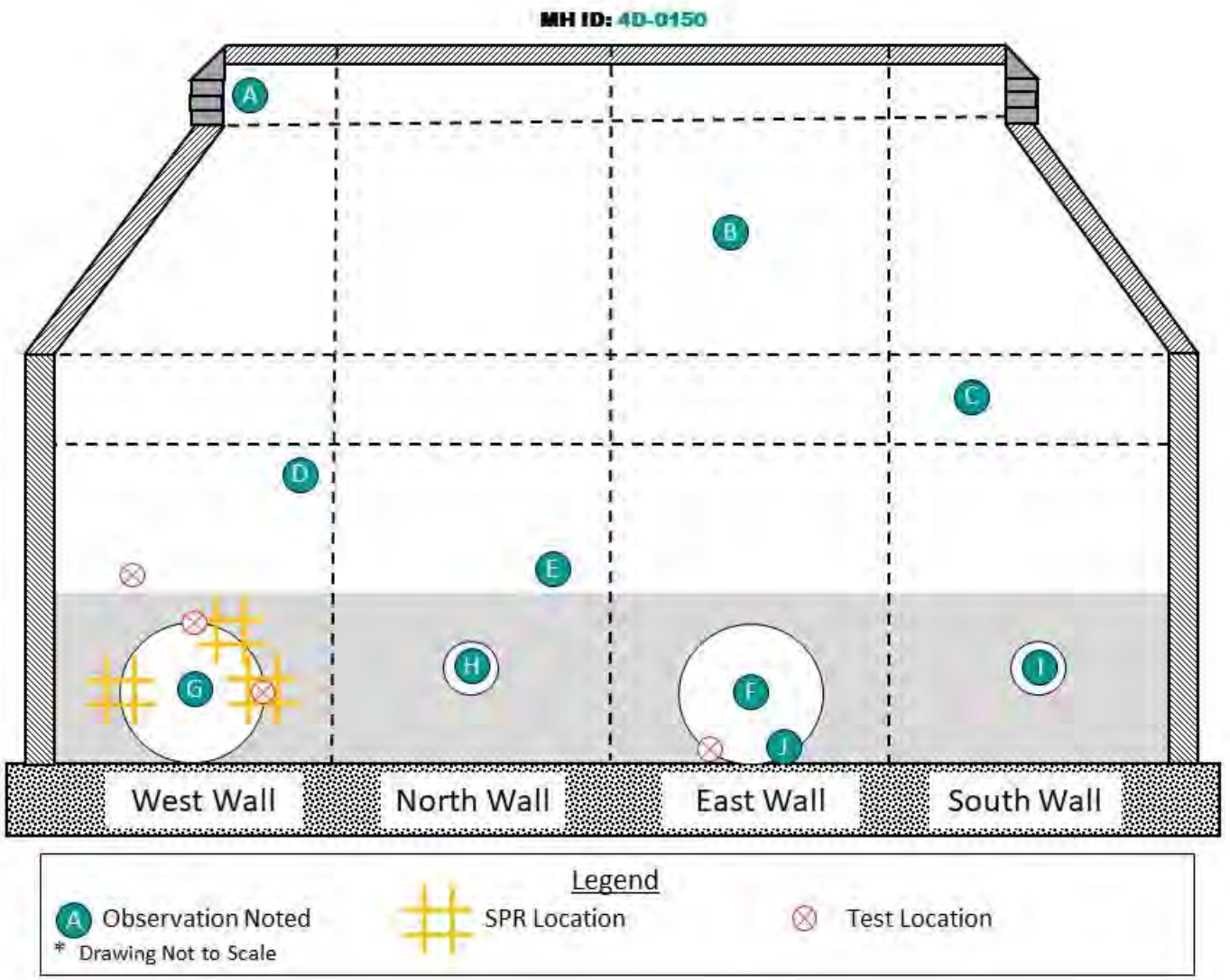
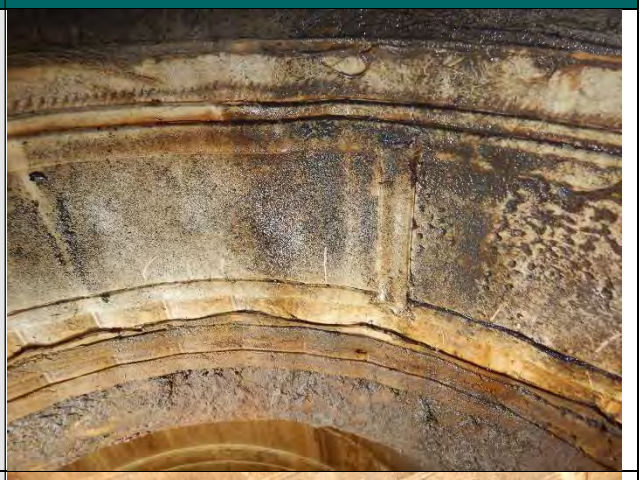
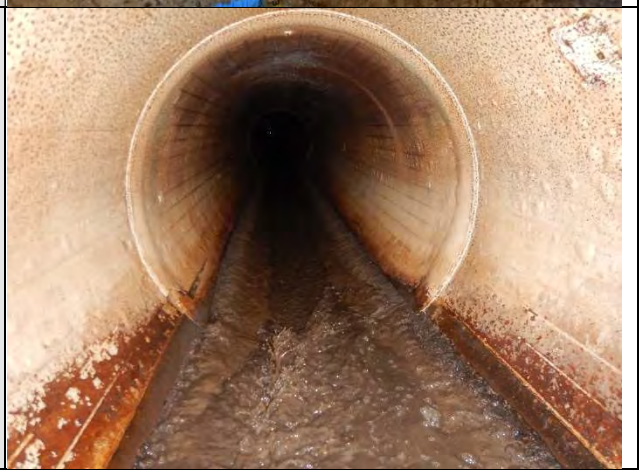


Figure A-5. Observations Diagram – MAS 4D-0150

	Observations:	
A	The interior of the access framing and chimney is in good condition, and no defects have been noted.	
B	Excessive blistering on the cone.	
C	All the weld strips in the barrel, cone, and chimney are in good condition.	

D	Excessive blistering on the third barrel.	
E	Excessive blistering on the first barrel.	
F	Influent pipe. Liner stained behind sludge layer (typical).	

G	Effluent pipe. Blisters between 1 to 3-in in diameter (typical).	
H	The north lateral line welds are in good condition.	
I	The south lateral is sealed.	

J	The influent pipe has exposed aggregate below the liner.	

Table A-11. Pipe Liner Termination Testing Results – MAS 4D-0150

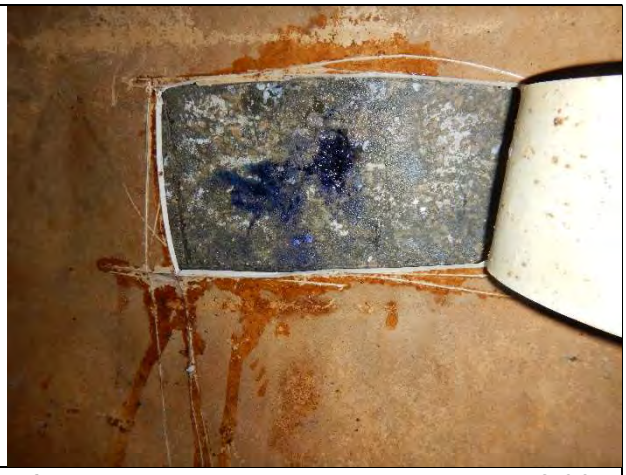
Location	Liner Condition	Concrete Deterioration Depth (in.)	VANDA Concrete Rating
Influent Pipe	Uplifted and undermined.	1/2 – 3/4	3
Effluent Pipe	Uplifted and undermined.	1/4 – 1/2	3

	
Influent pipe liner termination. Exposed aggregate.	Effluent pipe liner termination (underwater)

Table A-12. Exposed Concrete Testing Results – MAS 4D-0150

Location	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
Effluent Crown (12:00)	Hard	Solid	12	1/16	1
Effluent Below Spring line (3:00)	Hard	Solid	12	1/16	1
Influent Below Liner (5:00)	Exposed Agg.	Solid	8 (At-Depth pH)	1/16	3

Effluent pipe liner cut at the crown (12:00)



Influent pipe liner cut below the spring line (3:00)

Liner repair at the crown (12:00)

Liner repair at spring line (3:00)

Table A-13. Surface Penetrating Radar Scan Results – MAS 4D-0150

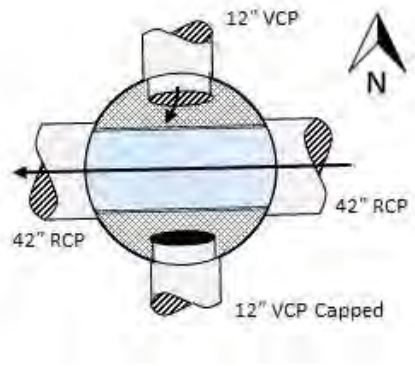
Location	Bar Dir. [a]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
Effluent Pipe 1:00, 3:00, 9:00	C	4.2	3.4	2.5	2.9	2.4	2.1
Effluent Pipe 12:00 → 4:00	L	3.4	2.4	1.5	6.3	4.5	1.3

(a) C = Circumferential, L = Longitudinal

MAS 4D-0360

MAS:	4D-0360	**Overall Condition:**
Location:	Schleisman Road and Vernazza Place	**MAS:** The MAS cast iron cover and framing were in good overall condition, with a 6-in cut in the liner. A 1/2-in puncture was observed in the cone, and 15 to 20 blisters up to 3-in in diameter were on the first barrel walls. Liner terminations at pipe connections and pipe penetrations were in good condition. **Pipe Segments**: 270-degree T-Lock liner had blisters, typically between 1 to 4-in in diameter. Liner termination was embedded yet undermined up to 4.5 in on the influent side. Exposed aggregate was observed below the liner termination in the influent and effluent lines. The concrete exposed for testing below the springline and at the crown was in good condition. The liner and exposed concrete below the springline were stained.
Date:	02.27.2024 - 02.28.2024	
Time:	09:30 PM – 02:00 AM	
Engineers:	Clay Shaffer	
Flow Level:	1 inch	
Location Description	In the left turn lane of eastbound Schleisman Rd, approximately 50-ft west of Vernazza Pl in Chino, CA. The MAS has a 36-in cast iron cover. The MAS is located in an unpaved area prone to muddy conditions after rain.	

Aerial Map



Flow Diagram (Not to Scale)

No photo taken.	
Street View	Plan View

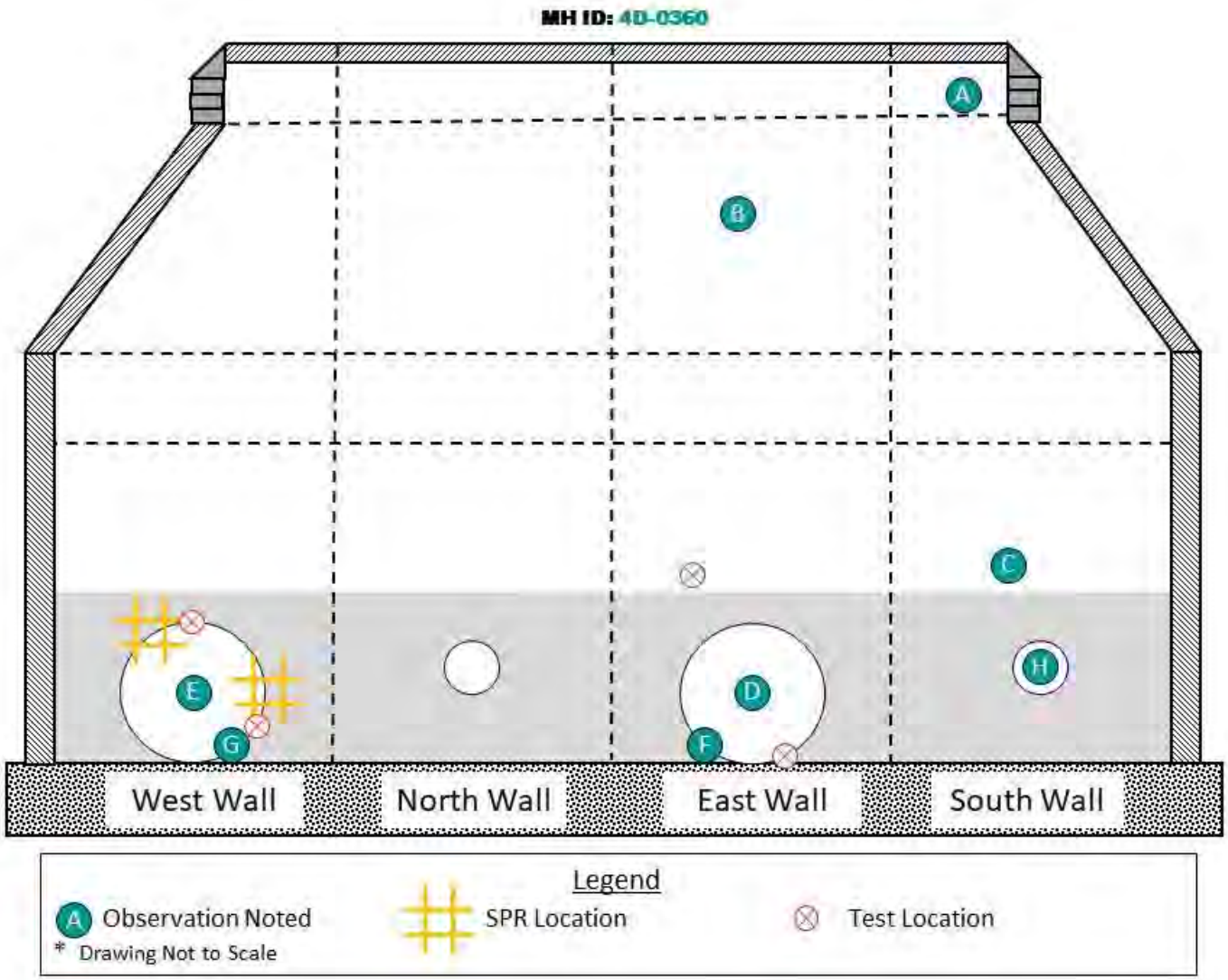
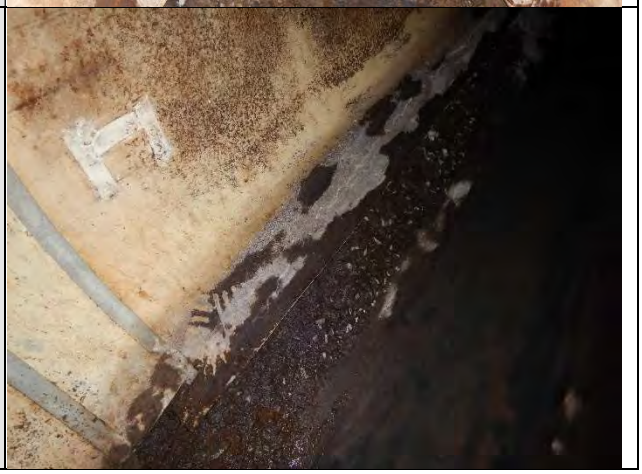


Figure A-6. Observations Diagram – MAS 4D-0360

	Observations:	
A	Interior of the chimney. A 6-in cut.	
B	A 1/2-in puncture in the cone.	
C	The first barrel walls have 15 to 20 blisters, up to 3-in in diameter blister.	

D	The influent pipe liner is in good condition.	
E	The effluent pipe liner has blisters up to 4 inches.	
F	The influent pipe has exposed aggregate up to 1-in of wall loss.	

G	The effluent pipe has up to 1-in of wall loss.	
H	The lining at the sealed lateral penetration was in good overall condition.	

Table A-14. Pipe Liner Termination Testing Results – MAS 4D-0360

Location	Liner Condition	Concrete Deterioration Depth (in.)	VANDA Concrete Rating
Influent Pipe	Uplifted and undermined.	1/2 – 1	3
Effluent Pipe	Uplifted and undermined.	1/2 – 1	3

	
Influent pipe liner termination	Effluent pipe liner termination

Table A-15. Exposed Concrete Testing Results – MAS 4D-0360

Location	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
Effluent Crown (12:00)	Hard	Solid	12	1/16	1
Effluent Below Spring line (4:30)	Hard	Solid	12	1/16	1
Influent Below Liner (5:00)	Exposed Agg.	Solid	13 (At-depth pH)	1/8	3

Effluent pipe liner cut at the crown (12:00)

Influent pipe liner cut below the spring line (4:30)

Liner repair at the crown (12:00)

Liner repair at spring line (4:30)

Table A-16. Surface Penetrating Radar Scan Results – MAS 4D-0360

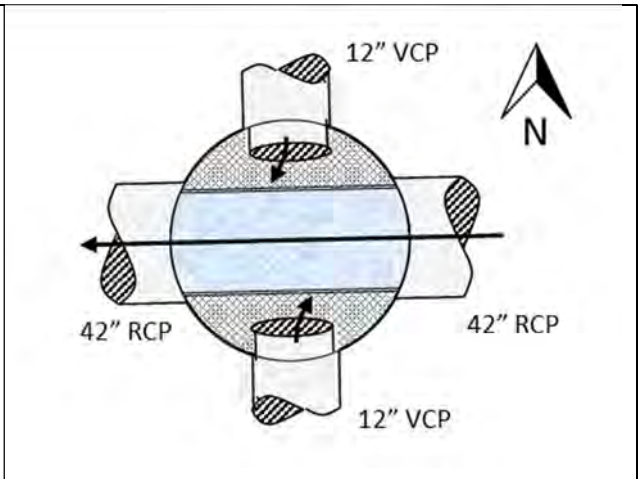
Location	Bar Dir. [a]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
Effluent Pipe 2:30, 3:30	C	3.8	3.5	3.2	2.4	2.2	1.8
Effluent Pipe 11:00 → 3:00	L	3.3	2.5	1.7	17.4	7.8	4.1

(a) C = Circumferential, L = Longitudinal

MAS 4D-0470

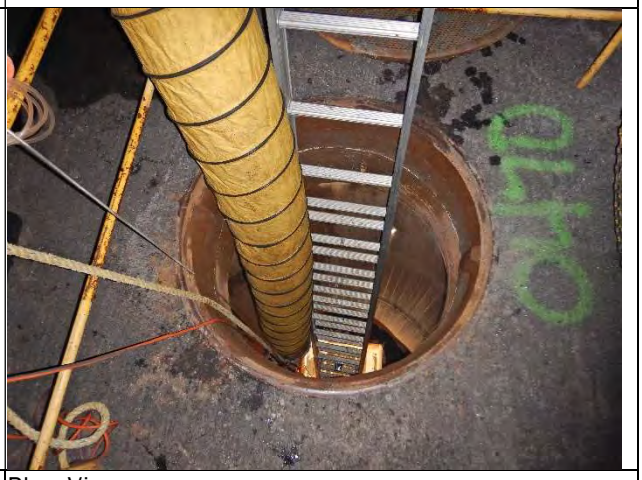
MAS:	4D-0470	**Overall Condition:**
Location:	Riverboat Dr	**MAS:** Holes in liner at cone and effluent pipe connection. Rim and liner in good condition. Multiple bulges between ribs. **Pipe Segments**: 270-degree T-Lock liner had multiple blisters. Small tear in south flap. Liner terminated was unattached and undermined. Exposed aggregate and reinforcement corrosion staining at undermined location. Gravel and debris at bottom of pipe. Concrete exposed for testing was in good condition. Previous assessment patches intact.
Date:	02.28.2024	
Time:	3:45 AM – 06:00 AM	
Engineers:	Noy Phannavong, Jarred Rivera	
Flow Level:	1 - 2 inches	
Location Description	West of the intersection of Riverboat Dr and Lancelot Dr, in Eastvale, CA. The. The MAS is located on the east bound lane on paved road.	

Aerial Map



Flow Diagram (Not to Scale)

Street View



Plan View

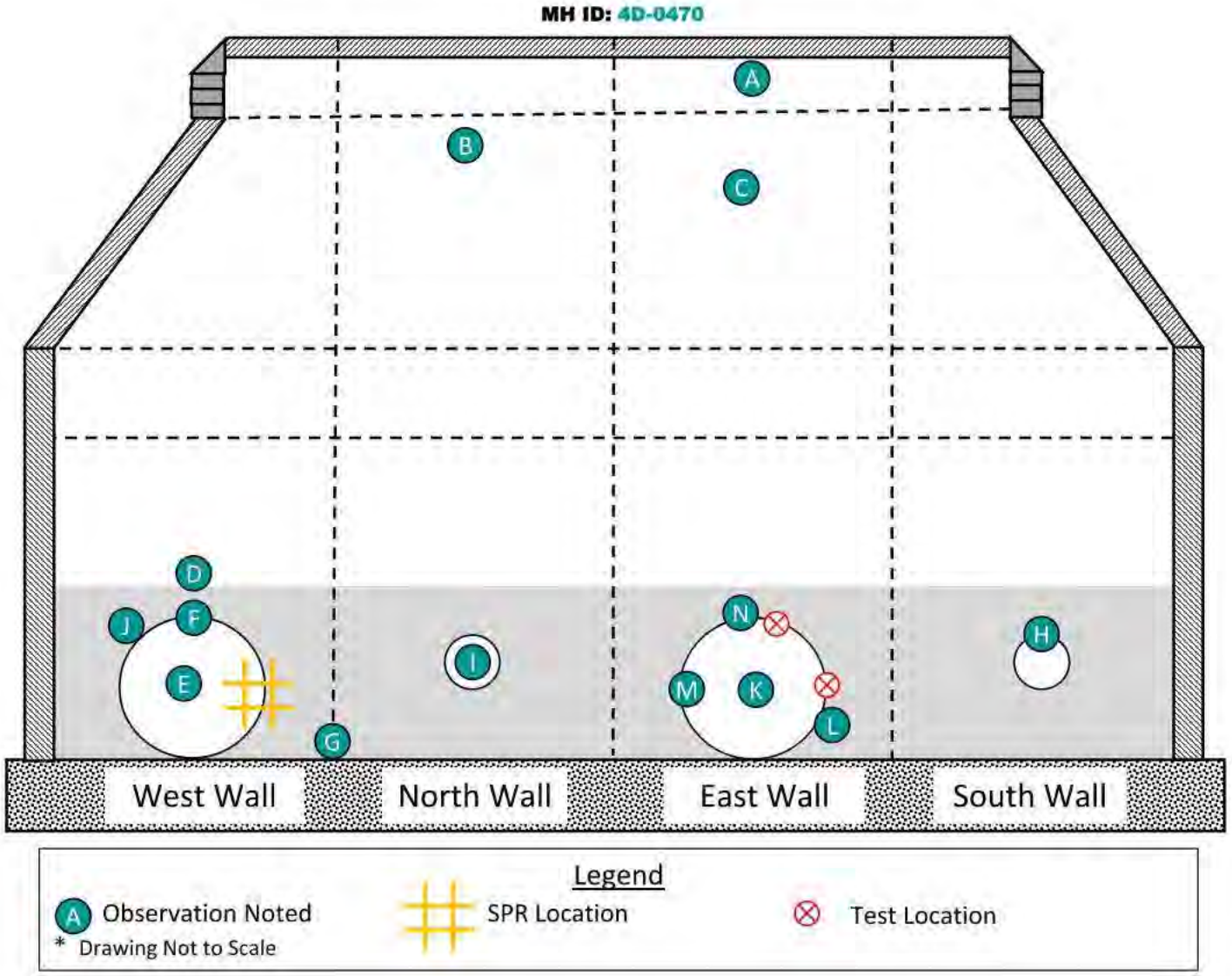
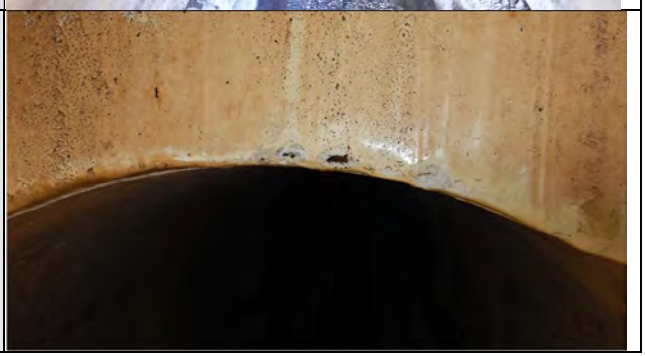
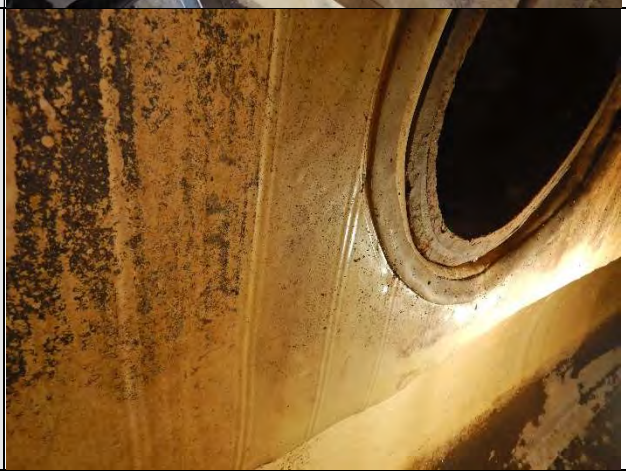
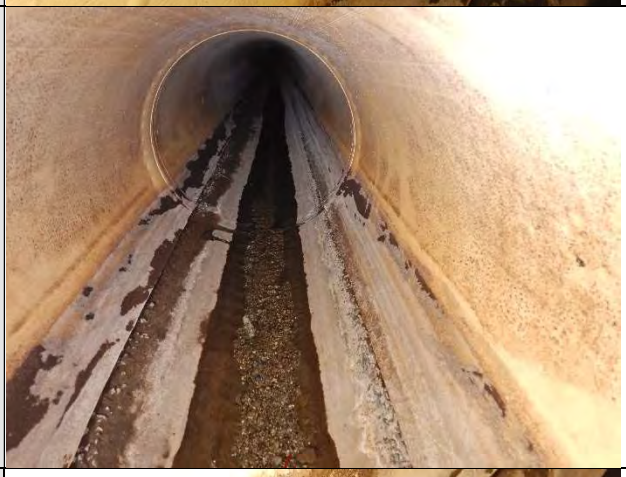


Figure A-7. Observations Diagram – MAS 4D-0470

	Observations:	
A	Rim and lining termination in good condition.	
B	Liner at chimney was embedded with multiple bulges found on wall circumference. Bulges are benign and pose no risk to lining at this time.	
C	Approximate 3-inch wide hole in T-Lock liner at cone. Appeared in previous assessment report. Cut remains in similar condition.	

D	Liner termination at pipe and MAS interface in good condition (typical).	
E	Effluent pipe liner was embedded with multiple blisters. Slime layer appeared to be up to typical waterline.	
F	Cut in liner at effluent pipe crown. Cuts appeared to be from a CCTV camera cable.	

G	Gravel and small amounts of trash found at bottom of pipe. Water clear.	
H	Small tear in south flap. Flap appears to be operable. Pipe termination in good condition.	
I	North flap in good condition. (Typ.)	

J	Overview of MAS channel construction. Reinforced concrete pipe segment cut and tied into MAS structure. Minor areas of lining joint degradation observed.	
K	Influent pipe had minor bulges in liner. Bulges are benign and pose no risk to lining at this time.	
L	Corrosion staining evidence of embedded reinforcement corrosion. Exposed aggregate at unlined concrete channel.	

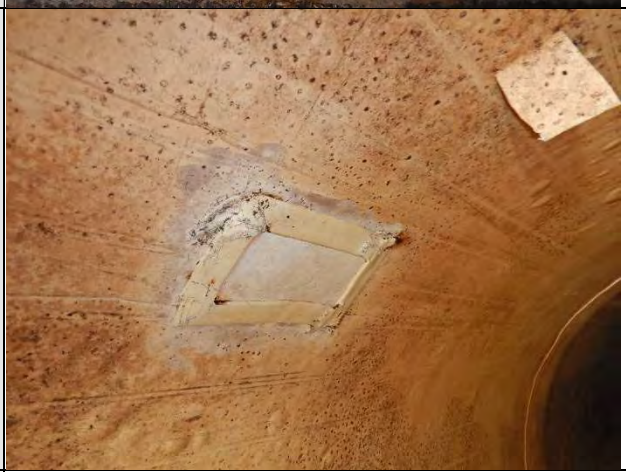
M	Patch repair on spring line (3:00) from previous assessment.	
N	Patch Repair on crown (12:00) from previous assessment.	

Table A-17. Pipe Liner Termination Testing Results – MAS 4D-0470

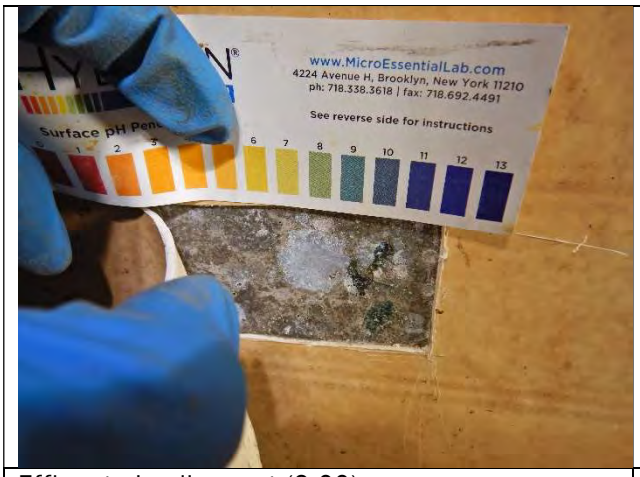
Location	Liner Condition	Concrete Deterioration Depth (in.)	VANDA Concrete Rating
Influent Pipe	Uplifted and undermined	1-5/16	3-4
Effluent Pipe	Embedded and not undermined.	1/2	3

Influent pipe liner termination

Effluent pipe liner termination (underwater)

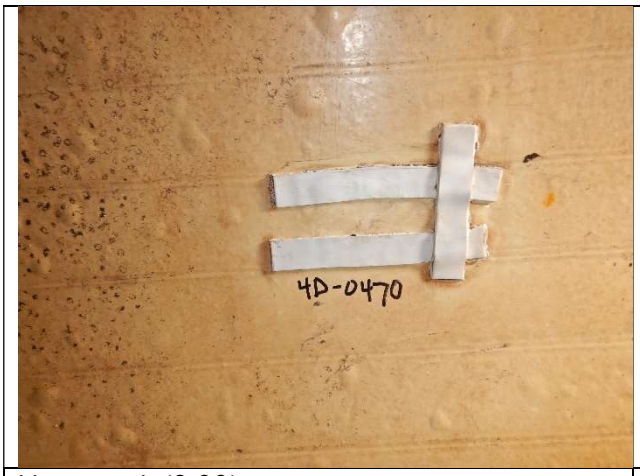
Table A-18. Exposed Concrete Testing Results – MAS 4D-0470 Influent Pipe Liner Cut

Location	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
Below Spring Line (9:00)	Hard	Solid	10	1/16	1
Crown (11:00)	Hard	Solid	10	1/16	1



Effluent pipe liner cut (9:00)

Influent pipe liner cut (7:00)



Liner repair (9:00)

Liner repair below spring line (7:00)

Table A-19. Surface Penetrating Radar Scan Results – MAS 4D-0470

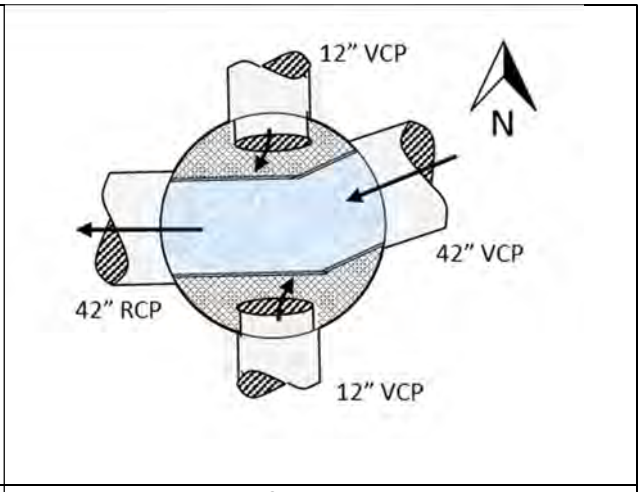
Location	Bar Dir. [a]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
Effluent Pipe 3:00	C	3.4	3.3	3.2	3.3	2.5	1.8
Effluent Pipe 4:00 → 11:00	L	4.1	2.5	1.5	13.3	7.5	4.5

(a) C = Circumferential, L = Longitudinal

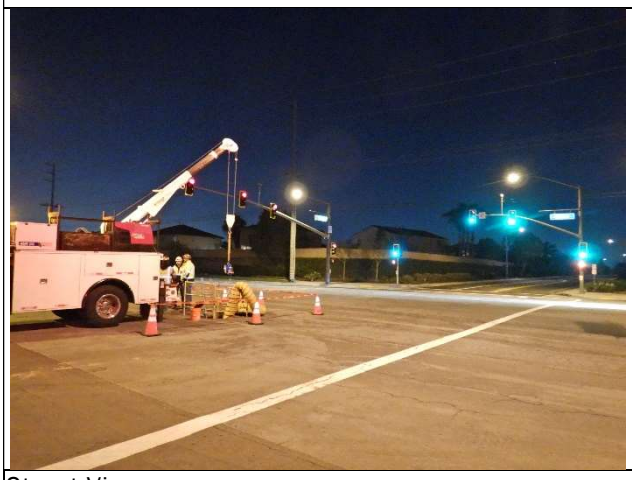
MAS 4D-0480

MAS:	4D-0480	**Overall Condition:**
Location:	Hamner Ave & Riverboat Dr	**MAS:** The MAS T-Lock Liner was in good condition. Liner terminations at pipe connection, pipe penetrations, and at the MAS rim were in good condition. The channel was lined and in good condition. **Pipe Segments**: Liner was in good condition. Liner termination was attached and in good condition. Liner cutouts were made on downstream pipe at 4:30 and 11:00. Concrete exposed for testing was in good condition. Previous assessment patches intact.
Date:	02.28.2024	
Time:	12:30 AM – 03:30 AM	
Engineers:	Noy Phannavong, Jarred Rivera	
Flow Level:	4 inches	
Location Description	On the southwest intersection of Hamner Ave & Riverboat Dr, in Eastvale, CA. The MAS is located in a paved area.	

Aerial Map



Flow Diagram (Not to Scale)



Street View

Plan View

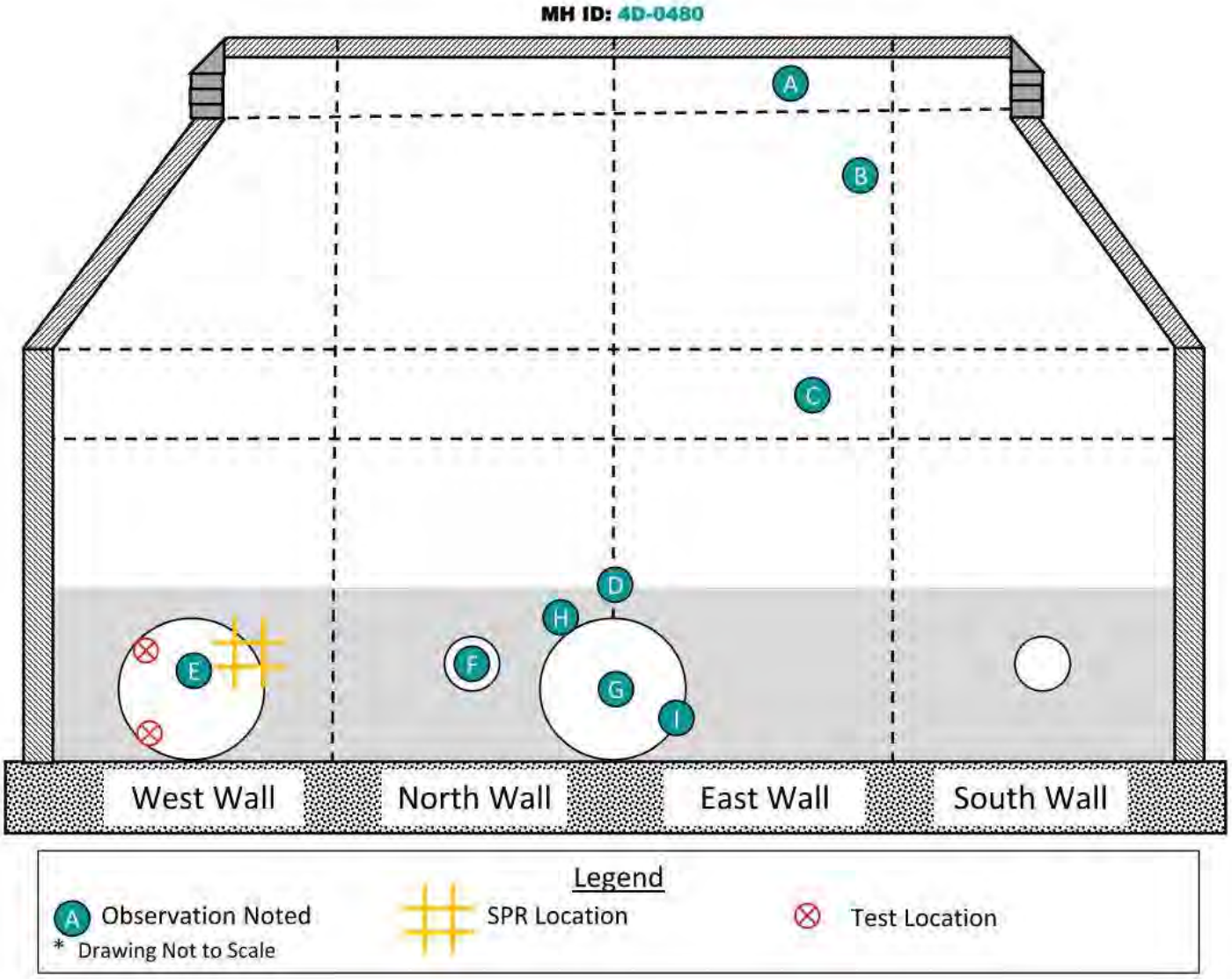
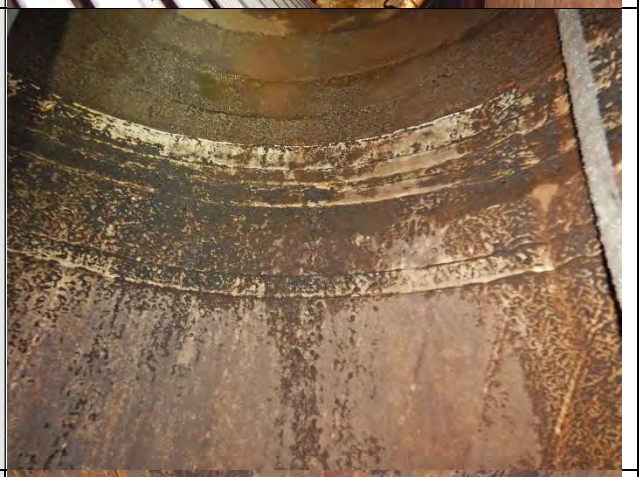
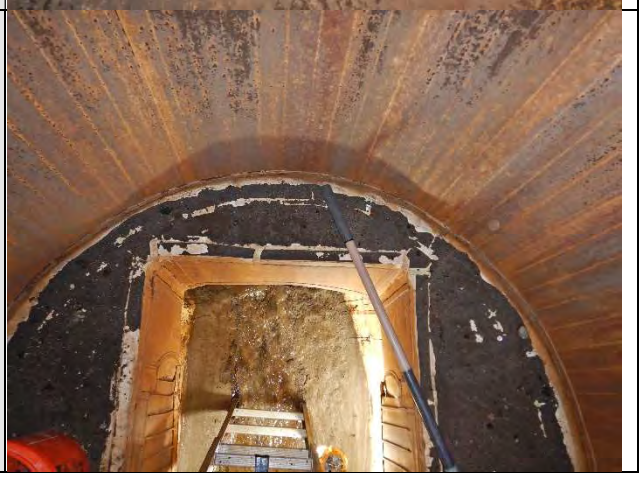
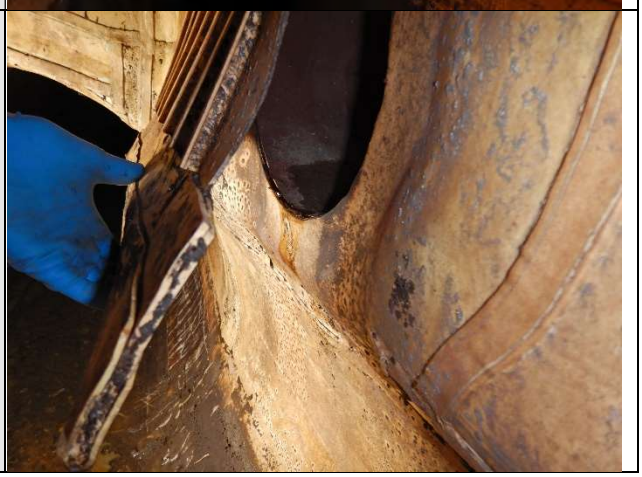


Figure A-8. Observations Diagram – MAS 4D-0480

	Observations:	
A	Rim and lining termination in good condition	
B	Liner at chimney was in good condition with slight miscoloring.	
C	The liner at the bench was in good condition with a build-up of fine sediment.	

D	Liner termination at pipe and MAS interface in good condition (typical).	
E	Effluent pipe liner was in good condition with no blisters. Shown is repair patch from previous assessment. Patch in good condition.	
F	Lateral with gas flap. Liner termination at pipe connection was in good condition. Flap appeared to be attached and in operating condition.	

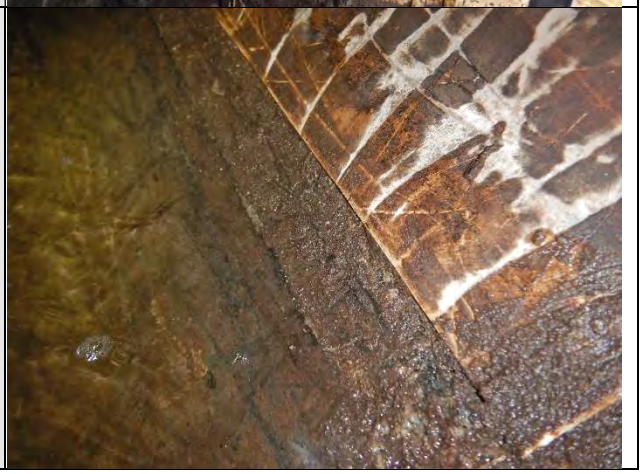
G	Influent pipe was constructed of vitrified clay. Slime later appeared to be up to the typical waterline. Approximately 1” deep and 8” wide of clear water flow. Approximately 1-2” of sediment/ slime build up.	
H	Liner at influent pipe termination in good condition.	
I	Channel liner in good condition. Minimum separation from pipe bottom.	

Table A-20. Pipe Liner Termination Testing Results – MAS 4D-0480

Location	Liner Condition	Concrete Deterioration Depth (in.)	VANDA Concrete Rating
Influent Pipe	N/A (Vitrified Clay Pipe)	N/A	N/A
Effluent Pipe	Embedded and not undermined.	Negligible	1

Influent pipe liner termination

Effluent pipe liner termination (underwater)

Table A-21. Exposed Concrete Testing Results – MAS 4D-0480 Effluent Pipe Liner Cut

Location	Surface Condition	Sounding	Surface pH	Penetration Depth (in.)	VANDA Rating
Above Spring Line (9:00)	Hard	Solid	11	1/16	1
Below Spring Line (7:00)	Hard	Solid	11	1/16	1

Effluent pipe liner cut above spring line (9:00)

Influent pipe liner cut below the spring line (7:00)

Liner repair above spring line (9:00)

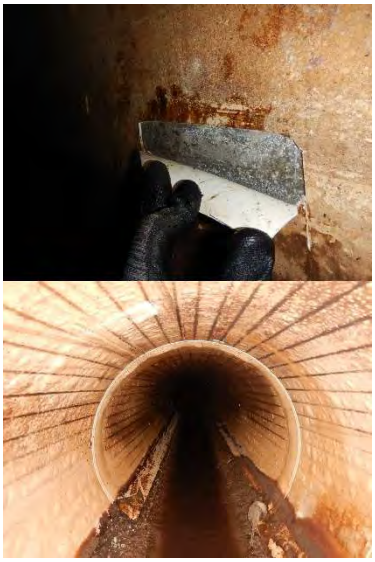
Liner repair below spring line (7:00)

Table A-22. Surface Penetrating Radar Scan Results – MAS 4D-0480

Location	Bar Dir. [a]	Rebar Depth Max. (in.)	Rebar Depth Avg. (in.)	Rebar Depth Min. (in.)	Rebar Space Max. (in.)	Rebar Space Avg. (in.)	Rebar Space Min. (in.)
Effluent Pipe 3:00	C	2.9	2.7	2.6	2.8	2.6	2.3
Effluent Pipe 11:00 → 4:00	L	2.3	1.7	0.8	13.0	11.3	9.4

(a) C = Circumferential, L = Longitudinal

V&A Project No. 23-0225



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APPENDIX B:

Brine Line Reach IV-D CCTV Inspection
Summary of Condition by Reach

Appendix B: Summary of Condition Assessment by Reach from CCTV Inspections

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
4D-0480	4D-0470	• Length surveyed: 1,294 ft • Pipe length: 1,294 ft • Direction of survey: U/S (4D-0470 to 4D-0480)	• Water level ~10% (water level below liner termination). • Typical water level ~40-50% based on debris markings. • Unlined concrete and liner termination visible on both sides of the pipe up to approx. 900 ft., except the left side which was covered by debris from approx. 50 to 140 ft. • Liner termination and unlined concrete were not visible on both sides of pipe after 900 ft due to debris accumulation. • Condition of inside of 4D-0470 was not recorded.	**2024 Inspection** • Visible aggregate on left and right sides of pipe below the liner termination for entire segment where unlined concrete was visible (0 to 900 ft). No visible rebar. • Liner uplift of up to approx. 1 inch for approx. 50% of alignment where liner termination was visible. Visible aggregate under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of alignment. Misalignment ranges from approx. 1 to 3 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Evidence of corrosion staining in unlined concrete on right side of pipe at 163 ft and 200 ft. No visible rebar. Moderate aggregate loss at this location. • Unable to see liner termination and unlined concrete after approx. 900 ft due to debris accumulation. • Liner appears to be in good condition overall. • MAS 4D-0480 appears to be in good condition. See Appendix A for man-entry condition assessment results. **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling. Condition of pipe unknown based on CCTV inspection.
4D-0470	4D-0460	• Length surveyed: 1,317 ft • Pipe length: 1,317 ft • Direction of survey: D/S (4D-0470 to 4D-0460)	• Water level ~10% (water level below liner termination). • Typical water level ~40-50% based on debris markings. • Liner termination and unlined concrete were not visible on both sides of pipe after 720 ft due to debris accumulation.	**2024 Inspection** • Visible aggregate on right side of pipe below the liner termination for entire segment where unlined concrete was visible (0 to 720 ft). No visible rebar. • Liner uplift of up to approx. 1 inch for approx. 50% of alignment where liner termination was visible. Longitudinal groove under uplifted liner with exposed aggregate. Moderate aggregate loss at some locations. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment. Misalignment ranges from approx. 1 to 3 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Evidence of corrosion staining in unlined concrete at 6 ft (4 o'clock), 175 ft (8 o'clock), 214 ft (8 o'clock), 258 ft (8 o'clock), 294 ft (8 o'clock), 355 ft (8 o'clock), 395 ft (8 o'clock), and 495 ft (4 o'clock). No visible rebar. • Wrinkle in liner along 8 to 10 o'clock at 471 ft, approx. 2 to 6 inches wide. • Wrinkle in liner along 8 to 10 o'clock at 491 ft, approx. 2 to 6 inches wide. • Minor liner blistering throughout. • MAS 4D-0460 and 4D-0470 appear to be in good condition. See Appendix A for man-entry condition assessment results at 4D-0470. • Heavy debris in pipe after 720 ft. Liner termination and unlined concrete not visible for rest of inspection. **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling except at one location (98 ft) where aggregate was visible at 5 o'clock due to gap in slime layer. Condition of pipe unknown based on CCTV inspection. • Wrinkle in liner near joint at 471 ft (8 o'clock to 9 o'clock), approx. 3 to 6 inches wide. • Wrinkle in liner near joint at 491 ft (8 o'clock to 9 o'clock), approx. 1 to 3 inches wide.
4D-0460	4D-0450	• Length surveyed: 637 ft • Pipe length: 637 ft • Direction of survey: U/S (4D-0450 to 4D-0460)	• Water level ~20% from 0 to 20 ft. Decreases to ~5% for remainder of segment. Water surface varies between right at liner termination to 1-2 inches below the liner. • Typical water level ~30% based on debris markings. • Fogging decreases video quality from 80 ft to 130 ft and 190 ft to 350 ft. Unlined concrete still visible through most of foggy portions. Unable to see majority of top half of pipe due to fog. • Condition of inside of 4D-0460 was not recorded.	**2024 Inspection** • Visible aggregate on left and right sides of pipe below the liner termination for majority of segment where unlined concrete was visible. No visible rebar. • Liner uplift of up to approx. 1 inch for approx. 75% of segment. Visible aggregate under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment. Misalignment ranges from approx. 1 to 3 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Evidence of corrosion staining in unlined concrete on left side of pipe at 39 ft, 339 ft, 540 ft, and 598 ft. No visible rebar. Moderate aggregate loss at this location. • Minor liner blistering in pipe segment throughout. • Liner termination detached at pipe joint at 316 ft (8 o'clock), 379 ft (4 and 8 o'clock), 539 (8 o'clock).

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
				• 4D-0460: Visible aggregate with apparent aggregate loss in unlined concrete in manhole channel. Liner appears to be in good condition. **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling. Condition of pipe unknown based on CCTV inspection.
4D-0450	4D-0440	• Length surveyed: 616 ft (Run 1) • Length surveyed: 720 ft (Run 2) • Total surveyed: 1,336 ft • Pipe length: 1,317 ft • Direction of survey: Run 1 – U/S (4D-0440 to 4D-0450) Run 2 – D/S (4D-0450 to 4D-0440)	• Water level ~5-10% (water level below liner termination). • Condition of inside of 4D-0440 was not recorded. • Liner termination and unlined concrete were not visible on both sides of pipe after 580 ft in Run 1 due to debris accumulation. • Run 2 – Significant fogging prevents clear image of pipe surfaces from 0 ft to 60 ft and 600 to 630 ft. • Condition of inside of 4D-0450 and 4D-0440 were not recorded.	**2024 Inspection** Run 1 – U/S Direction (4D-0440 to 4D-0450): • Visible aggregate on left and right sides of pipe below the liner termination for entire segment where unlined concrete was visible. No visible rebar. • Liner uplift of up to approx. 1 inch for approx. 50% of segment. Visible aggregate under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment. Misalignment ranges from approx. 1 to 6 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Large deposit approx. 2-3 inches in height from 4 to 5 o'clock at 100 ft. • Large deposit approx. 2-3 inches in height from 7 to 8 o'clock at 160 ft. • Moderate liner blistering from 10 to 2 o'clock for approx. 25% of segment. • Liner termination detached at pipe joint at 378 ft (7 o'clock) and 400 ft (4 o'clock). • Unable to see liner termination and unlined concrete after 580 ft due to debris accumulation. Run 2 – D/S Direction (4D-0450 to 4D-0440): • Fogging prevents clear image of pipe surfaces from 0 ft to 60 ft. • Visible aggregate on left and right sides of pipe below the liner termination for entire segment where unlined concrete was visible. No visible rebar. • Liner uplift of up to approx. 1 inch for approx. 50% of segment. Visible aggregate under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment. Misalignment ranges from approx. 1 to 3 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Liner termination detached at pipe joint at 198 ft (7 o'clock) and • Minor liner blistering in pipe throughout. • Significant liner blistering from 10 to 2 o'clock in pipe stick from 297 ft to 317 ft and from 496 ft to 537 ft. **2018 Inspection*** • Liner termination appears to be visible starting at 289 ft, but camera does not stop to focus. • Potentially visible aggregate below liner termination on both sides of pipe for majority of segment after 289 ft, but camera does not stop to focus on pipe walls, so it is difficult to verify. • Pipe sticks are rotated and liner termination does not align at pipe joints in several locations. Misalignment ranges from approx. 1 to 6 inches due improper installation of the pipe. • Potential longitudinal groove in pipe with exposed aggregate at liner termination on right-side from 365 ft to 385 ft, 520 ft to 545 ft, 675 ft to 740 ft, 890 ft to 908 ft, 928 ft to 948 ft, 1,010 ft to 1,070 ft, 1,090 ft to 1,108 ft, and 1,130 ft to 1,149 ft. No visible rebar. Camera does not stop to focus on it, so it is difficult to determine condition. • Potential longitudinal groove in pipe with exposed aggregate at liner termination on left-side from 500 ft to 565 ft, 585 ft to 640 ft, 675 ft to 705 ft, 750 ft to 800 ft, 825 ft to 850 ft, and 1,188 ft to 1,208 ft. Camera does not stop to focus on it, so it is difficult to determine condition. No visible rebar. • Liner termination detached at pipe joint (2 to 4-inch long) at 927 ft. • Manhole 4D-0440 appears to be in good condition.
4D-0440	4D-0430	• Length surveyed: 673 ft • Pipe length: 1,313 ft • Direction of survey: D/S (4D-0440 to 4D-0430)	• Water level ~10% at beginning. Rises to ~15% (1-2 inches below liner termination after 200 ft). • Typical water level ~50% based on debris markings. • Liner in MAS 4D-0440 appears to be in good condition. Camera does not show all interior surfaces. • Debris remained along invert of pipe at beginning.	**2024 Inspection** • Visible aggregate on left and right sides of pipe below the liner termination for majority of segment where unlined concrete was visible. No visible rebar. • Liner uplift of up to approx. 1-2 inches for approx. 50% of segment. Visible aggregate under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for approx. 50% of segment. Misalignment ranges from approx. 1 to 4 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side.

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
			• Fogging decreases video quality after 480 ft. Unlined concrete still visible through most of foggy portions. Unable to see majority of top half of pipe due to fog. • Survey abandoned at 673 ft due to heavy debris in the pipe.	• Large deposit approx. 2-3 inches in height from 7 to 8 o'clock at 106 ft. • Significant liner blistering from 9 to 3 o'clock in pipe stick from 0 ft to 160 ft, 250 ft to 300 ft, 370 ft to 390 ft. Did not identify any ruptured blisters. • Water level rises to 1-2 inches below liner termination after approx. 200 ft. Due to pipe stick rotation issues, the liner termination is under water for one side of pipe in some segments where rotation is particularly bad. • Liner termination detached at pipe joint at 580 ft (4 o'clock). • Heavy debris in pipe after 585 ft. Liner termination and unlined concrete not visible for rest of inspection. **2018 Inspection*** • Visible aggregate on left and right sides of pipe at the liner termination for majority of segment. No visible rebar. • Pipe sticks are rotated and liner termination does not align at pipe joints in several locations. Misalignment ranges from approx. 1 to 6 inches due improper installation of the pipe and occurs at the following locations: 35 ft, 95 ft, 116 ft, 237 ft, 317 ft, 519 ft, 579 ft, 801 ft, 860 ft, 920 ft, 940 ft, and 960 ft. • Corrosion stains indicating the presence of ferrous metal at 461 ft. No rebar seen. Cause of staining unknown. • Liner termination detached at pipe joint (~4 inches long) at 843 ft.
4D-0430	4D-0420	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Visible aggregate at liner termination along both sides of the pipe throughout the pipe segment. It is difficult to identify liner detachment due to video quality. No visible rebar. • Pipe sticks are rotated and liner termination does not align at pipe joints in several locations. Misalignment ranges from approx. 1 to 6 inches due improper installation of the pipe and occurs at the following locations: 26 ft, 66 ft, 86 ft, 106 ft, 285 ft, 428 ft, 447 ft, 467 ft, 506 ft, 527 ft, and 567 ft. • Potential liner detachment of up to 1 inch long on left-side at 480 ft. Poor video quality makes it difficult to verify. • Exposed aggregate and aggregate loss below liner termination in 4D-0420 manhole channel along 90° bend. Liner termination also detached (1 to 2 inches long) at that location. No visible rebar.
4D-0420	4D-0410	• Length surveyed: 936 ft • Pipe length: 1,320 ft • Direction of survey: U/S (4D-0410 to 4D-0420)	• Video is extremely dark due to poor lighting and fog. Pipe surfaces are not visible except at locations where camera stops, pans to the side to face the pipe wall, and shines a light on the pipe surface. • Water level appears to be above the liner termination (~20% – 30%), but could not verify due to poor lighting. • Survey abandoned at 936 ft because they ran out of cable. • Condition of inside of 4D-0410 was not recorded.	**2024 Inspection** • Unable to see liner termination and unlined concrete from 0 ft to 450 ft due to poor lighting and high water level. At approx. 450 ft, the liner termination along one side of the pipe is above the water level by anywhere from approx. 1 to 4 inches (varies) and a narrow band of unlined concrete is exposed. Only one side is above the water level at a time due to the improper rotation of the pipe sticks at the joints. • The liner termination and unlined concrete along the left side of the pipe are exposed between 450 ft to 470 ft and 490 ft to 510 ft. • The liner termination and unlined concrete along the right side of the pipe are exposed between 470 ft to 490 ft, 530 ft to 550 ft. • Where the liner termination and unlined concrete are exposed, there is visible aggregate below the liner. No visible rebar. It is difficult to identify liner detachment due to video quality. • Potential liner uplift in several locations where unlined concrete was visible, but could not verify due to poor video quality. • Heavy debris on pipe walls after 550 ft. Unable to see liner termination for remainder of inspection. **2018 Inspection*** • Pipe sticks are rotated and liner termination does not align at pipe joints in several locations. Misalignment ranges from approx. 1 to 6 inches due improper installation of the pipe and occurs for over ~95% of the segment from start of inspection to approx. 1,020 ft. Liner termination is covered by slime layer/scaling after 1,020 ft. • Visible aggregate below liner termination on both sides of pipe for over ~ 95% of segment from start of inspection to approx. 1,020 ft. No visible rebar. • Apparent aggregate loss point defects shown throughout segment. Difficult to verify due to video quality and speed at which camera moves through pipe. No visible rebar. • Longitudinal groove with exposed aggregate on right-side of pipe below liner termination from 465 ft to 485 ft, 515 ft to 580 ft, 608 ft to 640 ft, and from 820 ft to 860 ft. Liner termination detached by up to 1 inch along these distances. No visible rebar. • Longitudinal groove with exposed aggregate on left-side of pipe below liner termination from 227 ft to 264 ft, 404 ft to 463 ft, 485 ft to 505 ft, 900 ft to 920 ft, and from 960 ft to 980 ft. Liner termination detached by up to 1-inch along these distances. No visible rebar.

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
				• Aggregate loss in 90° bend of manhole channel at 4D-0420. No visible rebar.
4D-0410	4D-0400	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0400	4D-0390	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Pipe sticks are rotated and liner termination does not align at pipe joints in several locations. Misalignment ranges from approx. 1 to 6 inches due improper installation of the pipe and occurs at the following locations: 45 ft., 65 ft., 85 ft., 105 ft, 125 ft, 225 ft., 245 ft., 305 ft., 320 ft., 340 ft., 360 ft., 380 ft., 420 ft., 460 ft., 540 ft., 615 ft., 638 ft., 658 ft., 735 ft., 755, 775 ft., 815 ft., 935 ft., 953 ft. • Visible aggregate below liner termination on both sides of pipe for majority of segment up to 1,015 ft. No visible rebar. • Longitudinal groove with exposed aggregate below liner termination on right side of pipe from 15 ft to 40 ft, 65 ft to 85 ft, 225 ft to 240 ft, 320 ft to 380 ft, 550 ft to 590 ft, 698 ft to 710 ft, 775 ft to 791 ft, and from 970 ft to 1,005 ft. Liner termination detached by up to 1-inch along these distances. No visible rebar • Longitudinal groove with exposed aggregate below liner termination on left side of pipe from 88 ft to 106 ft, 108 ft to 125 ft, 302 ft to 320 ft, 330 ft to 350 ft, 698 to 710 ft, and from 875 ft to 953 ft. Liner termination detached by up to 1-inch along these distances. No visible rebar.
4D-0390	4D-0380	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Pipe sticks are rotated and liner termination does not align at pipe joints in several locations. Misalignment ranges from approx. 1 to 6 inches due improper installation of the pipe and occurs at the following locations: 35 ft., 55 ft., and 75 ft. • Aggregate visible along entire observed segment where liner termination is above water level and/or not covered by slime layer/scaling. No visible rebar. • Longitudinal groove with exposed aggregate below liner termination on right side of pipe from 34 ft to 52 ft. No visible rebar. • Continuous liner detachment of up to 1-inch on right side of pipe from 34 ft to 70 ft. • Continuous liner detachment of up to 1-inch on left side of pipe from 50 ft – 63 ft. • Liner termination detached up to 1-inch on left side at 87 ft. Approx 1-foot long.
4D-0380	4D-0370	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0370	4D-0360	• Length surveyed: 920 ft • Pipe length: 1,109 ft • Direction of survey: U/S (4D-0360 to 4D-0370)	• Water level ~5-10% (water level below liner termination) • Typical water level ~50% based on debris markings. • Survey abandoned at 920 ft because they ran out of cable. • Heavy debris in pipe after 530 ft. Liner termination and unlined concrete not visible for rest of inspection. • Liner in MAS 4D-0360 appears to be in good condition. Camera does not show all interior surfaces. See Appendix A for man-entry condition assessment results for 4D-0360. Condition of inside of 4D-0370 was not recorded.	**2024 Inspection** • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. • Aggregate projecting throughout indicating moderate concrete deterioration. No visible rebar. • Liner uplift of up to approx. 1-3 inches for approx. 50% of segment that was inspected. Visible aggregate and aggregate loss under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for approx. 50% of segment. Misalignment ranges from approx. 1 to 4 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • The liner termination on the right side is significantly higher than the left side (approx. 6-8 inch difference) from 155 ft to 295 ft and 490 ft to 535 ft. Unlined concrete on right side has experienced moderate concrete deterioration and aggregate loss. No visible rebar. • Evidence of corrosion staining in unlined concrete on right side of pipe at 4 ft, 164 ft to 168 ft, 195 ft, 216 ft, 237 ft, 255 ft, 269 ft, 338 ft. No visible rebar. Moderate aggregate loss at these location. • Potential joint separation of approx. 1/2 to 1/4-inch in pipe at 97 ft and 419 ft. Visible in unlined concrete below liner. • Apparent longitudinal score or scratch in the T-Lock liner from 42 to 53 ft along the 9 o'clock position. Ends at joint at 53 ft. It doesn't look like the score penetrates though the liner. Otherwise, the liner appears to be in good condition. • Heavy debris in pipe after 530 ft. Liner termination and unlined concrete not visible for rest of inspection. **2018 Inspection***

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
				• Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0330	4D-0320	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0320	4D-0310	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. MAS 4D-0310 appeared to be in good condition.
4D-0310	4D-0305	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0305	4D-0300	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0300	4D-0290	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete for majority of reach due to slime layer/scaling on pipe walls. Where exposed, pipe is in good condition along liner transition.
4D-0290	4D-0280	• Length surveyed: 639 ft • Pipe length: 1,001 ft • Direction of survey: U/S (4D-0280 to 4D-0290)	• Water level ~20% at beginning (above liner termination). • Typical water level ~50% based on debris markings. • Survey abandoned at 639 ft due to heavy debris. • Condition of inside of 4D-0280 was not recorded.	**2024 Inspection** • Visible aggregate on left and right sides of pipe below the liner termination where unlined concrete was visible. No visible rebar. • Liner termination and top 1-2 inches of unlined concrete are mostly visible on both sides of the pipe from 150 ft to 595 ft. Liner uplift of at least 1-2 inches and visible aggregate where exposed. Potential longitudinal groove with exposed aggregate on both sides of pipe, but difficult to confirm due to high water level. • Significant liner uplift of approx. 3-4 inches on right side of pipe from 185 ft to 265 ft and 342 ft to 618 ft. Longitudinal groove below uplifted liner with considerable aggregate loss and concrete deterioration. No visible rebar, but evidence of corrosion staining at 199 ft, 510 ft, and 530 ft. Liner termination on right side is submerged from 265 ft to 342 ft. Liner termination on right side becomes covered with debris after 618 ft. • Significant liner uplift of approx. 3-4 inches on left side of pipe from 275 ft to 305 ft and 484 ft to 595 ft. Longitudinal groove below uplifted liner with considerable aggregate loss and concrete deterioration. No visible rebar. Liner termination on left side is submerged from 305 ft to 484 ft. Liner termination on left side becomes covered by debris after 595 ft. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment where termination was visible. Misalignment ranges from approx. 1 to 4 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Liner appears to be in good condition overall. • Fairly large blisters in the liner around the 12 o'clock position from approx. 75 to 85 ft. • Heavy debris in pipe after 595 ft. **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0280	4D-0270	• Length surveyed: 598 ft (Run 1) • Length surveyed: 606 ft (Run 2) • Total survey: 1,204 ft • Pipe length: 1,074 ft • Direction of survey: Run 1 – D/S (4D-0280 to 4D-0270) Run 2 – U/S (4D-0270 to 4D-0280)	• Water level ~5-10% (water level below liner termination). • Typical water level ~50-60% based on debris markings. • Run 1 – water level rises to just below the liner termination at 281 ft. • Condition of inside of 4D-0280 was not recorded. Minimal footage of inside of 4D-0270. • Run 2 – Fogging from 100 ft to 125 ft prevents clear view of top half of pipe. • Reversal water level ~10% (water level below liner termination).	**2024 Inspection** Run 1 – D/S Direction (4D-0280 to 4D-0270): • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. • Aggregate projecting throughout indicating moderate concrete deterioration. No visible rebar. • Liner uplift of at least approx. 1-2 inches for entire segment that was inspected. Longitudinal groove below uplifted liner with considerable aggregate loss and concrete deterioration on both sides. Significant uplift of 3-4 inches in some areas. Camera does not stop to focus on the liner termination at any point, so could not confirm extent of uplift. • Pipe sticks are rotated and liner termination does not align at pipe joints for approx. 25% of segment. Misalignment ranges from approx. 1 to 3 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side.

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
				• Water level rises to 1-2 inches below the liner termination at 281 ft. • Liner termination becomes submerged on left side after 398 ft. • Unlined concrete on right side becomes submerged after 434 ft, but uplift liner remains above water surface until 448 ft. Liner termination on both sides are submerged after 448 ft. <u>Run 2 – U/S Direction (4D-0270 to 4D-0280)</u>: • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. • Aggregate projecting throughout indicating moderate concrete deterioration. No visible rebar. • Liner uplift of at least approx. 1-2 inches for entire segment that was inspected. Longitudinal groove below uplifted liner with considerable aggregate loss and concrete deterioration on both sides. • Significant uplift of 3-6 inches on right side from 62 ft to 103 ft and on the left side from 188 ft to 317 ft and 495 ft to 550 ft. Camera does not stop to focus on the liner termination at any point, so could not confirm extent of uplift. • Pipe sticks are rotated and liner termination does not align at pipe joints for approx. 25% of segment. Misalignment ranges from approx. 1 to 3 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Evidence of corrosion staining in unlined concrete on right side of pipe throughout. No visible rebar. Camera does not stop to focus on these locations at any point. • Potential misaligned joint at 206 ft. • Several large deposits that range from 2-6 inches in height and 4-8 inches in length. Typically orange in color. • Fogging from 100 ft to 125 ft prevents clear view of top half of pipe. **<u>2018 Inspection</u>*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0270	4D-0260	• Length surveyed: 400 ft • Pipe length: 1,020 ft • Direction of survey: D/S (4D-0270 to 4D-0260)	• Water level ~5% at beginning and rises to ~10% by 30 ft. • Condition of inside of 4D-0280 was not recorded. • Typical water level ~50% based on markings. • Poor video quality and camera does not stay centered when traversing down the pipe. Hard to see liner condition in top half of pipe. • Error in the footage counter at around the 20:45 minute mark. CCTV traverses entire pipe stick (typically 20 ft in length), but only increases by ~5 ft. Counter gets stuck at 312.90' for several feet. • Survey abandoned at 400 ft for unspecified reasons. Likely due to the water level exceeding the liner termination.	**<u>2024 Inspection</u>** • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. • Aggregate projecting throughout indicating moderate concrete deterioration. No visible rebar. • Liner uplift of at least approx. 1-2 inches for entire segment that was inspected. Longitudinal groove below uplifted liner with considerable aggregate loss and concrete deterioration on both sides. • Significant uplift of 3-6 inches on right side from 167 ft to 185 ft and 228 ft to 238 ft and on the left side from 308 ft to 345 ft. Camera does not stop to focus on the liner termination at any point, so could not confirm extent of uplift. • Pipe sticks are rotated and liner termination does not align at pipe joints for approx. 50% of segment. Misalignment ranges from approx. 1 to 4 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Several large deposits that range from 2-6 inches in height and 4-8 inches in length. Typically orange in color. • Liner termination on right side becomes submerged after 310 ft. Liner termination on both sides become submerged after 357 ft. **<u>2018 Inspection</u>*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0260	4D-0250	Not inspected in 2024.	Not inspected in 2024.	**<u>2018 Inspection</u>*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0250	4D-0240	• Length surveyed: 1,015 ft • Pipe length: 1,015 ft • Direction of survey: D/S (4D-0250 to 4D-0240)	• Water level ~10% (water level below liner termination). • Minimal footage of MAS 4D-0250. Portion of cone is shown, which has numerous liner blisters. None appeared ruptured. • Pipe was not sufficiently cleaned. Liner termination and unlined concrete were mostly covered by debris/slime layer for entire segment. • Typical water level ~30-40% based on markings.	**<u>2024 Inspection</u>** • Debris/slime layer mostly covers the unlined concrete on both sides of pipe for the entire segment. Liner uplift is apparent through the slime layer, except between 120 ft to 160 ft and 900 ft to 915 ft where debris/slime layer is too thick to identify liner uplift. Condition of unlined concrete hard to ascertain during this stretch. • Continuous liner detachment of at least 1 inch on both sides of pipe throughout. Potentially significant liner detachment and uplift of at least approx. 3-4 inches on both sides of pipe for over 75% of segment. Potentially significant longitudinal groove with aggregate loss below uplifted liner. Debris/slime layer prohibits clear view of aggregate for verification.

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
			• Camera very shaky in several stretches. Likely due to debris remaining along the pipe invert.	• Liner termination covered by heavy slime layer/debris on both sides of pipe from 120 ft to 160 ft and 900 ft to 915 ft. Could not identify of the liner is uplifted during these stretches. • Liner termination detached at pipe joint by approx. 2-4 inches at 5 ft (5 o'clock), 223 ft (5 o'clock), 465 ft (7 o'clock), 583 ft (5 o'clock), 682 ft (7 o'clock), 785 ft (7 o'clock), 865 ft (5 o'clock), 885 ft (7 o'clock), 965 ft (7 o'clock) • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment. Misalignment ranges from approx. 1 to 6 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Evidence of corrosion staining in unlined concrete on left side of pipe at 453 ft. No visible rebar. Debris/slime layer prohibits clear view for verification. • T-Lock liner appears to be in good condition overall. • Dense liner blistering in final ~5 ft of segment and in the channel of MAS 4D-0240. • Exposed aggregate in unlined concrete channel of 4D-0240. Liner in 4D-0240 appears to be in good condition based on minimal footage. **2019 Inspection*** • Continuous liner detachment of 1 to 3 inches and longitudinal groove with exposed aggregate on right-side throughout entire segment. Minor aggregate loss observed throughout. • Continuous liner detachment of 1 to 3 inches and apparent longitudinal groove with exposed aggregate on left-side of pipe from 80 ft to end of segment. Liner termination located at or below water level from start of inspection to 80 ft due to rotation of pipe liner. Liner termination along right-side of pipe located several inches above water level as a result. No apparent liner detachment on left-side where water level obscures clear view from start of inspection to 80 ft. Minor aggregate loss observed from 80 ft to end of segment. • Unable to see liner termination or unlined concrete due to slime layer on left side of pipe wall from 125 ft to 140 ft, 262 ft to 300 ft, and 795 ft to 830 ft. • Unlined concrete covered by slime layer on both sides of pipe from 645 ft to 660 ft. • Liner termination and unlined concrete obstructed by high water level from 663 ft to 885 ft. Detached liner visible on right-side of pipe from 798 ft to 835 ft due to improper rotation of pipe liner. • Pipe sticks are rotated and liner termination does not align at pipe joints in several locations. Misalignment ranges from approximately 1 to 6 inches due to improper installation of the pipe. • Manhole 4D-0250 appears to be in good condition. • No visible rebar.
4D-0240	4D-0230	• Length surveyed: 778 ft • Pipe length: 778 ft • Direction of survey: D/S (4D-0240 to 4D-0230)	• Water level ~5-10% (water level below liner termination). • Minimal footage of MAS 4D-0240. • Pipe was not sufficiently cleaned. Liner termination and unlined concrete were mostly covered by debris/slime layer for entire segment. • Typical water level ~30-40% based on markings.	**2024 Inspection** • Based on minimal footage of MAS 4D-0240, the liner appears to be in good condition. • Debris/slime layer mostly covers the liner termination and unlined concrete on both sides of pipe for the entire segment. Liner uplift is apparent through the slime layer. Condition of unlined concrete hard to ascertain during this stretch. • Continuous liner detachment of at least 1 inch on both sides of pipe throughout. Potentially significant liner detachment and uplift of at least approx. 3-4 inches on both sides of pipe for over 75% of segment. Potentially significant longitudinal groove with aggregate loss below uplifted liner. Debris/slime layer prohibits clear view of aggregate for verification. • Liner termination covered by heavy slime layer/debris on right side of pipe from 530 ft to 760 ft and on left side of pipe from 540 ft to 555 ft and 645 ft to 770 ft. Could not identify of the liner is uplifted during these stretches. • CCTV operator noted possible longitudinal rebar exposure at 607 ft along the 7 o'clock position. Length approx. 4-6 inches. Woodard & Curran thinks it is unlikely to be exposed rebar. Surrounding heavy debris/slime layer prohibits clear view of unlined concrete to verify. • T-Lock liner appears to be in good condition overall. • Dense liner blistering in the MAS 4D-0230 channel. • Possible exposed aggregate in unlined concrete channel of 4D-0230. Unable to verify due to slime layer. Liner in 4D-0230 appears to be in good condition based on footage. **2018 Inspection*** • Continuous liner detachment of 1 to 3 inches and longitudinal groove with exposed aggregate below liner termination on both sides of pipe throughout entire segment. Aggregate below liner consistently covered by slime layer, but

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
				aggregate loss is likely. Liner termination periodically covered by slime layer, but consistently appears detached when exposed. No visible rebar.
4D-0230	4D-0220	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Continuous liner detachment of 1 to 3 inches and longitudinal groove with exposed aggregate on left-side of pipe from 42 ft to 65 ft and from 87 ft to 102 ft. Aggregate below liner consistently covered by slime layer, but aggregate loss is likely. Liner termination periodically covered by slime layer, but consistently appears detached when exposed. Only 124 ft were inspected for the approx. 776 ft long segment.
4D-0220	4D-0210	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0220 and 4D-0210 appear to be in good condition.
4D-0210	4D-0200	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0210 and 4D-0200 appear to be in good condition.
4D-0190	4D-0180	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0190 and 4D-0180 appear to be in good condition.
4D-0180	4D-0170	• Length surveyed: 754 ft • Pipe length: 812 ft • Direction of survey: U/S (4D-0170 to 4D-0180)	• Water level ~10-15%, decreases to 5-10% after 20 ft (water level below liner termination). • Markings on pipe show flow line typically 40-50% full. • Poor video quality (blurry) and fogging between 30 ft to 360 ft. Heavy fogging again after 615 ft. • Heavy debris in pipeline after 754 ft. No access at 4D-0180 to finish cleaning the segment. • Inspection abandoned at 754 ft due to heavy debris. • Condition of inside of 4D-0180 was not recorded.	**2024 Inspection** • MAS 4D-0170 appears to be in good condition. • Poor video quality (blurry) and fogging from 30 ft to 360 ft makes is hard to see condition of liner termination and unlined concrete while the CCTV apparatus is moving. Condition of liner and concrete is visible when the camera stops and pans to the side. Video quality improves after 360 ft, until heavy fogging again at 615 ft • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. Minor aggregate loss for majority of segment. • Liner uplift of up to approx. 1 inch for approx. 25% of alignment where liner termination was visible. Visible aggregate under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for approx. 50% of the segment. Misalignment ranges from approx. 1 to 4 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Liner termination on left side is submerged between 350 ft and 405 ft due to pipe stick rotation issue. **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0170	4D-0160	• Length surveyed: 780 ft • Pipe length: 1,206 ft • Direction of survey: U/S (4D-0160 to 4D-0170)	• First attempt began at 4D-0170, but was abandoned at 13 ft due to debris/obstruction in the pipe. • Water level ~15% at beginning of inspection. Decreases to 5-10% after 100 ft. • Markings on pipe show flow line typically ~40-50% full. • There was debris from a broken manhole lid in the channel of MAS 4D-0160. CCTV navigated around it. • Survey abandoned at 780 ft.	**2024 Inspection** • Liner termination submerged on one side of pipe for majority of segment due to pipe stick rotation issue and higher water level at time of inspection. • Liner termination submerged on left side of pipe from 0 ft to 65 ft. • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. Minor aggregate loss for majority of segment. • Liner uplift of up to approx. 1-2 inches for approx. 25% of alignment where liner termination was visible. Visible aggregate under uplifted liner. • Pipe sticks are rotated and liner termination does not align at pipe joints for approx. 50% of the segment. Misalignment ranges from approx. 1 to 4 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Liner detached by 1-2 inches at pipe joint at 204 ft (4 o'clock). **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. • Liner termination at top of 4D-0170 manhole cone detached by up to 1 inch. Approx. 3 inches in length.
4D-0160	4D-0150	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Continuous visible aggregate at liner termination on both sides of pipe for majority of pipe segment.

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
				• Visible aggregate with minor aggregate loss below liner termination on left-side of pipe from 10 ft to 80 ft, 215 ft to 240 ft, and 252 ft. • Visible aggregate with minor aggregate loss below liner termination on right-side of pipe from 207ft to 250ft. • Liner termination detached on right-side of pipe at connection to manhole 4D-0150. Liner detached by approximately 3 inches. • No visible rebar at any point along segment. • Visible aggregate below liner termination in 4D-0160 manhole channel.
4D-0150	4D-0140	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manhole 4D-0150 and 4D-0140 appear to be in good condition. See observations for reach 4D-0140 to 4D-0130 for infiltration runner in 4D-0140.
4D-0140	4D-0130	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. • Infiltration runner at corner of 4D-0140 manhole bench around 3 o'clock, facing the outlet pipe. Otherwise, manhole appears to be in good condition
4D-0130	4D-0120	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection.
4D-0120	4D-0118	• Length surveyed: 5 ft • Pipe length: 43 ft • Direction of survey: U/S (4D-0118 to 4D-0120)	• Water level ~20-25% (water level above liner termination). • Markings on pipe show flow line typically ~50-60% full. • Survey abandoned due to high water level. • No footage of MAS 4D-0118 or 4D-0120.	**2024 Inspection** • Liner termination and unlined concrete are submerged due to high water level. Condition of pipe unknown. • Dense liner blistering in the first 10 ft. **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0120 and 4D-0118 appear to be in good condition.
4D-0118	4D-0110	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0118 and 4D-0110 appear to be in good condition.
4D-0110	4D-0100	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0110 and 4D-0100 appear to be in good condition.
4D-0100	4D-0090	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Continuous visible aggregate at liner termination on right side at 23 ft – 25 ft. No visible rebar. • Visible aggregate point defect at liner termination on right-side at 74 ft. No visible rebar • Visible aggregate point defect at liner termination on left-side at 174 ft. No visible rebar. • Unable to see liner termination or unlined concrete for a majority of segment due to slime layer/scaling on pipe walls. • Manholes 4D-0100 and 4D-0090 appear to be in good condition.
4D-0090	4D-0080	• Length surveyed: 828 ft • Pipe length: 1,213 ft • Direction of survey: U/S (4D-0080 to 4D-0090)	• Water level ~10% (water level below liner termination). • Markings on pipe show flow line typically ~40% full. • Heavy slime layer/debris remained on pipe surfaces from 580 ft to 600 ft. Moderate slime layer remained from 600 ft to rest of inspection. • Survey abandoned at 828 ft.	**2024 Inspection** • Dense liner blistering in MAS 4D-0080 manhole barrel and cone. • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. • Aggregate projecting throughout indicating moderate concrete deterioration. No visible rebar. • Liner uplift of at least approx. 1-2 inches for approx. 50% of the segment that was inspected. Longitudinal groove below uplifted liner beginning to appear in several locations with considerable aggregate loss. • Liner termination submerged on the left side of pipe from 160 ft to 185 ft and from 320 ft to 348 ft due to pipe rotation issues. CCTV apparatus moving upstream causes the water level to rise for a few feet in front of the camera. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment. Misalignment ranges from approx. 1 to 6 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Dense linter blistering throughout segment. • Liner detached at pipe joint at 365 ft. Approx. 4 to 6 inches long.

U/S Manhole	D/S Manhole	Inspection Information	CCTV General Comments	Condition Summary (Includes key comments from 2018/2019 CCTV inspections for comparison)
				• Unable to see liner termination or unlined concrete due to slime layer/debris from 580 ft to 600 ft and 680 ft to 700 ft. **2018 Inspection*** • Liner detached and folded over at 4 o'clock on pipe joint at 264 ft. Approximately 4 to 6-inches long. • Visible aggregate point defect at liner termination on right side at 415 ft and 638 ft. No visible rebar. • Aggregate loss point defect at liner termination on right side at 604 ft. No visible rebar. • Continuous visible aggregate at liner termination on right side at 580 ft – 587 ft, 600 ft – 610 ft, 820 – 835 ft, 896 ft – 902 ft, 1165 ft – 1199 ft. No visible rebar. • Continuous visible aggregate at liner termination on left side at 850 ft – 868 ft, 1170 ft – 1200 ft. No visible rebar. • Appears to be a roughly 1-inch wide hole approximately 1-inches to 2-inches deep at liner termination on left side at 864 ft. No visible rebar. • Manholes 4D-0080 and 4D-0090 appear to be in good condition.
4D-0080	4D-0070	• Length surveyed: 946 ft • Pipe length: 946 ft • Direction of survey: D/S (4D-0080 to 4D-0070)	• Water level ~10% (water level below liner termination). • Markings on pipe show flow line typically ~40% full. • Slime layer not cleaned off unlined concrete on right side of pipe from 165 ft to 185 ft. • Turbulent flow in pipe at 183 ft due to obstruction. CCTV is able to pass obstruction. • Heavy debris/slime layer remaining on right side of pipe after 580 ft. Lighter on the left side. Liner termination and unlined concrete visible on left side of pipe for majority of remaining segment.	**2024 Inspection** • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. • Aggregate projecting throughout indicating moderate concrete deterioration. No visible rebar. • Liner uplift of at least approx. 1-2 inches for approx. 50% of the segment that was inspected. Longitudinal groove below uplifted liner beginning to appear in several locations with considerable aggregate loss. • Pipe sticks are rotated and liner termination does not align at pipe joints for majority of segment. Misalignment ranges from approx. 1 to 4 inches due to improper installation of the pipe. The side with the higher liner termination has generally experienced more corrosion than the lower side. • Liner termination on left side is submerged between 165 ft to 190 ft due to pipe stick rotation issue. • Slime layer covering unlined concrete on right side of pipe from 165 ft to 185 ft. Unable to assess condition of concrete over this stretch. • Dense linter blistering throughout segment. **2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0080 and 4D-0070 appear to be in good condition.
4D-0070	4D-0060	• Length surveyed: 173 ft • Pipe length: 796 ft • Direction of survey: D/S (4D-0070 to 4D-0060)	• Water level ~10% (water level below liner termination). • Markings on pipe show flow line typically ~40% full. • Poor video quality due to heavy fogging. • CCTV operators entered through the grit trap manhole cover, not MAS 4D-0070. Inspection ended at MAS 4D-0060, located approx. 173 ft downstream of the grit trap.	**2024 Inspection** • Visible aggregate on left and right sides of pipe below the liner termination for entire segment inspected where unlined concrete was visible. No visible rebar. • Aggregate projecting throughout indicating moderate concrete deterioration. No visible rebar. • Liner uplift of at least approx. 1-3 inches for entire segment that was inspected. Longitudinal groove below uplifted liner beginning to appear in several locations with considerable aggregate loss. • Dense linter blistering throughout segment. • Liner detached at pipe joint at 173 ft. Approx. 4 to 6 inches long. • At 169 ft: Large debris on pipe wall approx. 4 to 6 inches in height from 7 to 8 o'clock. **2018 Inspection*** • Potential longitudinal groove with exposed aggregate at liner termination on left side from 0 ft – 370 ft, and 400 ft – 560 ft. Slime layer prohibits clear view of aggregate for verification. • Potential longitudinal groove with exposed aggregate at liner termination on right side for majority of segment. Slime layer prohibits clear view of aggregate for verification. • Liner blistering around pipe joints for majority of segment.
4D-0030	4D-0020	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Manholes 4D-0030 and 4D-0020 appear to be in good condition.
4D-0020	4D-0010	Not inspected in 2024.	Not inspected in 2024.	**2018 Inspection*** • Unable to see liner termination or unlined concrete due to slime layer/scaling on pipe walls. Condition of pipe unknown based on CCTV inspection. Refer to condition assessment results from man-entry inspections of 4D-0020. • Infiltration stain from 1 o'clock to 4 o'clock at 116 ft. • Liner blistering around pipe joints for majority of segment. • Manholes 4D-0020 and 4D-0010 appear to be in good condition.

*Refer to Appendix C and Appendix D for complete CCTV inspection comments from the 2018 and 2019 inspections.

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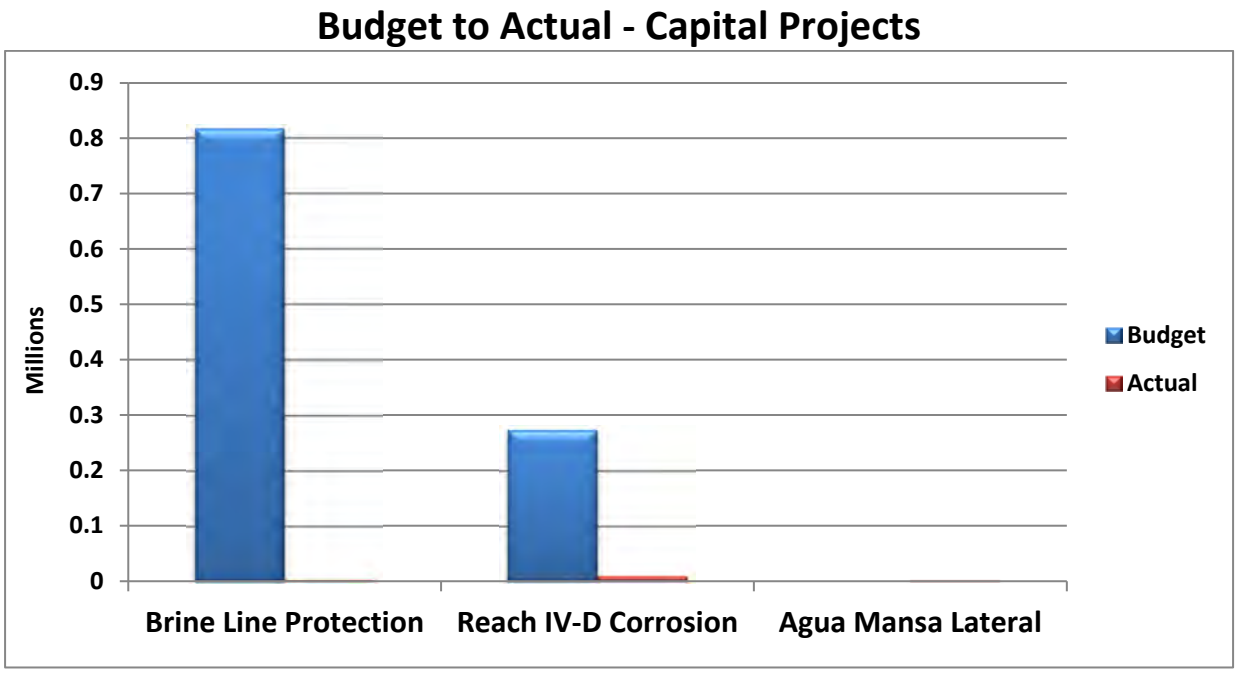
Santa Ana Watershed Project Authority
PA24 - Brine Line - Financial Report
January 2025

Staff comments provided on the last page are an integral part of this report.

Overview	This report highlights the Brine Line's key financial indicators for the Fiscal Year-to-Date (FYTD) through January 2025 unless otherwise noted.

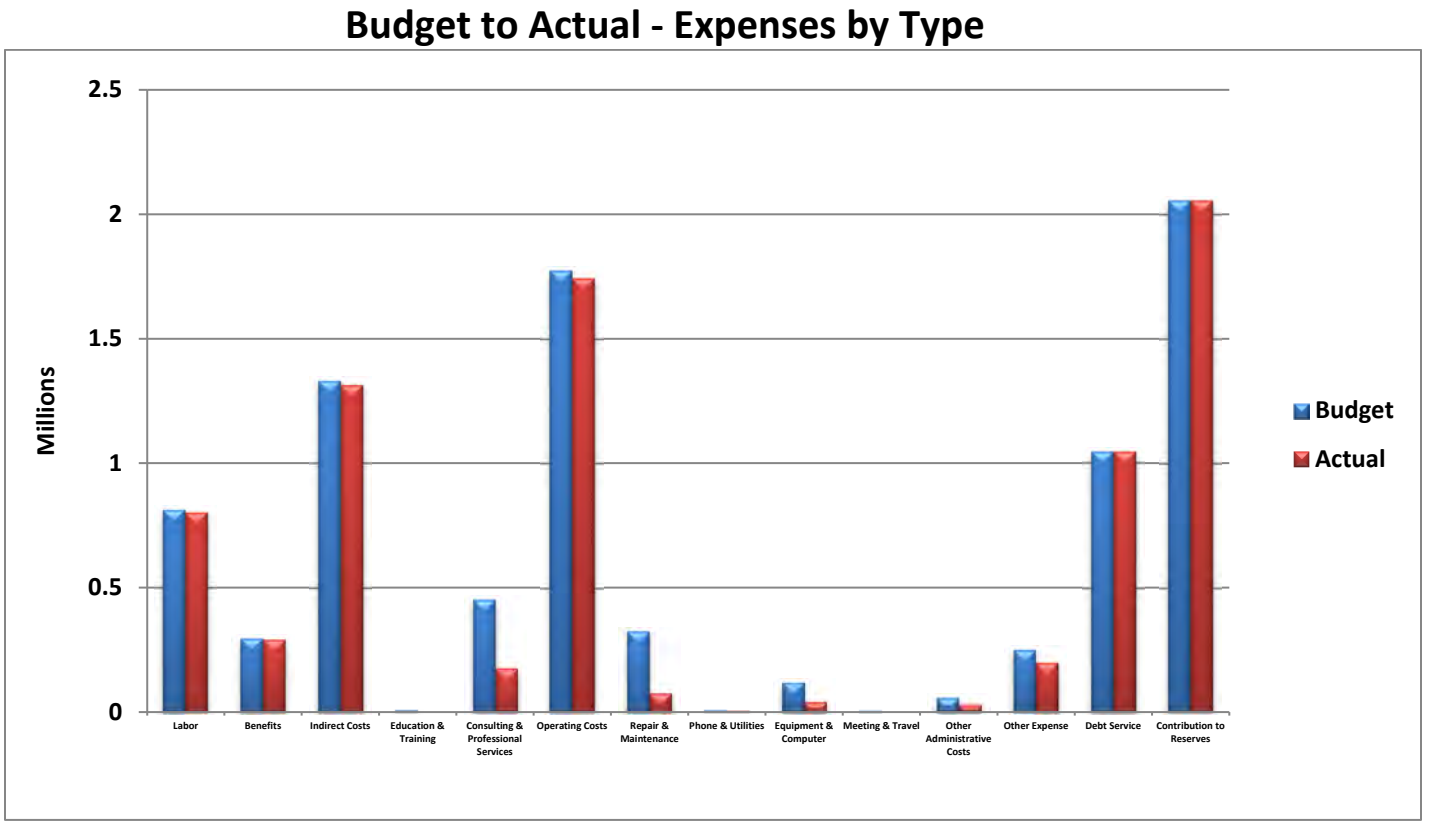
Brine Line - Capital Projects

Budget to Actual – Capital Projects				Favorable
	Annual Budget	FYTD Budget	FYTD Actual	Favorable (Unfavorable) Variance
Brine Line Protection	$1,400,590	$817,011	$2,704	$814,307
Reach IV-D Corrosion	469,423	273,830	10,251	263,579
Agua Mansa Lateral	-	-	1,488	(1,488)
Total Capital Costs	**$1,870,013**	**$1,090,841**	**$14,443**	**$1,076,398**

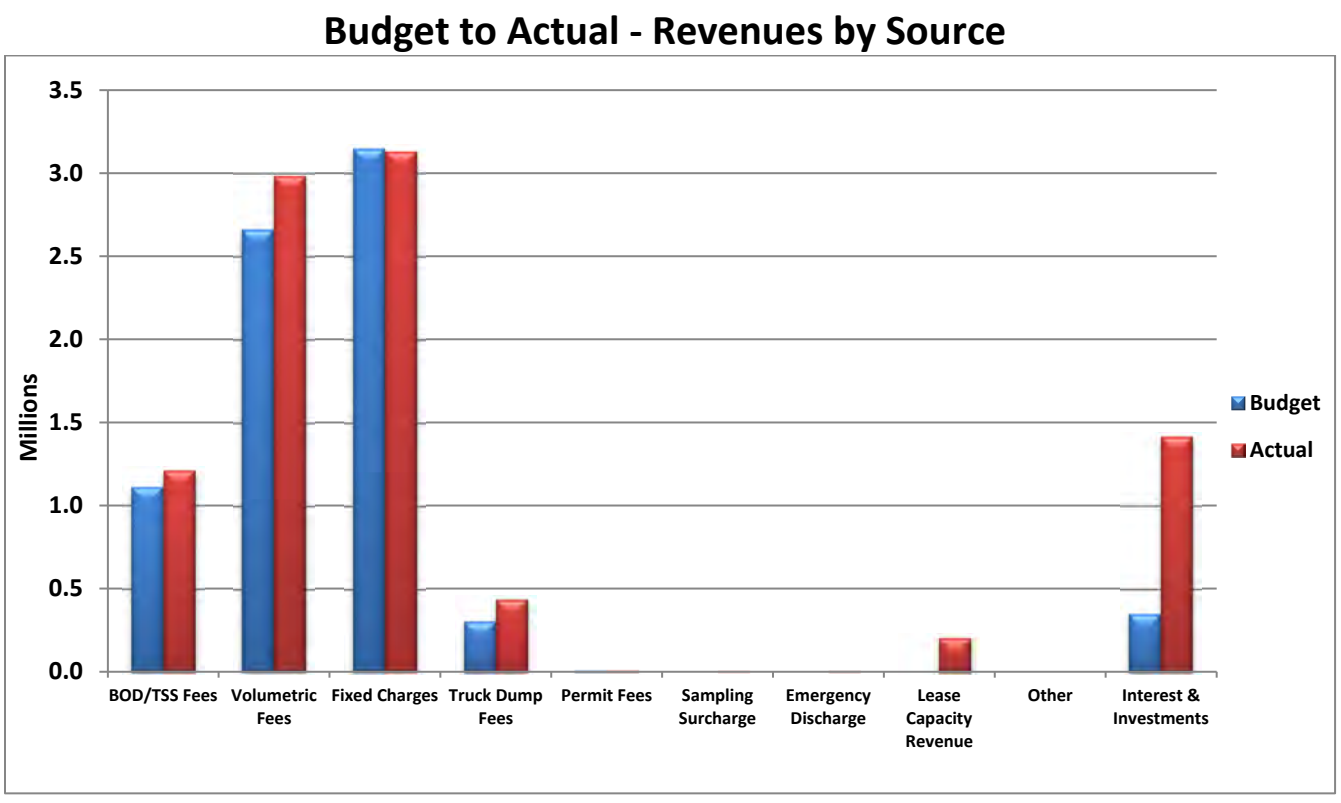


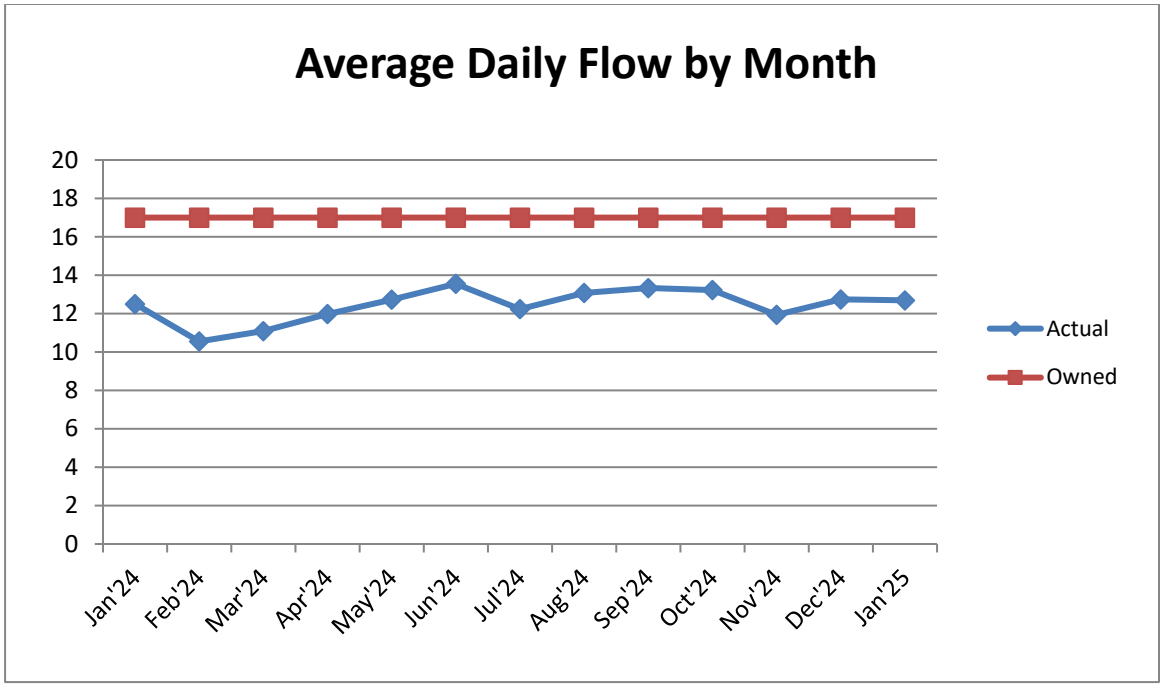
Brine Line – Operating

Budget to Actual - Expenses by Type				Favorable
	Annual Budget	FYTD Budget	FYTD Actual	Favorable (Unfavorable) Variance
Labor	$1,392,817	$812,477	$801,938	$10,539
Benefits	507,443	296,008	291,905	4,103
Indirect Costs	2,278,716	1,329,251	1,311,971	17,280
Education & Training	15,225	8,881	-	8,881
Consulting & Prof Svcs	772,500	450,625	177,418	273,207
Operating Costs	3,041,939	1,774,464	1,743,869	30,595
Repair & Maintenance	553,558	322,909	76,711	246,198
Phone & Utilities	13,200	7,700	4,796	2,904
Equip & Computers	204,167	119,097	43,582	75,515
Meeting & Travel	7,700	4,492	1,126	3,366
Other Admin Costs	98,988	57,743	30,727	27,016
Other Expense	426,597	248,848	199,270	49,578
Debt Service	1,709,476	1,044,273	1,044,273	-
Contribution to Reserves	2,055,786	2,055,786	2,055,786	-
Total	**$13,078,112**	**$8,532,554**	**$7,783,372**	**$749,182**



Budget to Actual - Revenues by Source				Favorable
	Annual Budget	FYTD Budget	FYTD Actual	Favorable (Unfavorable) Variance
BOD/TSS Fees	$1,900,850	$1,108,829	$1,207,137	$98,308
Volumetric Fees	4,564,617	2,662,693	2,985,029	322,336
Fixed Charges	5,396,025	3,147,681	3,130,867	(16,814)
Truck Dump Fees	517,020	301,595	433,236	131,641
Permit Fees	26,600	7,900	9,000	1,100
Sampling Surcharge	-	-	3,761	3,761
Emergency Discharge Fees	-	-	5,261	5,261
Lease Capacity Revenue	-	-	203,634	203,634
Other Revenue	-	-	267	267
Interest & Investments	673,000	350,917	1,414,135	1,063,218
Total	**$13,078,112**	**$7,579,615**	**$9,392,327**	**$1,812,712**



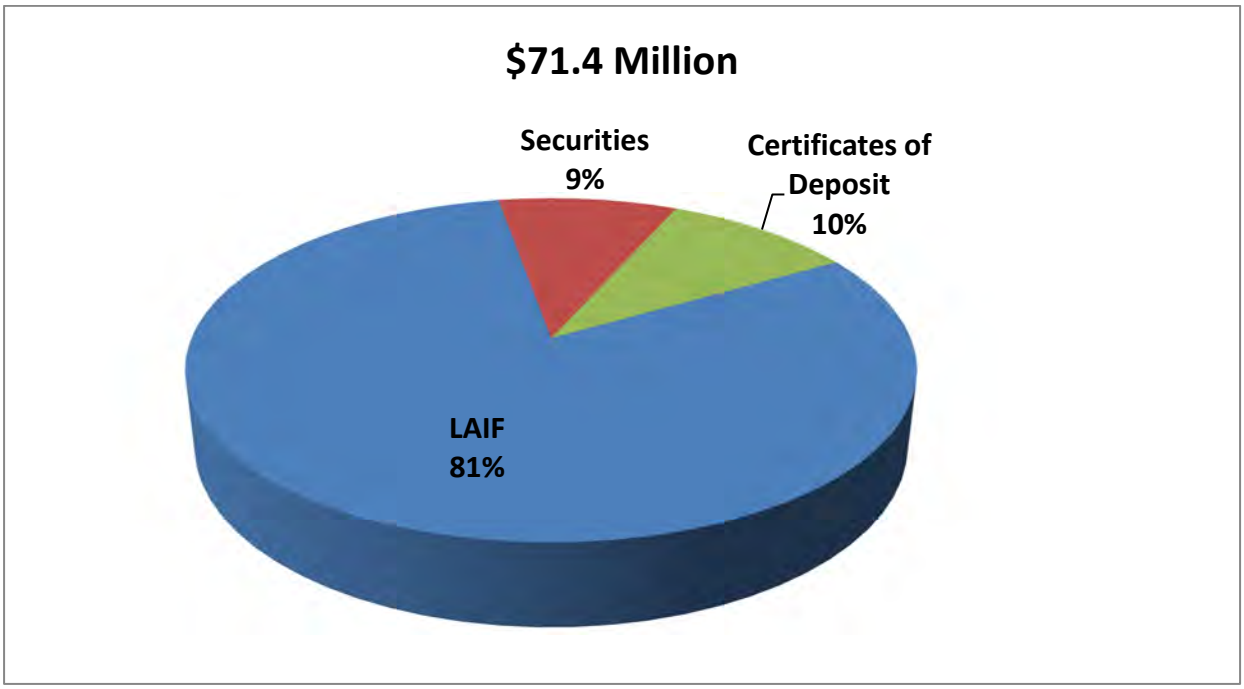


Total Discharge by Agency
(in million gallons)

Discharger	Jul'24	Aug'24	Sep'24	Oct'24	Nov'24	Dec'24	Total
Chino Desalter Authority	109.4633	99.5941	115.5658	112.7109	111.1550	113.0520	661.5411
Eastern Municipal Water District	104.3521	91.4534	115.7813	106.8580	111.8461	112.6482	642.9391
Inland Empire Utilities Agency	16.9394	14.3438	15.7094	14.2392	13.0521	13.0986	87.3825
San Bernardino Valley MWD	44.0789	45.0388	44.7654	45.5667	43.1998	45.4757	268.1253
Western Municipal Water District	88.9240	124.8091	124.5022	127.3453	105.6868	104.6496	675.9170
SAWPA Adjustment	0.0000	0.0000	6.5000	0.0000	0.0000	0.0000	6.5000
Truck Discharge	4.0942	3.9492	3.4518	3.3775	3.2437	2.8978	21.0142
Total	**367.8519**	**379.1884**	**426.2759**	**410.0976**	**388.1835**	**391.8219**	**2,363.4192**

Discharger	Jan'25	Feb'25	Mar'25	Apr'25	May'25	Jun'25	Total
Chino Desalter Authority	100.6980						762.2391
Eastern Municipal Water District	97.6937						740.6328
Inland Empire Utilities Agency	13.6921						101.0746
San Bernardino Valley MWD	43.5330						311.6583
Western Municipal Water District	122.0981						798.0151
SAWPA Adjustment	0.0000						6.5000
Truck Discharge	2.9594						23.9736
Total	**380.6743**						**2,744.0935**

Total Cash & Investments



Reserve Fund Balance

	Amount
Debt Retirement	$3,077,423
Pipeline Replacement & Capital Investment	37,634,962
OC San Pipeline Rehabilitation	3,102,321
Pipeline Capacity Management	13,087,674
OC San Future Treatment & Disposal Capacity	2,003,765
YVWD Treatment Purchase	4,485,897
Brine Line Operating	2,337,938
Brine Line Operating Cash	5,661,048
Total Reserves	**$71,391,028**

Legend		
		Compared to Budget
	Ahead or Favorable	Above +5% Favorable Revenue or Expense Variance
	On Track	+5% to -2% Variance
	Behind	-3% to -5% Variance
	Concern	Below -5% Variance

Staff Comments

For this month's report, the item(s) explained below are either "behind", a "concern", or have changed significantly from the prior month.

Capital Projects are 98.7% below budget. Operating Expenses are 8.8% below budget and Revenues are 23.9% above budget.