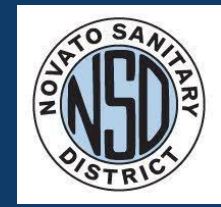




INSPECTION OF A 50-YEAR OLD OUTFALL FORCEMAIN TO SAN PABLO BAY



NATIONAL PLANT SERVICES
A Carylton Company

February 16, 2023

**PUG Sharing
Technologies Seminar**

PRESENTED BY

James Kohne, Project Engineer (W&C)

Xavier Irias, Project Manager (W&C)

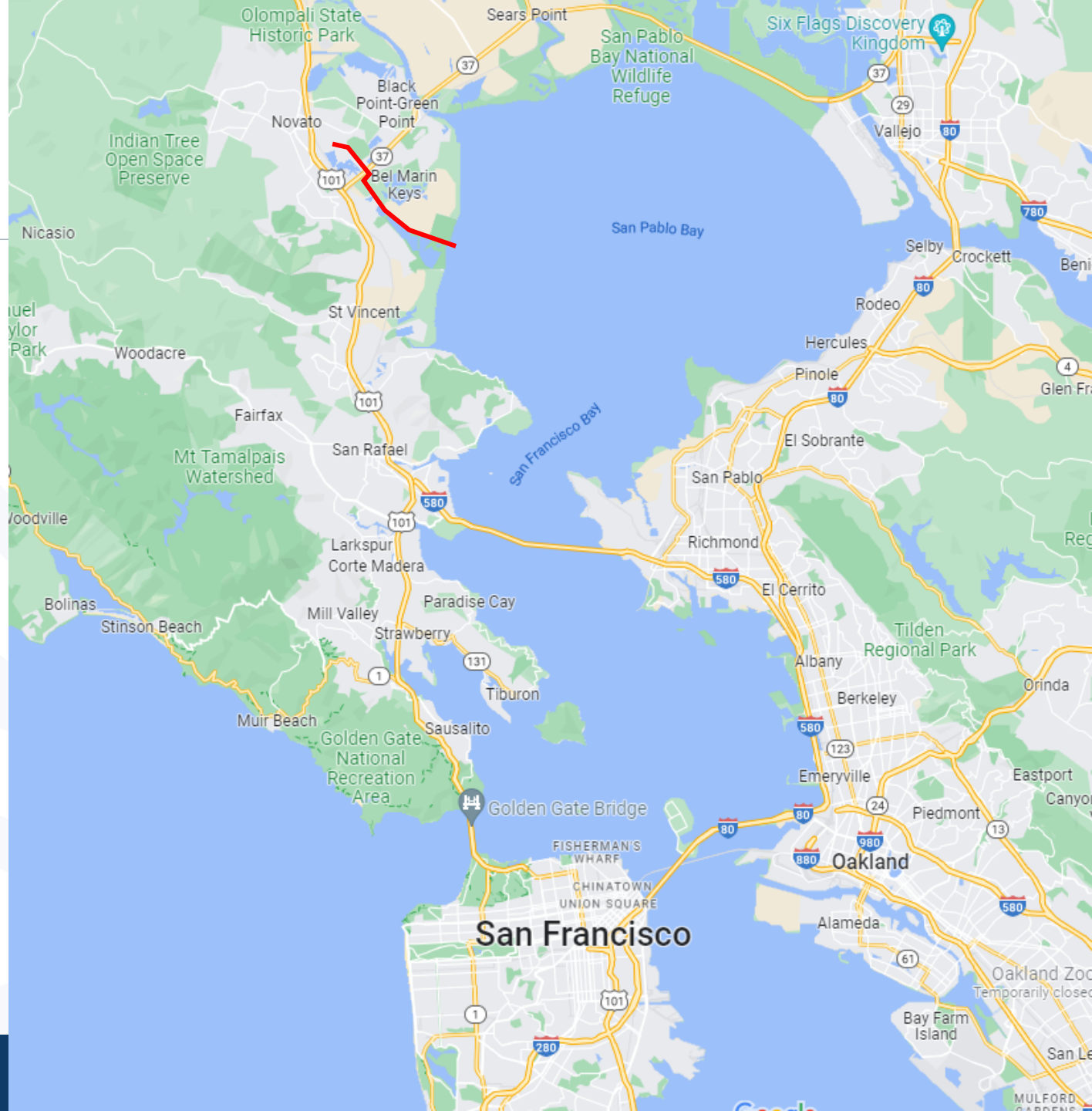
Jeff Boheim, Project Manager (NSD)

Agenda

1. Project Background and Overview
2. Project Challenges
 - a. Stakeholder Coordination
 - b. Pipeline Access
 - c. Limited Inspection Window
3. Inspection Results
4. Lessons Learned
5. Questions

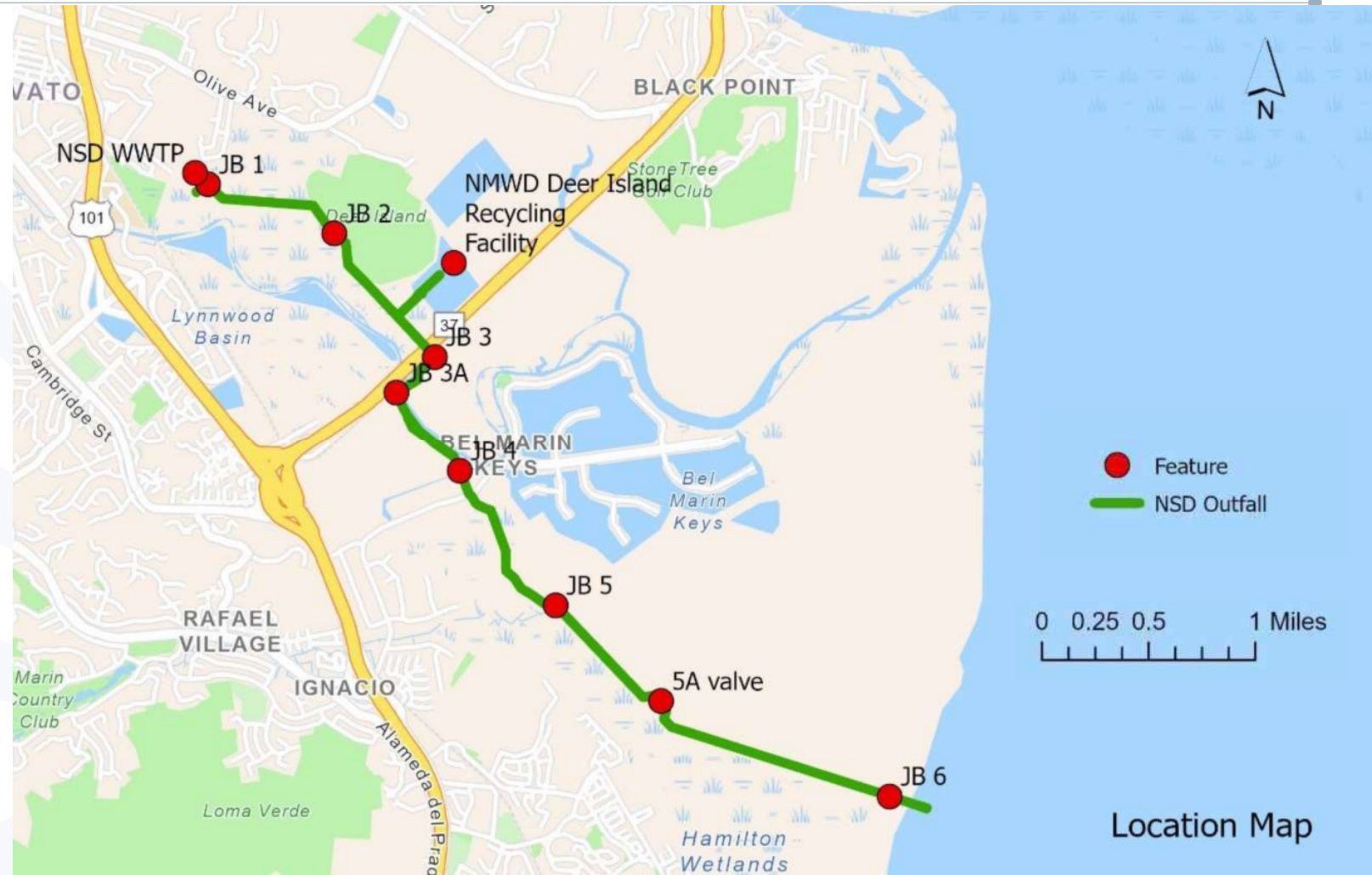
Project Background and Overview

Overview Map



Project Map and System Highlights

- **Effluent Forcemain Length:** ~5 miles
- **Pipe Material:** Primarily RCP
- **Pipe Diameter:** 48- to 54- inches
- **Project Driver:** Need to confirm the pipe's condition as it passes under Novato Creek and discharges into San Pablo Bay Pipe's. Pipe age.



Project Map and Highlights

→ NSD hired Woodard & Curran (W&C) to:

1. Support selecting an inspection contractor.
2. Review data collected.
3. Develop a summary TM with recommended next steps.

→ Inspection Technologies/Approaches Used:

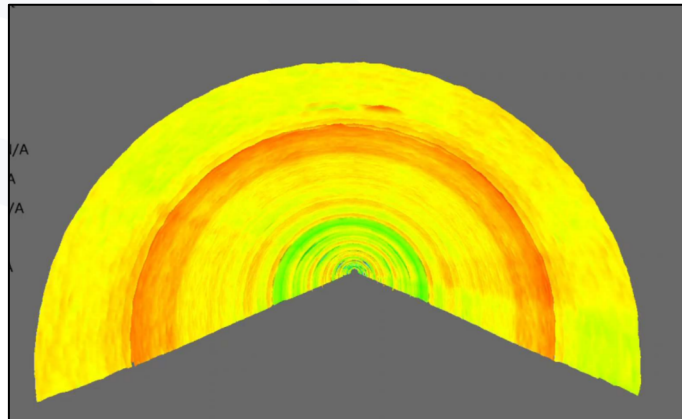


Photo 1 – Typical soft marine growth on pipe crown

Project Challenges

The background features several overlapping, semi-transparent blue geometric shapes, including triangles and lines, creating a layered, abstract pattern. A thin, light green line forms a rectangular frame around the text, with a small circle at the bottom right corner.

Project Challenges

Multitude of Stakeholders



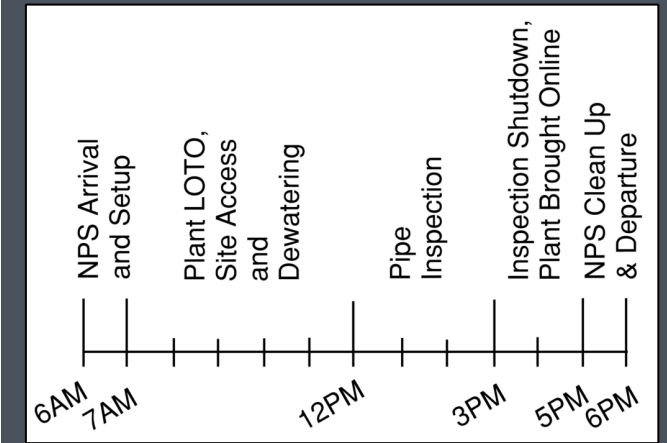
- Extensive coordination was required

Limited Physical Access



Only 7 Access Points over ~5 miles

Limited Inspection Window

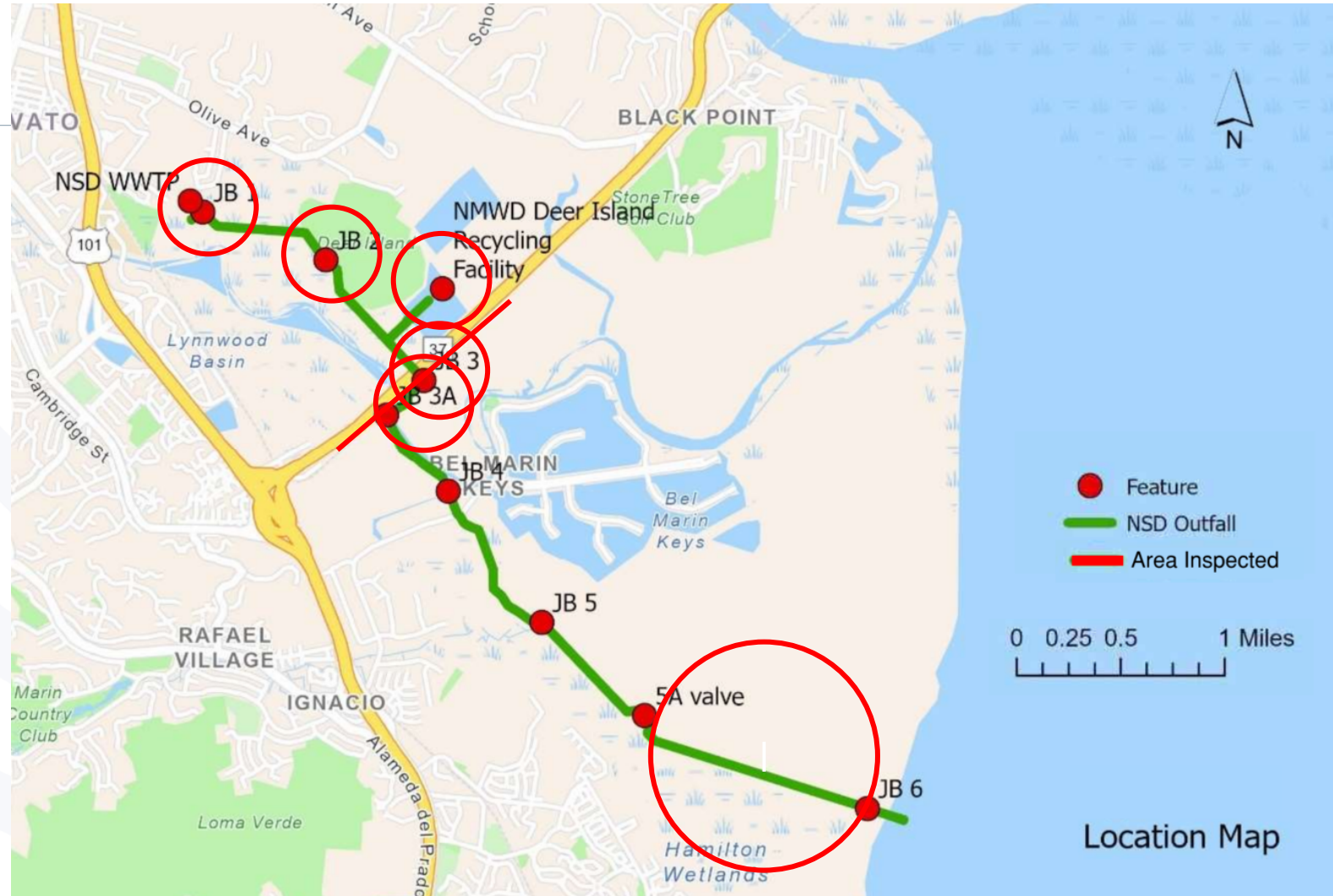


Daily Plant Shutdowns, Dewatering and Inspection Required Before Plant Brought Back Online

Multitude of Stakeholders

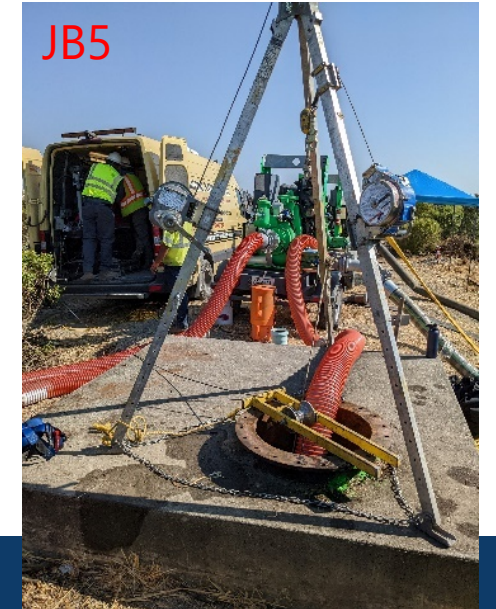
1. Plant Operators (Veolia)
2. Landowners
3. County Parks
4. Flood Control District
5. PG&E
6. Mosquito & Vector Control
7. North Marin Water District (Reclamation Facility)

JKO



Limited Physical Access – 7 Access Locations

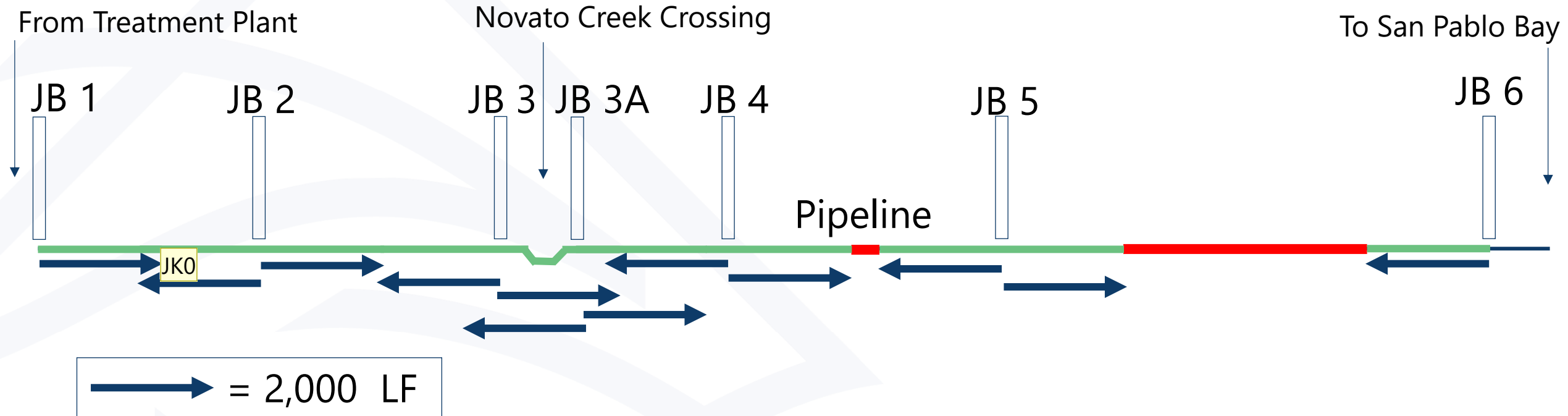
JKO



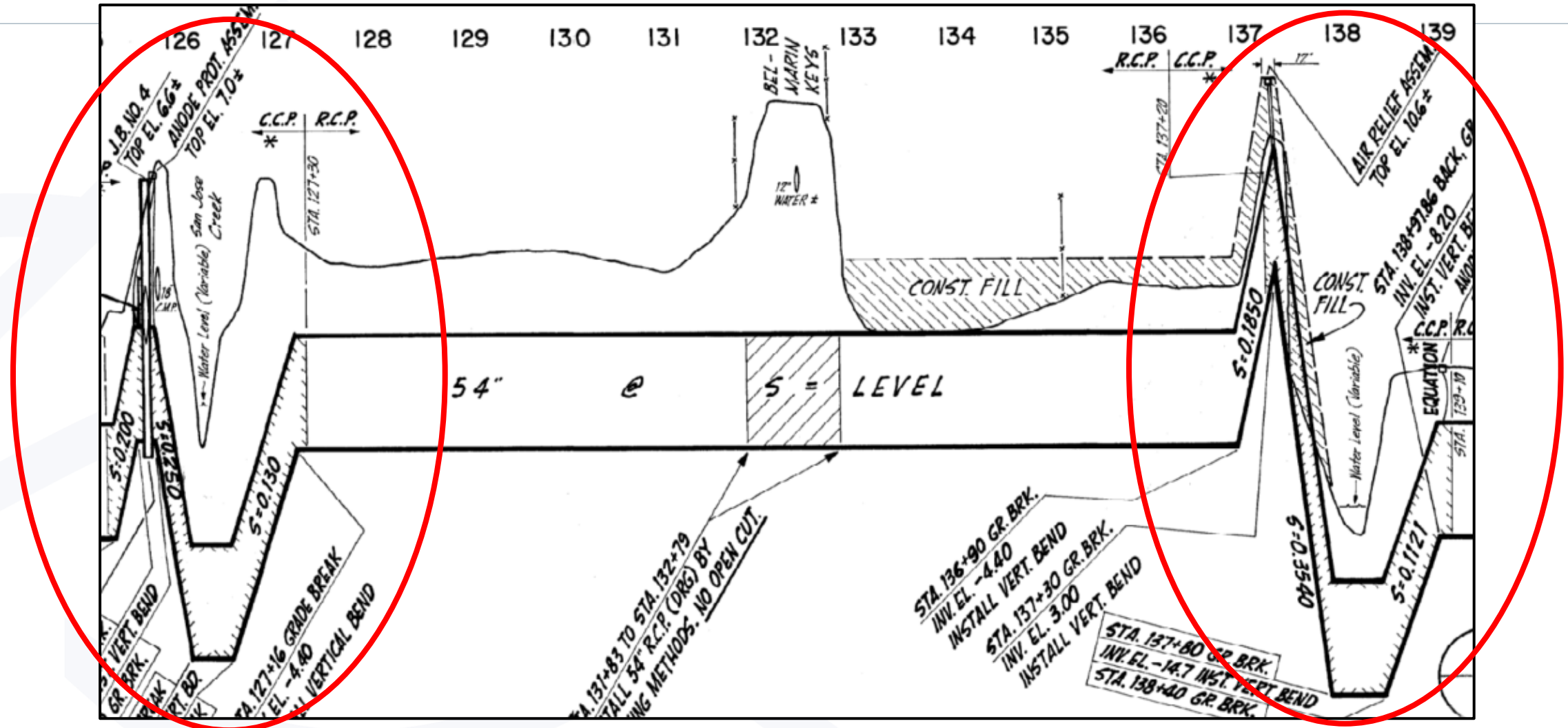
Limited Physical Access – 7 Access Points



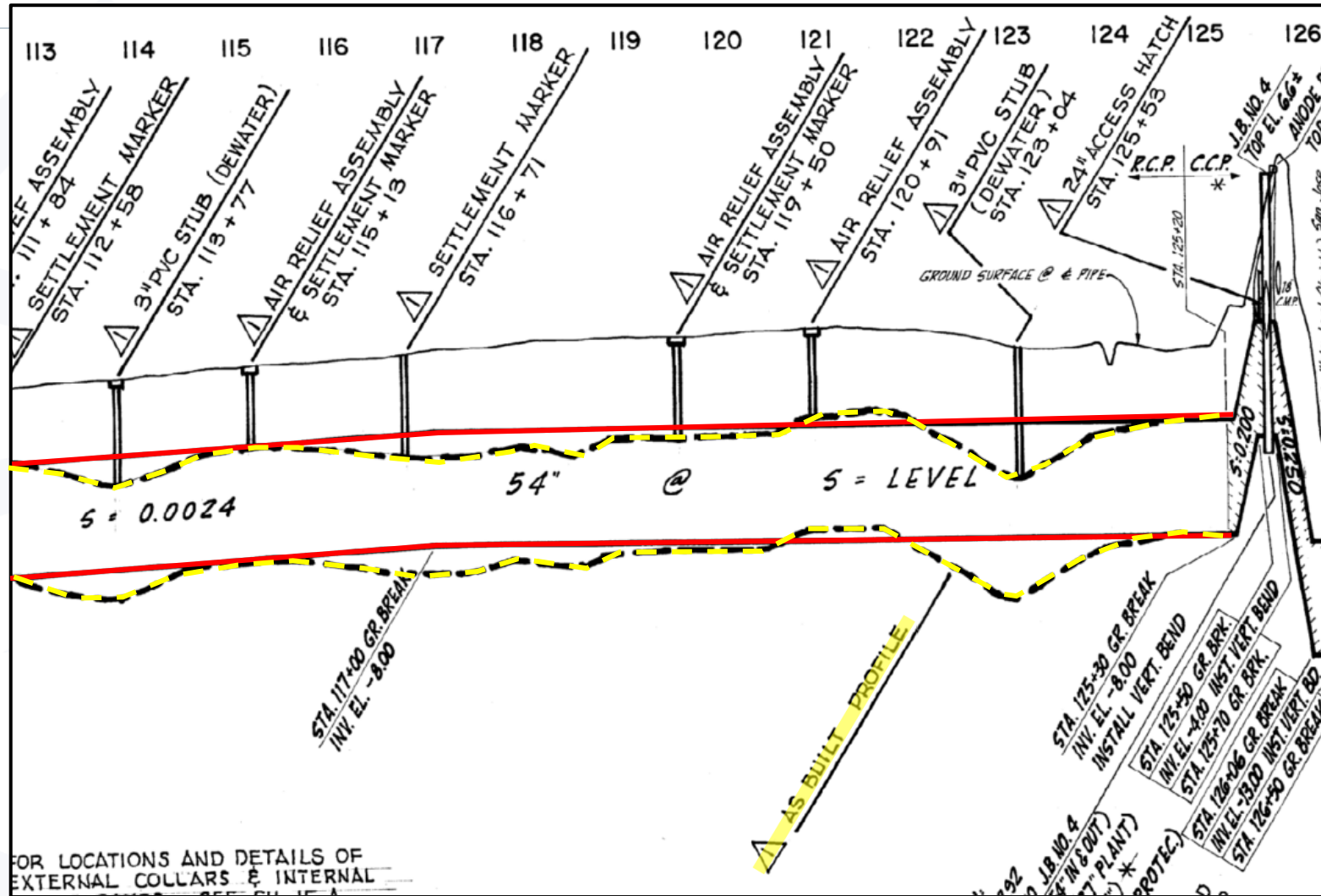
Limited Physical Access – Anticipated Coverage (Conceptual)



Limited Physical Access – Realities/Challenges (Multiple Vertical Bends)



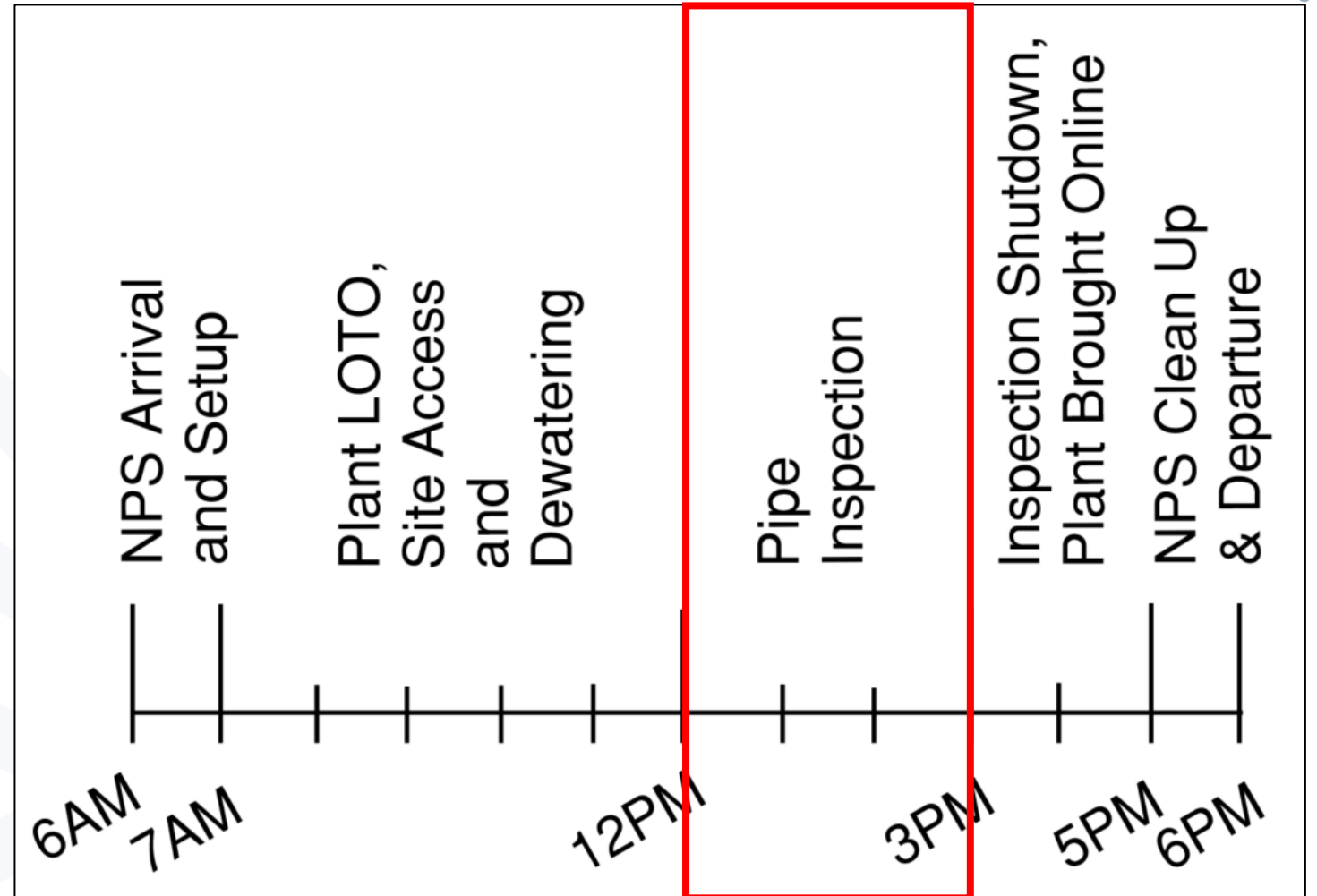
Limited Physical Access – Realities/Challenges (Design vs As-Built)



Limited Inspection Window

Daily Workplan

1. Arrival and Setup
2. LOTO/Access
3. Dewatering
4. Inspection
5. Reinstatement/Cleanup



Workplan

NATIONAL PLANT SERVICES, INC., WORK PLAN FOR
NOVATO SANITARY DISTRICT OUTFALL ASSESSMENT

WORK PLAN

Inspections will begin on the downstream reaches (after JB4) first downstream section is complete, sections JB 1-4 will proceed and plant shutdowns.

NOTE, ACTUAL PIPE CONDITIONS MAY REQUIRE ALTERATIONS

Point of Interest	Station	Rim elev. ft.	Min Invert elev (ft)	Distance from Prior JB, ft	Pipe Diam between US JB,
Junction Box 1	10+03.5	6.0 NQVD 29	-9.0 NQVD 29	3,611	
Junction Box 2	46+14.58	0.62 NQVD 29	-8.5 NQVD 29	4,040	
Junction Box 3	86+54.95	0.79 NQVD 29	-8.4 NQVD 29	1,361	
Junction Box 3A	100+16	-2.22 NQVD 29	-6 +/- NQVD 29	2,54	
Junction Box 4	125+62.29	6.6 NQVD 29	-4 NQVD 29	4	
Junction Box 5	170+30.57	-1.5 NQVD 29	-11.4 NQVD 29		
Valve box 5A		14 +/- NAVD 88	8 +/- NAVD 88		
Junction Box 6	268+64	11.0 NQVD 29	4.3 +/- NQVD 29		
Totals					

General

- 1 Jet/Vac Truck, 2 CCTV trucks, Sunbelt personnel will be on-site for all work, will be on site as much as possible.
- Unbolt the access lids AFTER LOCK
- Have pneumatic ratchet on site. Bring an assortment of fittings to the site.
- Bring an assortment of fittings to the site as quickly as possible per the directions at once (see work plan for logistics).
- Dewater as fast as possible in case we encounter directions at once (see work plan for logistics).
- The Jet/Vac truck will be on site in case we encounter directions at once (see work plan for logistics).
- prevents the CCTV crawler from tracking through the pipes.
- From JB4-6 - we have long work windows as the outfall is currently shut down.
- From JB1-4, we only have 10-hour WWTP shutdown windows, so remove dewatering, inspecting, then re-bolting lids all have to occur within a 10-hour window.

- NATIONAL PLANT SERVICES, INC., WORK PLAN FOR
NOVATO SANITARY DISTRICT OUTFALL ASSESSMENT
- If ponding of water happens during land application, inform Jeff Boheim with NSD.
 - Refueling:
 - The 6" pump @ 2000 gpm will consume 2.7 GPH of fuel. They have 25 gallon capacity so they will run for about 27 hours before fueling is needed.
 - The Super 6 pump that will run the sprinkler system @ 1750 gpm will consume 4.05 gph. This pump has a 135 gallon tank and should run for 33 hours before fueling.
 - NSD recommended fuel service:
 - North Bay Petroleum (707) 575-0505
 - Golden Gate Petroleum (925) 228-2222



WORK PLAN - INFORM VEOLIA PRIOR TO ALL WORK

Junction Box	Work Plan
Box 5-6 Reach Summary <ul style="list-style-type: none"> Segment begins at JB5 at 170+30, invert -11.4 Ends at JB6 at 268+68, invert -6.2 Total length is 4,458 LF between JB4 and JB5, and 9,838 LF between JB5 and JB6. JB5 access is through a farm field. Assume we can dewater onto the farm field at JB5 using Big Gun Sprinklers. 	Day 1: <ul style="list-style-type: none"> Inform NSD of work progress. The stretch of the outfall from JB4-JB6 is currently isolated, so we have no WWTP Shutdown constraints or daily time limits for this work. JB4 gate to be locked and tagged. At start of the workday, unbolt and open JB5 cover. Place 3 pumps to discharge into ditch at JB5 and attempt to pump out as much water as possible into the ditch. Pump rates may be limited to prevent erosion to the ditch. All flow will go through a totalized flow meter. The amount of water to remove is as follows: <ul style="list-style-type: none"> JB4-JB5 - 531,566 gallons

NATIONAL PLANT SERVICES, INC., WORK PLAN FOR
NOVATO SANITARY DISTRICT OUTFALL ASSESSMENT

- JB5-JB6 - 1,169,827 gallons
- TOTAL from JB4-JB6 - 1,701,393 gallons
- If no totalized flow meter is used, pump use and performance parameters (pressure, flow, run time, etc.) shall be collected to estimate totalized flow from the rental pump performance curve.
- With 3 pumps running at a total of 1,750 gpm each (total of 5,250 gpm), the total pumping time is 324 minutes or 5.4 hours to dewater. (If only 2 pumps are able to be used at one time, dewatering time is 8 hrs.)
- There is an inverted section immediately downstream of JB5. Invert is approximately 100 LF from JB5, and is 4.2 feet lower than JB5. Attempt to pull the suction hose down to the invert with the CCTV crawler, if possible, and as needed to remove water. Otherwise, crawl through the submerged section to continue inspection.
- Re-bolt all lids from JB4-JB6 at end of each workday.

Day 2:

- Inform NSD of work progress.
- Continue dewatering, if necessary.
- Inspect from JB5 toward JB 6, and from JB5 to JB 4, as far as we can go, but no farther than 2,000 LF from each direction.
- While 2 crew personnel are inspecting the pipes, the rest of the crew are to remove the flap gate at JB6 (or we hire Monterey Mechanical).

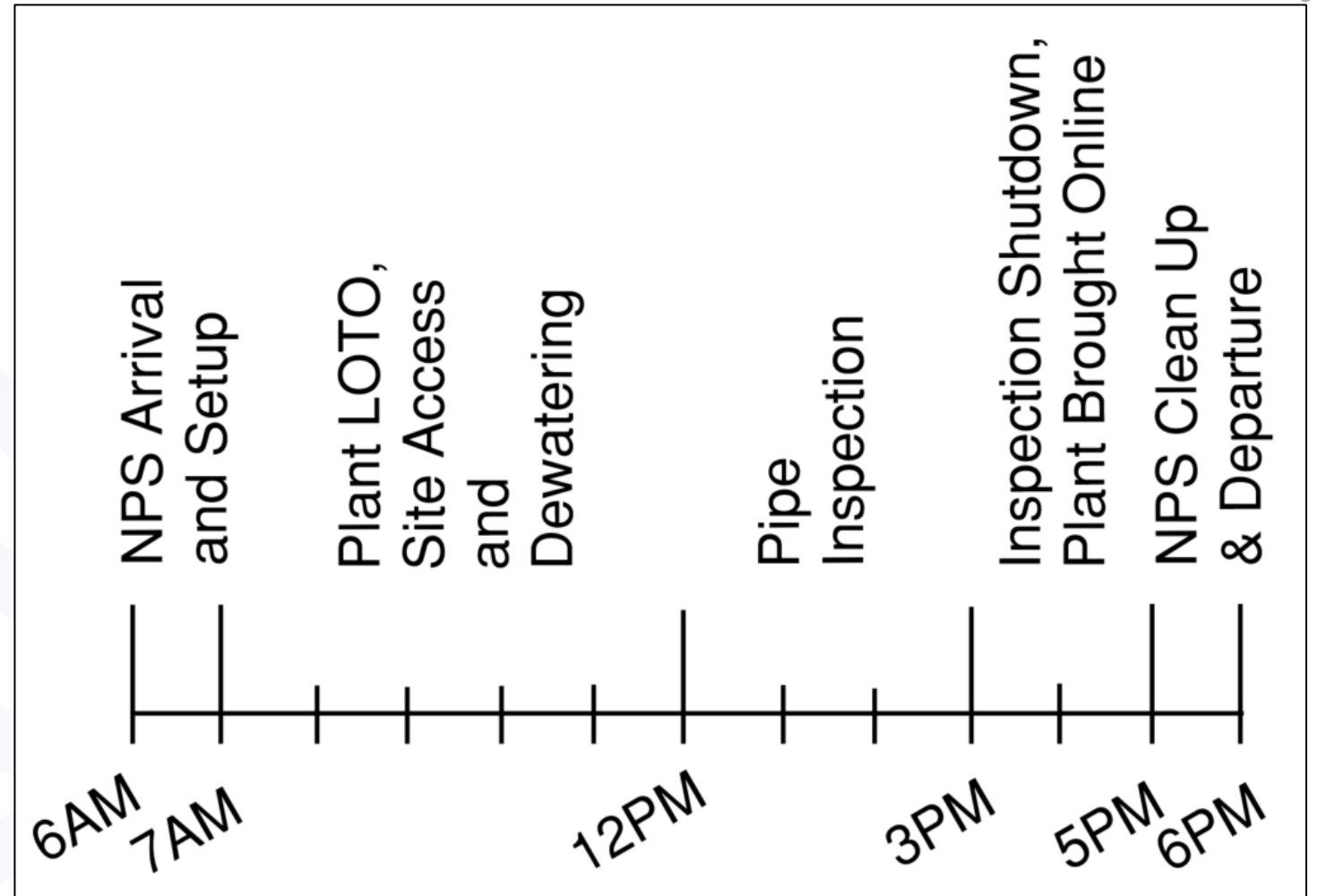
Day 3:

- Inform NSD of work progress
- With 54" flap gate at JB6 removed, install flow thru plug downstream of JB6 and pump any remaining water US of JB6 to the Bay.
- Inspect from JB6 back toward JB5 as far as we can go. Dewater pipe as required/possible.
- We will likely only inspect upstream for 1,319 LF before we hit the next inverted pipe section which will be full of water. Will try to inspect through this for up to 2,000 LF toward JB5.
- We sealed up JB5 as we have completed work at this stretch.

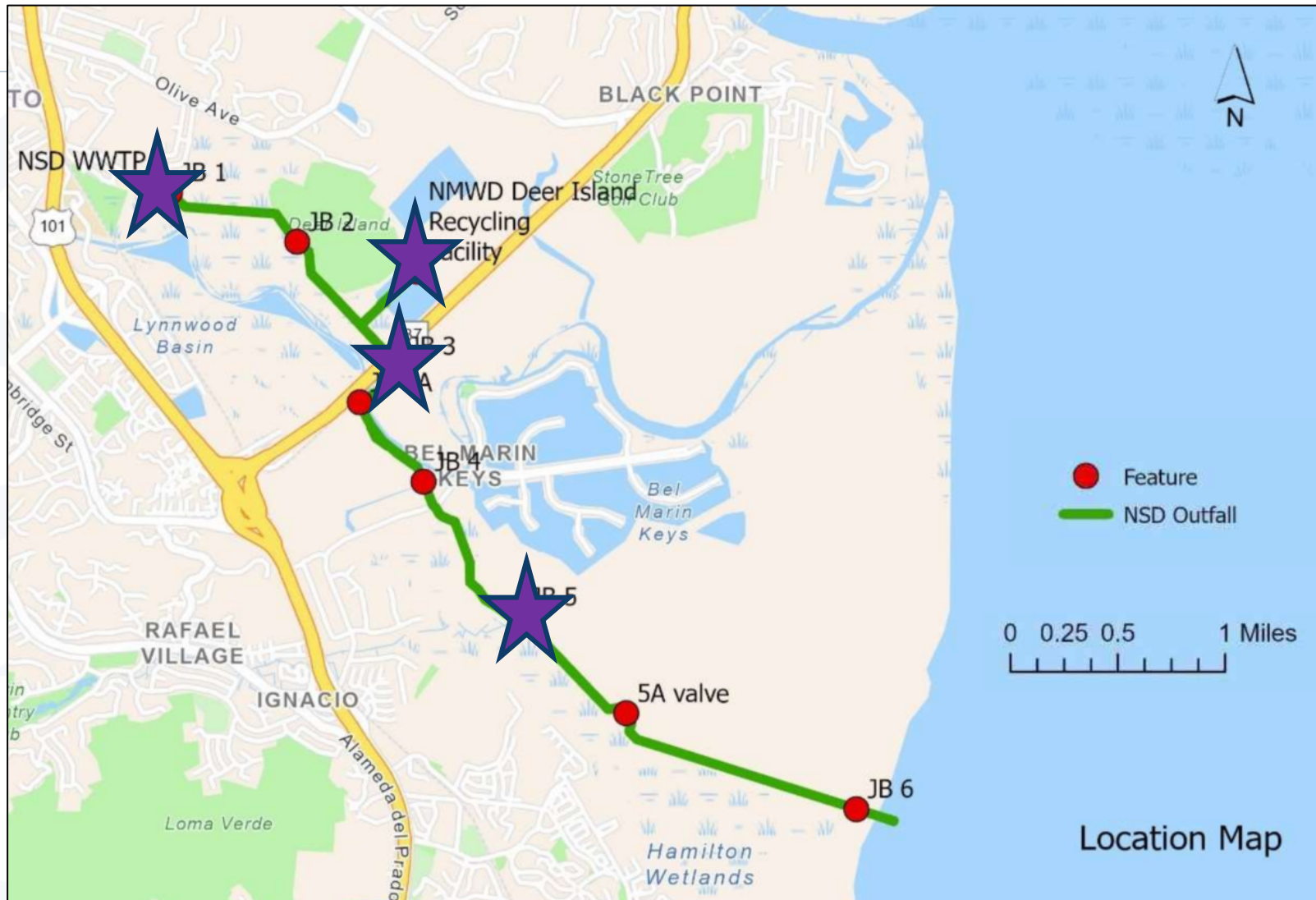
Limited Inspection Window

Daily Workplan

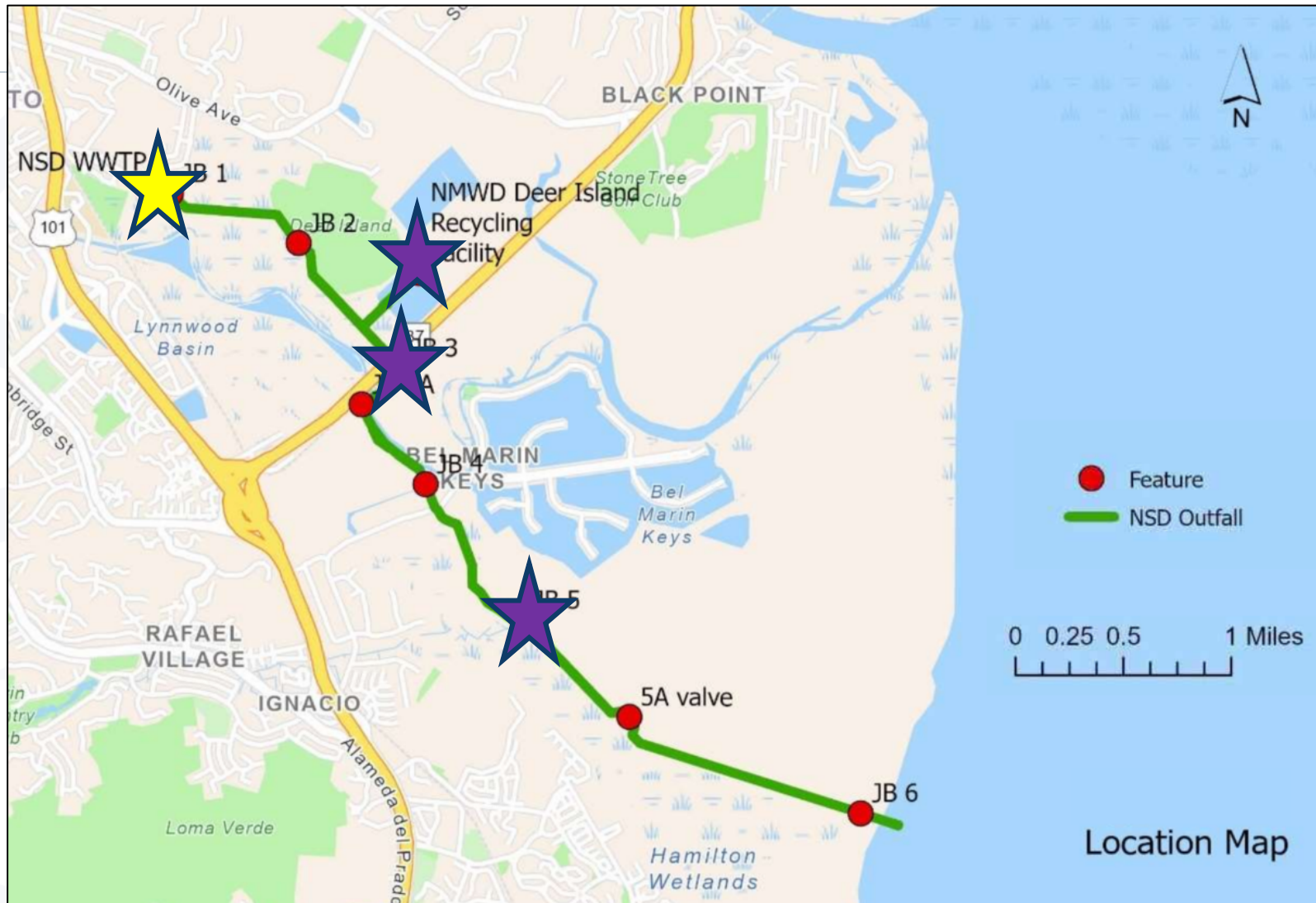
1. Arrival and Setup
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Dewatering



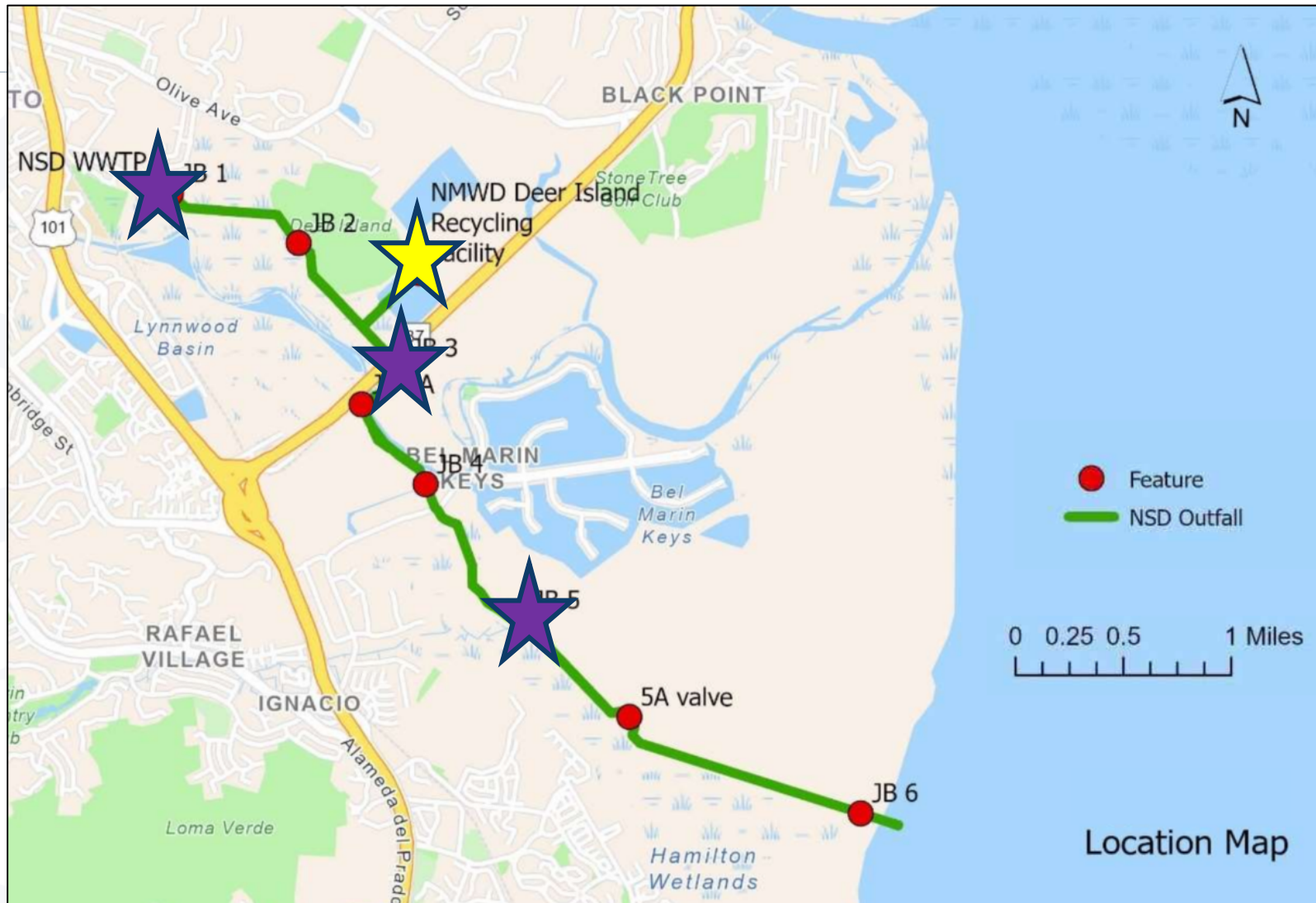
Dewatering - JB 1 @ Treatment Plant



Dewatering – JB 1 @ Treatment Plant



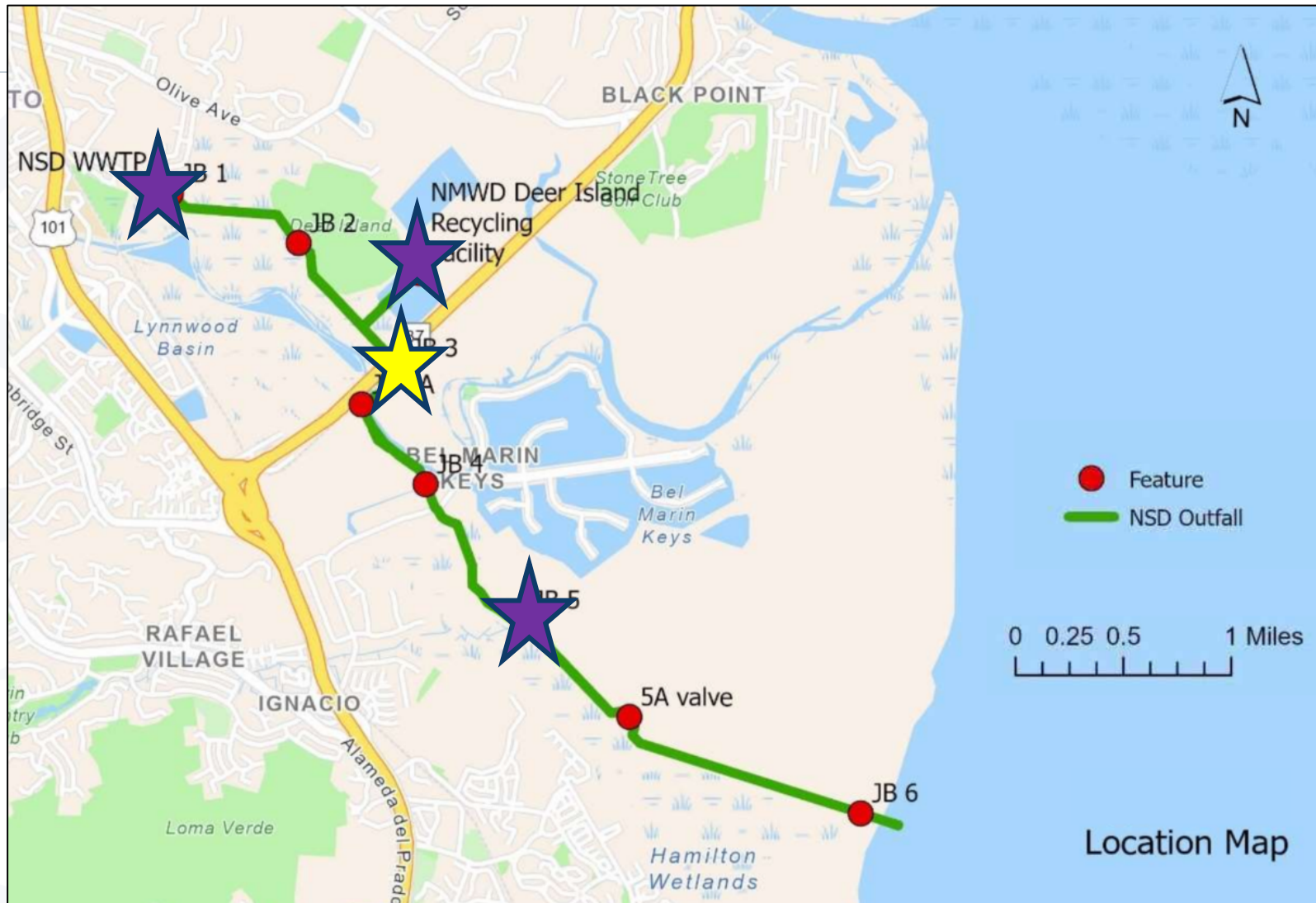
Dewatering - Well @ Deer Island



Dewatering – Well @ Deer Island



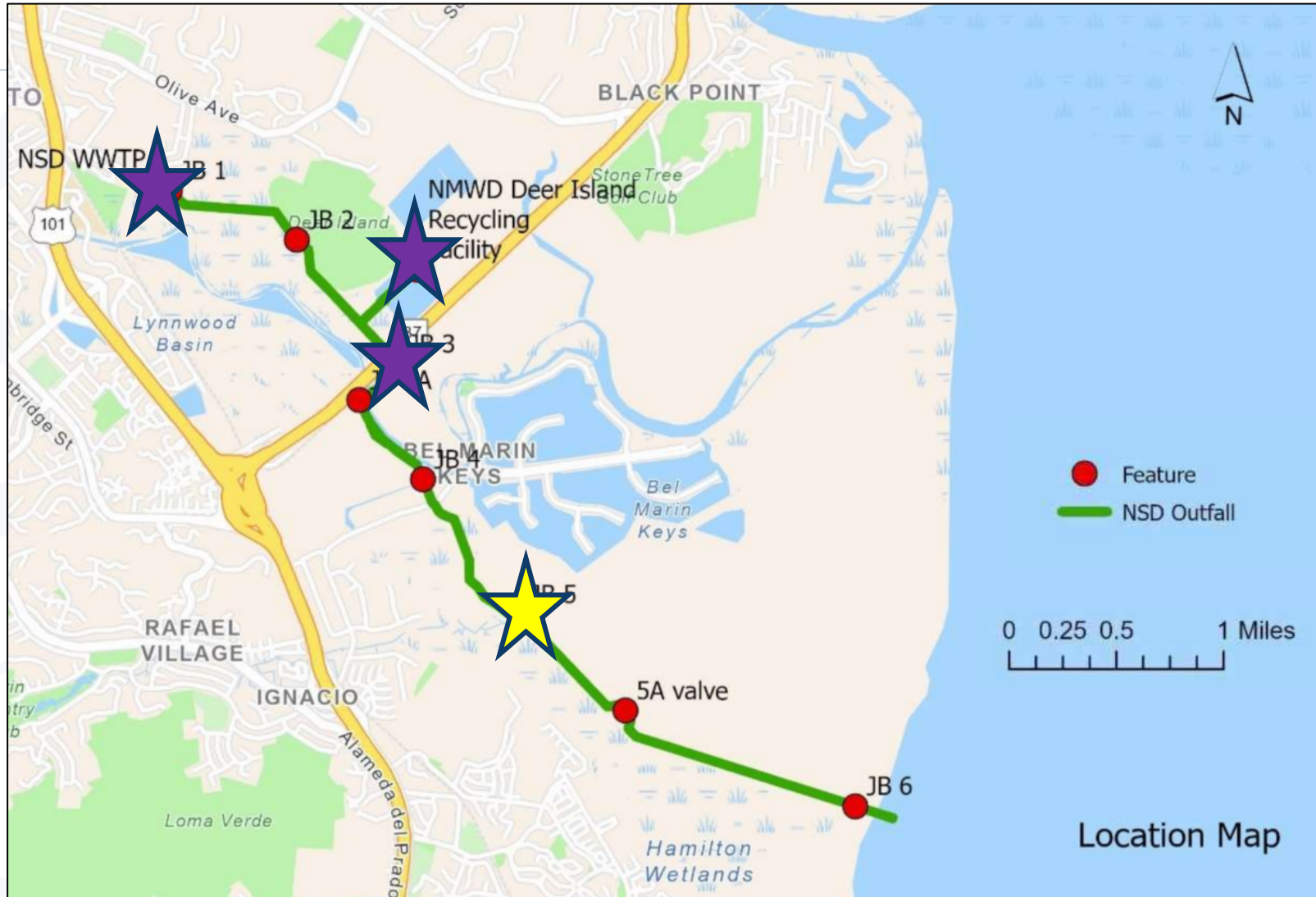
Dewatering - JB 3 @ Fields



Dewatering, JB 3 @ Fields



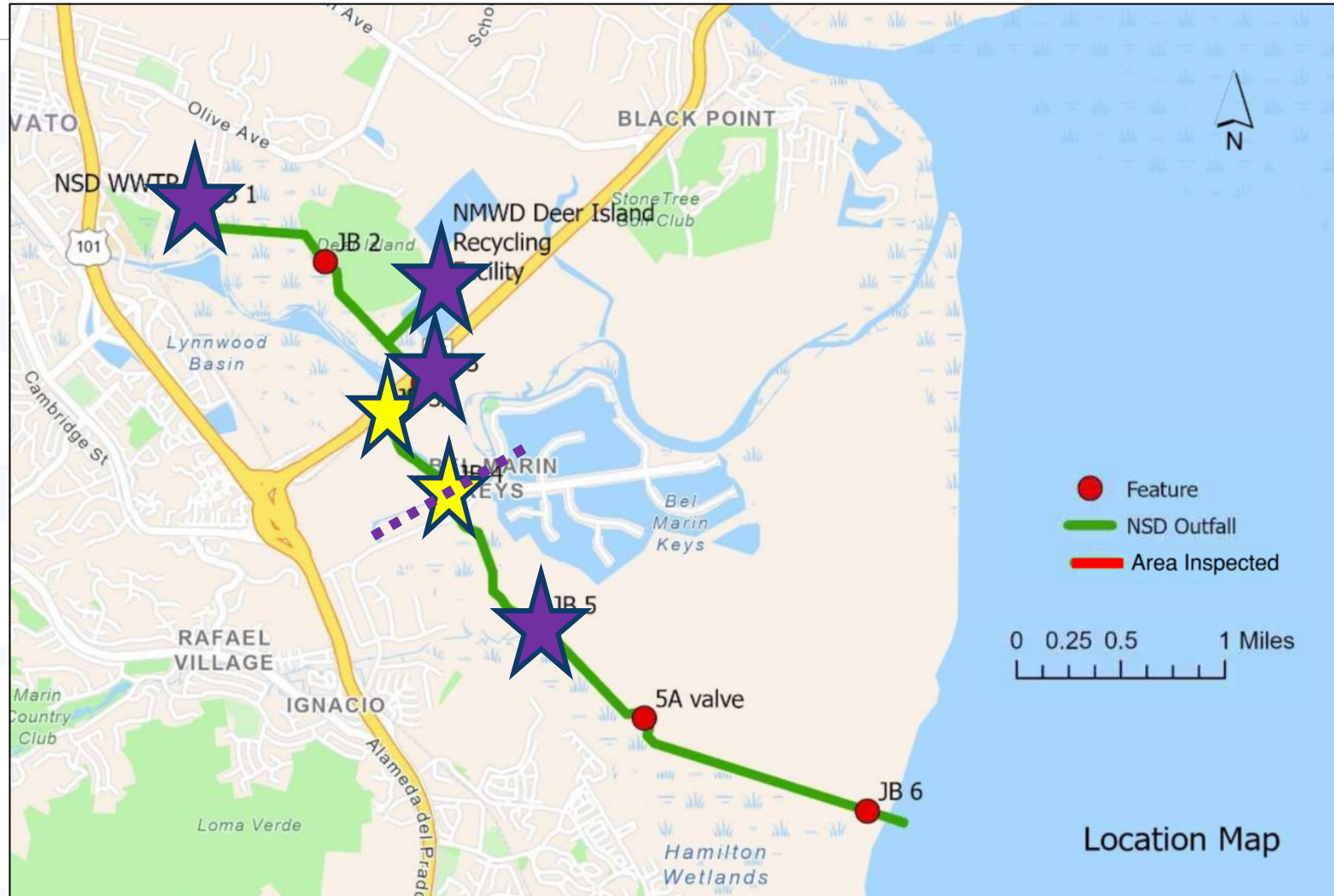
Dewatering - JB 5 @ Wetlands



Dewatering - JB 5 @ Wetlands



Dewatering - Flow-through Plugs



Dewatering - Flow-through Plugs

JB 3A

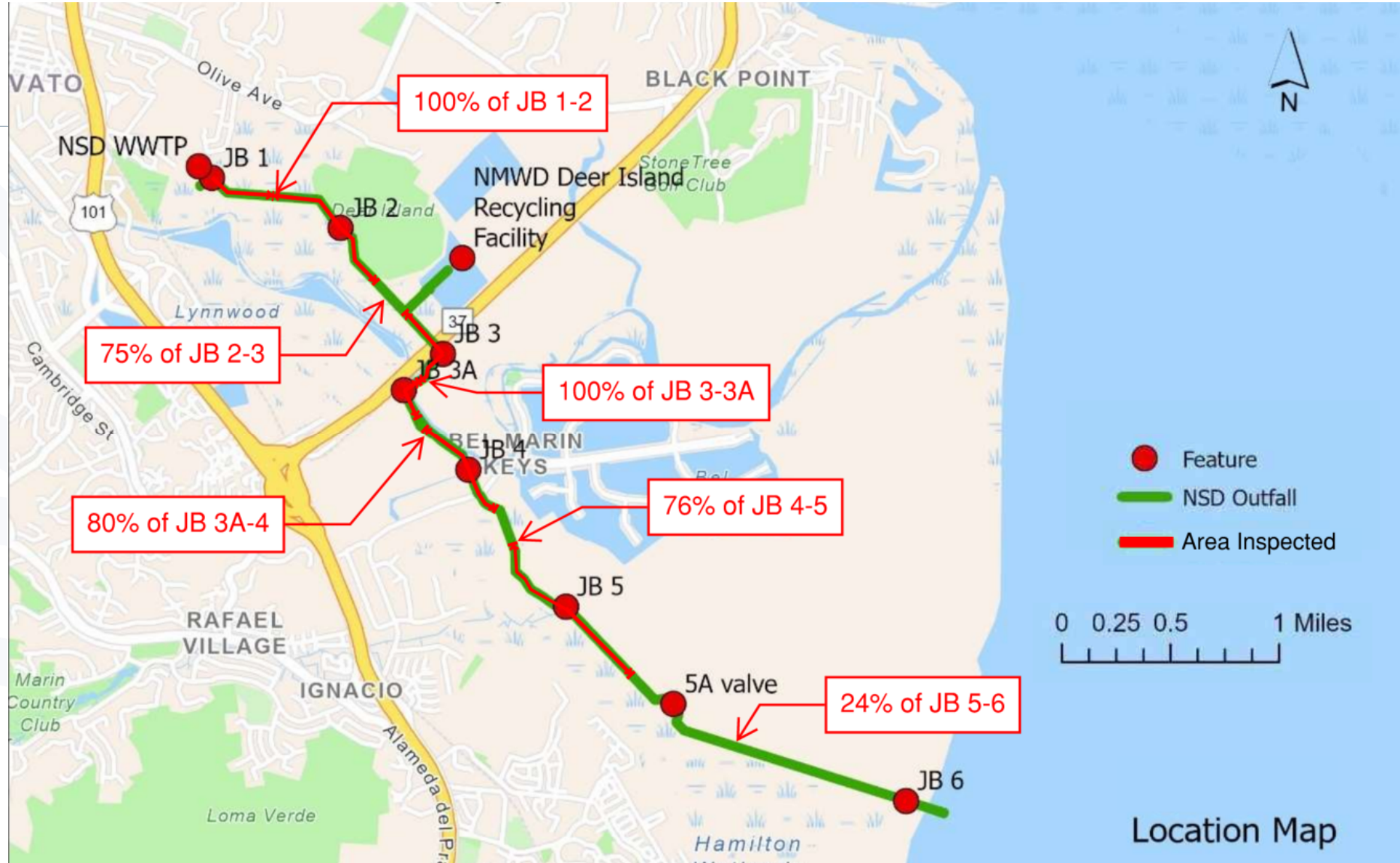


Results

The background of the slide features a complex, abstract pattern of overlapping, semi-transparent blue lines and shapes. These lines form various geometric and organic forms, including triangles, rectangles, and curved paths, creating a sense of depth and movement. The overall color palette is a range of blues, from deep navy to lighter, more vibrant tones. A thin, light-colored line is visible in the top-left corner, and a small circular marker is located at the bottom-right corner of the slide's content area.

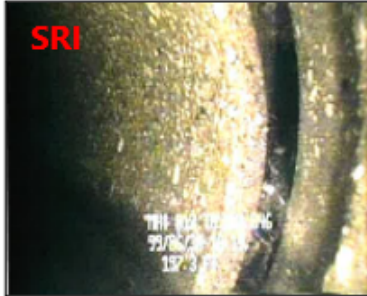



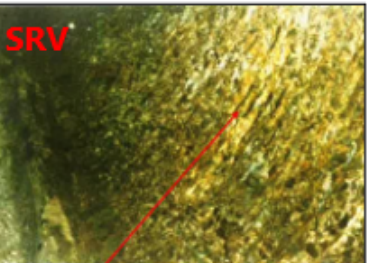

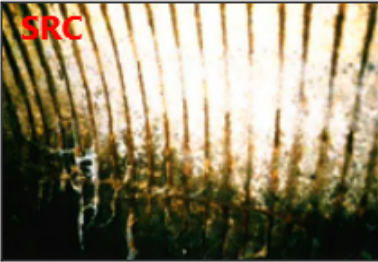
CCTV Inspection Results

1. 61% inspected.
2. 23% inspected but submerged.
3. 47% visibly inspected.



CCTV Inspection Results

All PACP Coded

NASSCO Defect Code	Sample Photo	
<p>SRI – Roughness Increased SAV – Aggregate Visible</p>		
<p>SAP – Aggregate Projecting SAM – Aggregate Missing</p>		
<p>SRV – Reinforcement Visible SPR – Reinforcement Projecting SRC – Reinforcement Corroded</p>		 

Traditional CCTV and GoPro Video



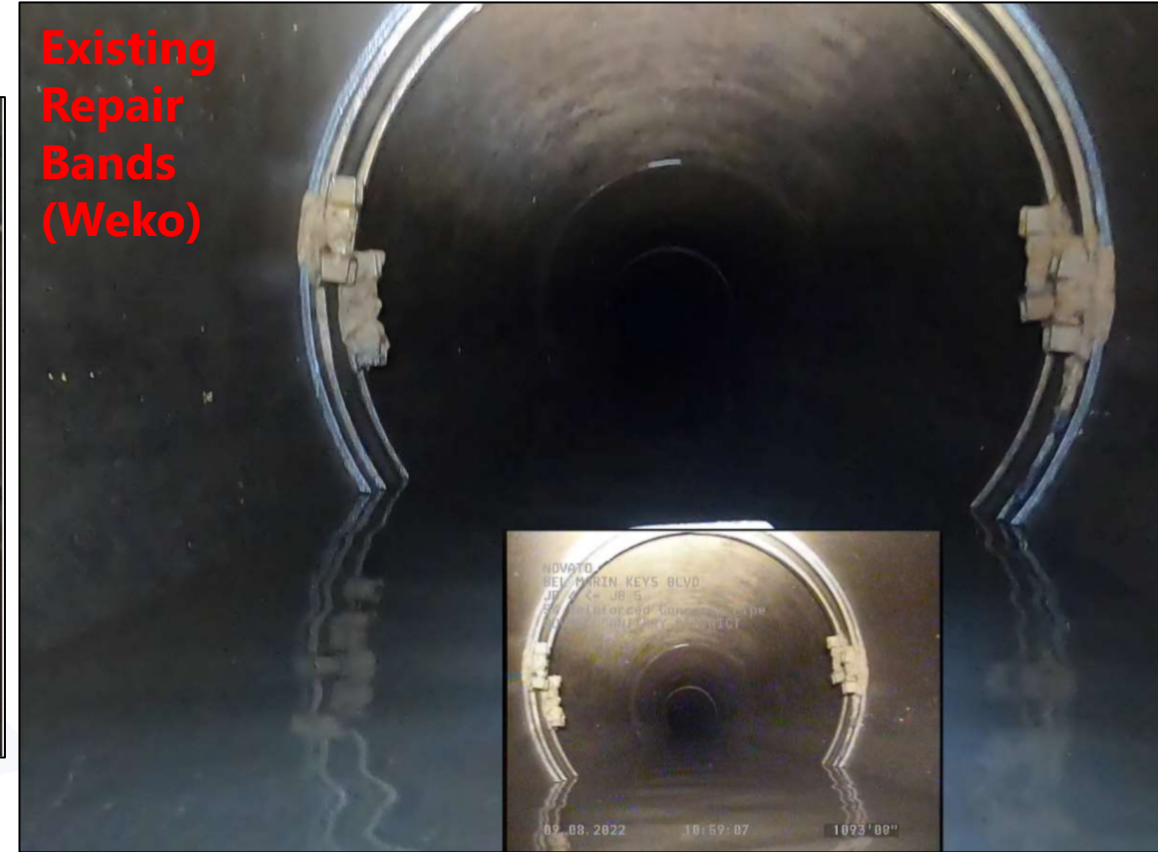
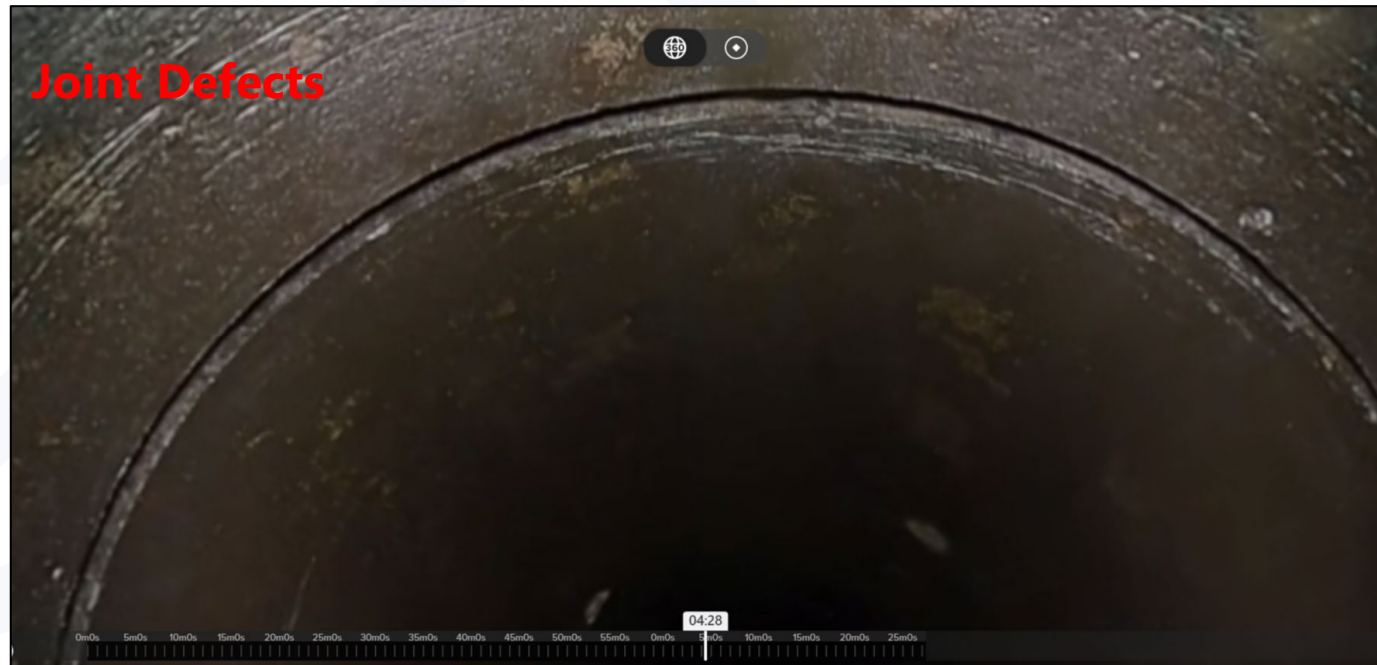
CCTV Inspection Highlights

**In good
condition
overall**

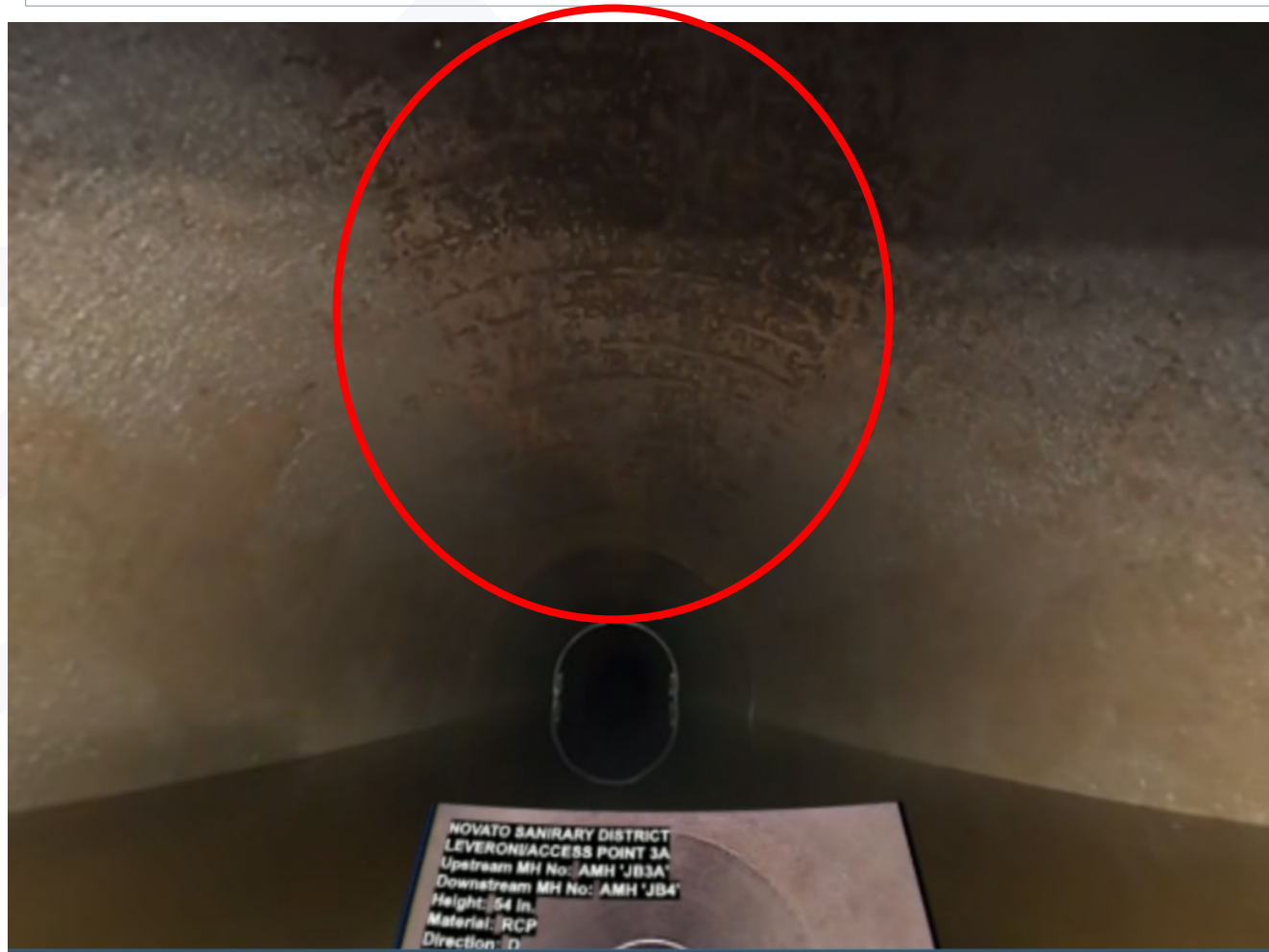
NOVATO
LEVERONI/ACCESS POINT 3A
JB3A ← JB4
54 Reinforced Concrete Pipe
JB3A_JB4



CCTV Inspection Highlights



CCTV Inspection Highlights

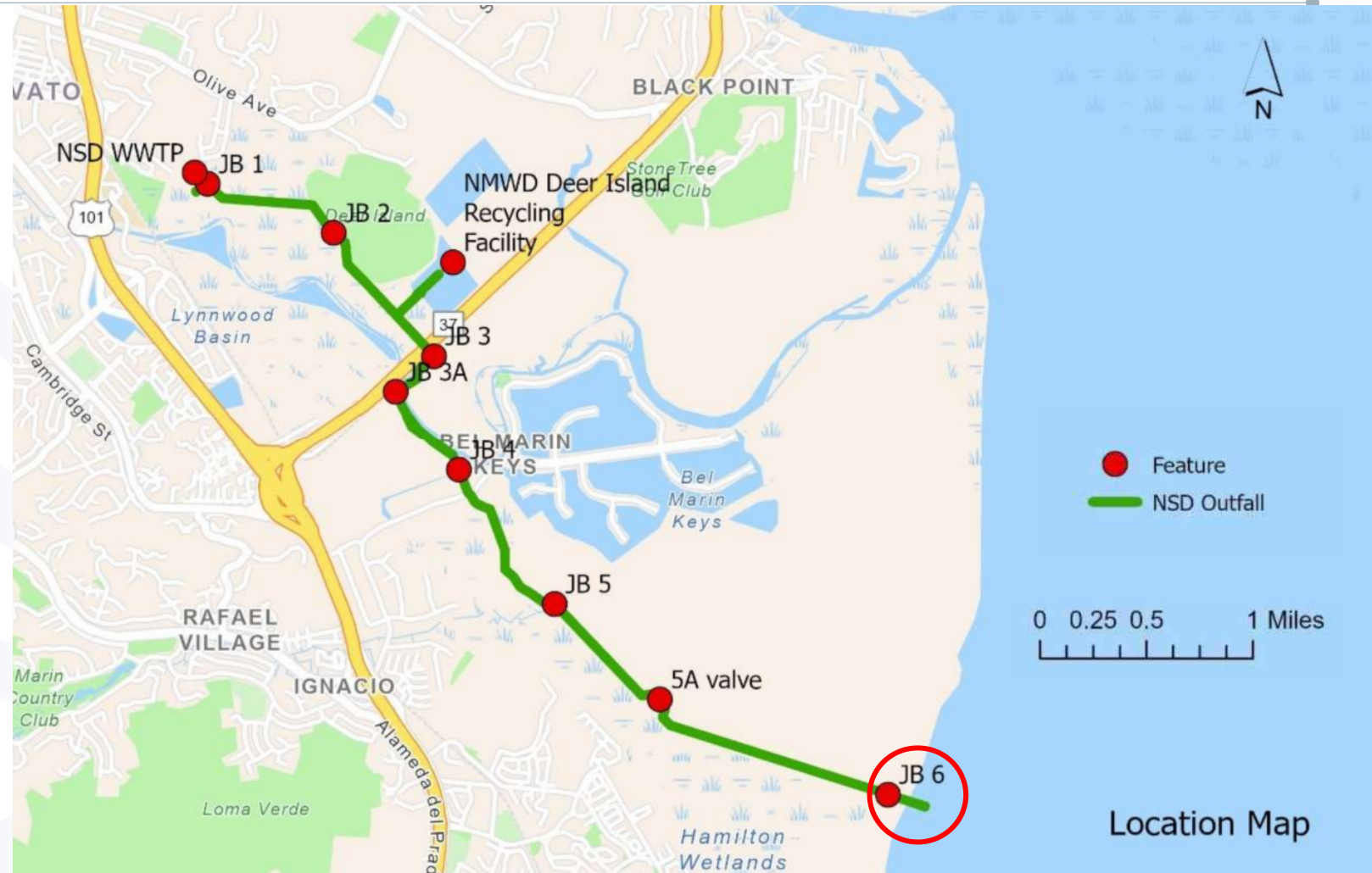


CCTV Inspection Highlights



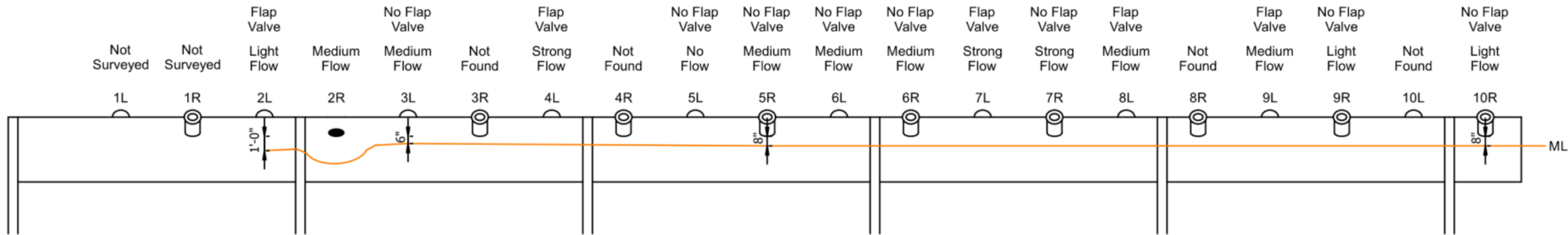
Submarine Outfall Inspection

- 822' from JB 6 to the end of the diffuser section.
- 20 diffusers on the last 125' of the outfall.



Location Map

Diver Inspection – External

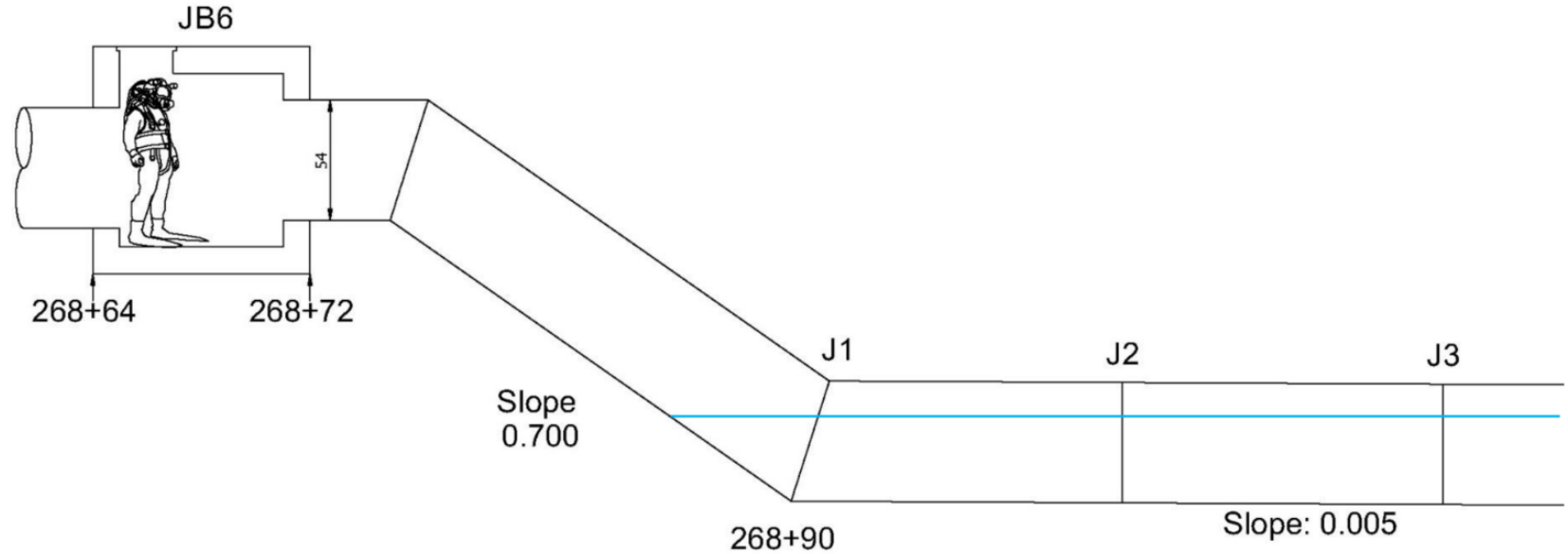


Diver Inspection –External

Video Log - Novato Outfall Diffuser Section Inspection - 2/15/2022					
Video Time	Diffuser No.	Flap Valve In Place	Flow	Diffuser Interior	Notes
11:26:40	10R	No	Light	Clean	Farthest offshore diffuser
11:27:10	10L	-	-	-	Diffuser not found
11:27:45	9R	No	Light	Clean	
11:29:20	9L	Yes	Medium	Clean	
11:30:00	8R	-	-	-	Diffuser not found
11:30:55	8L	Yes	Medium	Clean	
11:31:50	7R	No	Strong	Clean	Diffuser 8-inches off the mudline
11:33:00	7L	Yes	Strong	Clean	Diffuser 8-inches off the mudline
11:34:30	6R	No	Medium	Clean	Diver placed arm in hole and felt no sediment
11:36:50	6L	No	Medium	Clean	
11:48:26	5R	No	Medium	Clean	Diffuser 8-inches off the mudline

Diver Inspection – Internal

Figure 1 – Point of Entry to Joint 3



866 Estabrook St.
San Leandro, CA 94577
510-957-5097 | urdiving.com



866 Estabrook St.
San Leandro, CA 94577
510-957-5097 | urdiving.com

Video & Data Log – Novato 54 Inch Outfall Internal Inspection – Page 1 of 4

Video Time Stamp	Joint No.	Joint Gaps (in.)				Sedi-ment (in.)	Dive Hose Dist (ft)	Notes
		Invert 6:00	North 9:00	Crown 12:00	South 3:00			
09:06:15	1	0	1/16	0	1/4	0	0	Slippery pipe
09:07:55	2	1	1/2	1/16	1/2	1/16		1/8" wide spall at 10:00 position.
09:09:47	3	0	0	0	0	1/8		1/8" of soft marine growth on pipe crown
09:11:53	4	1/4	1.5		5/8			2" x 2" spall at 4:00. 3" x 6" spall at 5:00.
09:14:39	5	0	3/8	0	1/8	1/16		Pipe sections are 3/8" offset at crown
09:15:34	6	0	1/8	1/8	1/8	1/8		
09:16:21	7	0	1/4	3/16	1/2	1/16		Joint spall at 12:00 – 12"L x 0.5"W
09:17:12								Diver notes pipe is half full of water.
09:17:30	8	0	7/8	1	1/2	1/16		
09:18:30	9	0	5/8	1	1/4			Pipe sections are 0.5" offset at invert
09:19:22	10	0	1/8	1/8	1/4	1/8		Joint spall at 12:00 – 6"L x 4"W x 0.5"D.

Lessons Learned (Reinforced?)

Lessons Learned (Reinforced?)

1. Have backups of critical equipment.
2. Have backups to the backups.
3. Plans are nothing. Planning is everything.
4. Be flexible and communicate.
5. Good/done is better than perfect.



Thank You,
Jeff and
Michelle!



Ignacio Transfer
Pump Station



Novato Creek spilled
over into the basin
where the Outfall
follows Novato Creek.



Water pouring over the levee
leading to JB4



An aerial photograph showing a coastal area with a large body of water, a dike, and a small white building. The water is a murky brown color. The dike is a long, narrow strip of land that runs along the water's edge. A small white building is situated on the dike. In the background, there are houses and trees. The sky is a pale blue.

NSD has
remained
100%
compliant!



Questions?

