



DON'T TEAR DOWN THIS WALL

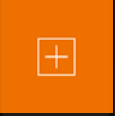
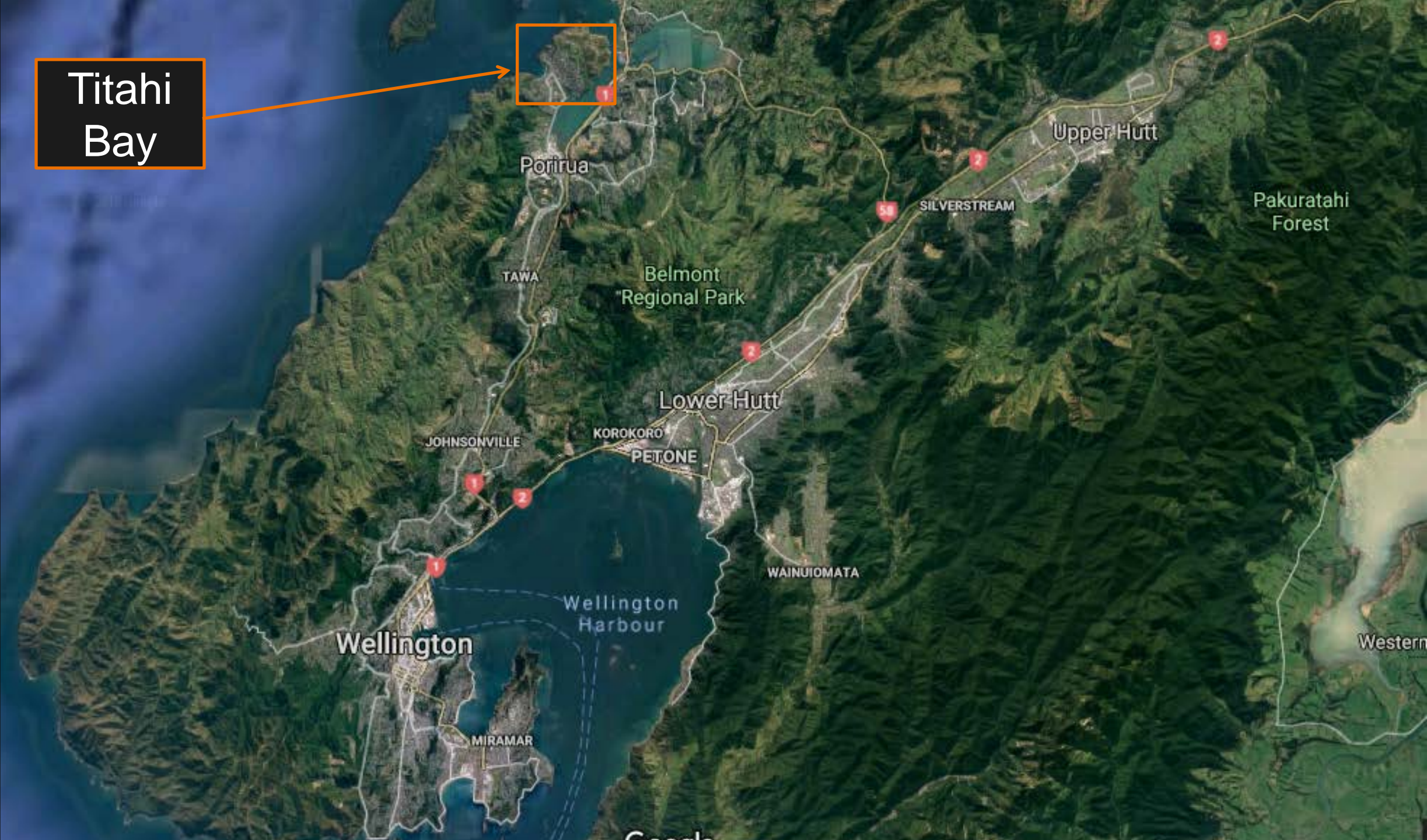
Renewal of a
U-Shaped Sewer



Agenda

1. Introduction
2. Options
3. Liner and Installation
4. Issues - Defects
5. Remedy – Repair
6. Lessons!

Titahi Bay

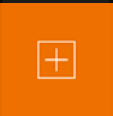
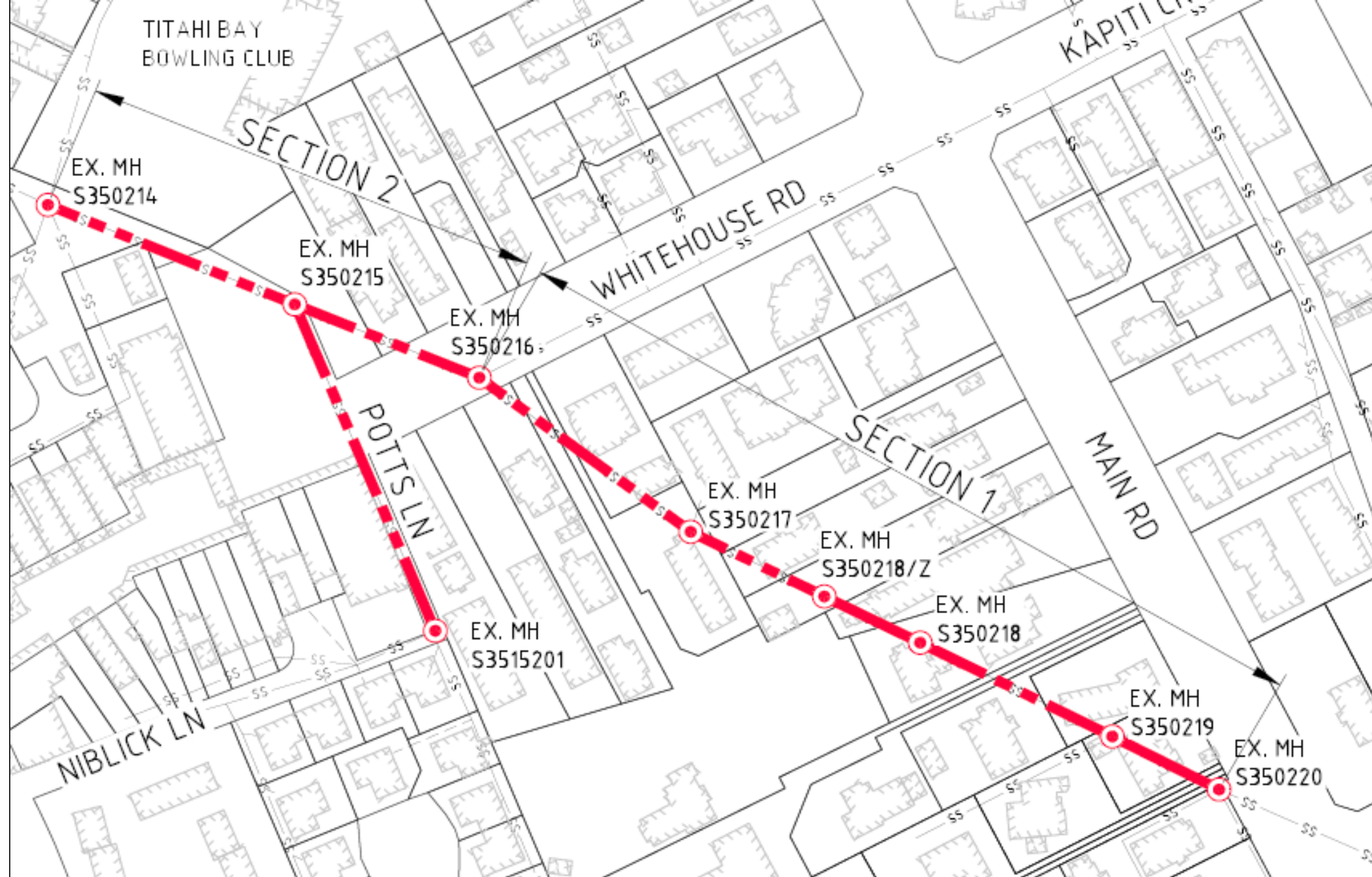


Whitehouse Road Renewal



Treatment Plant









[REDACTED]
\$350216

\$350215

US-D\$



11710

[REDACTED]

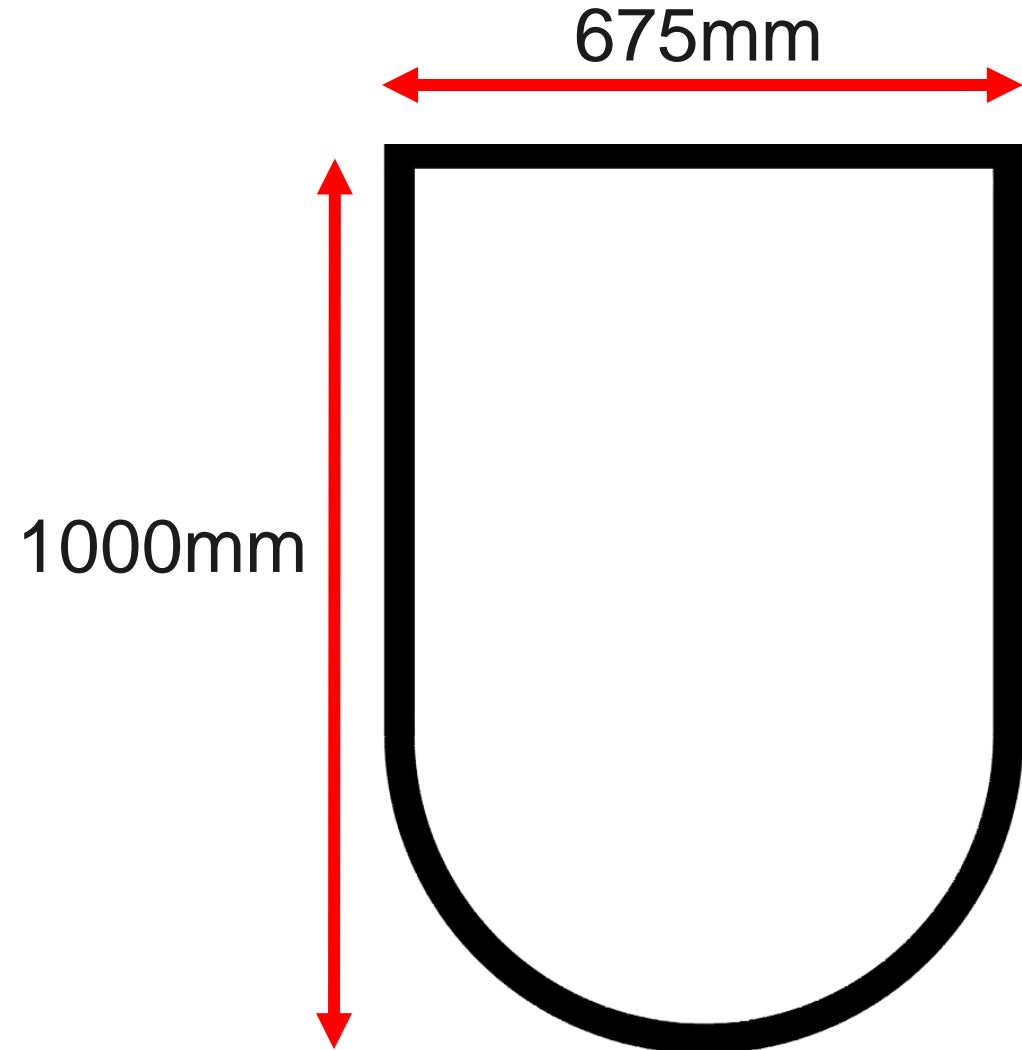
S350216
S350215
US-DS



Renewal Options

Renewal options:

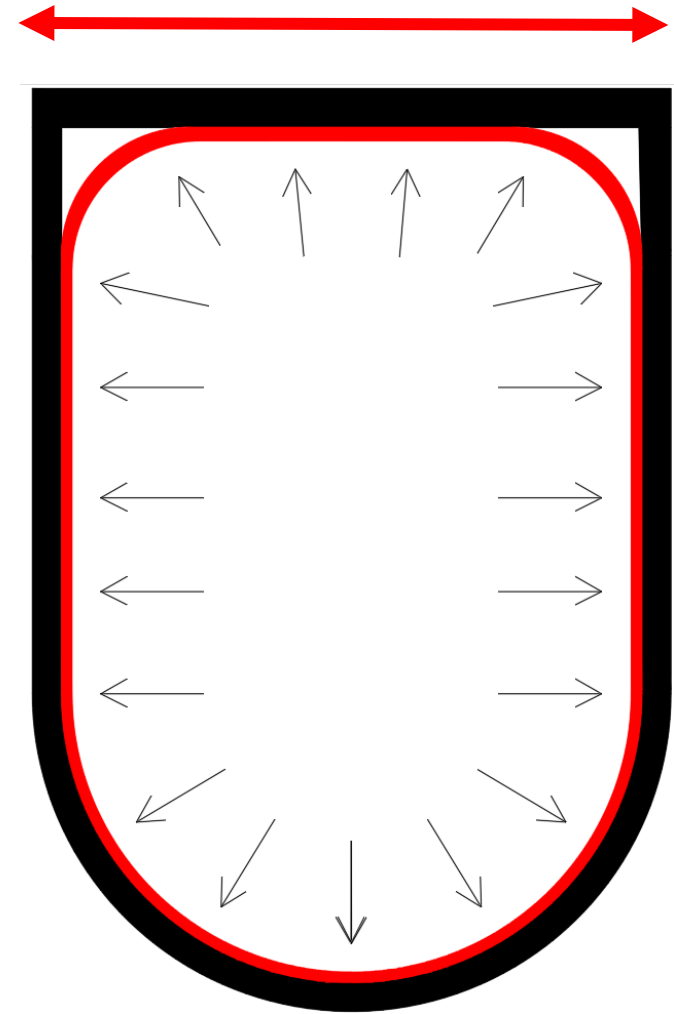
- 1) Excavate Online
- 2) Excavate Offline
- 3) Rehabilitate



So what do you do?

Rehabilitation Options

- 1) Slip lining
- 2) Expander liner
- 3) CIPP lining
 - Form fitting
 - Minimal reduction in capacity
 - Structural



CIPP

Cured In Place Pipe

Multi Layered Felt Liner

Range in thickness

Impregnated with resin

Thickness of the liner
determines volume of resin.

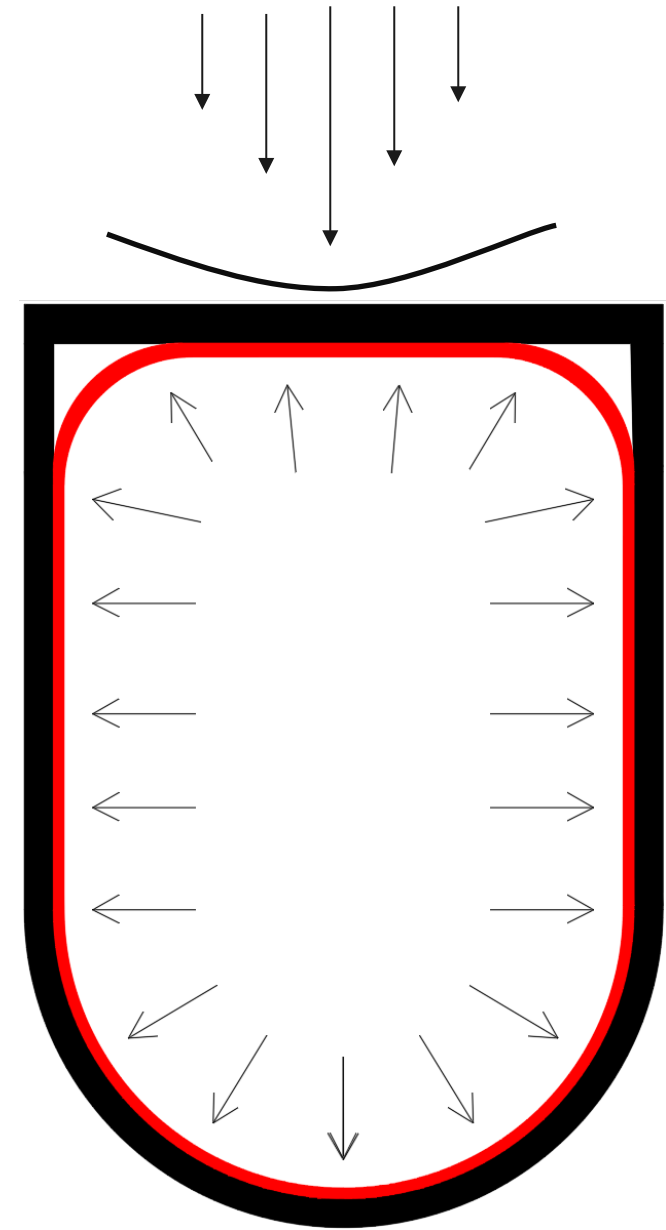


Beam Dynamics - Load

Top Span = Critical member
Maximum load applied to center

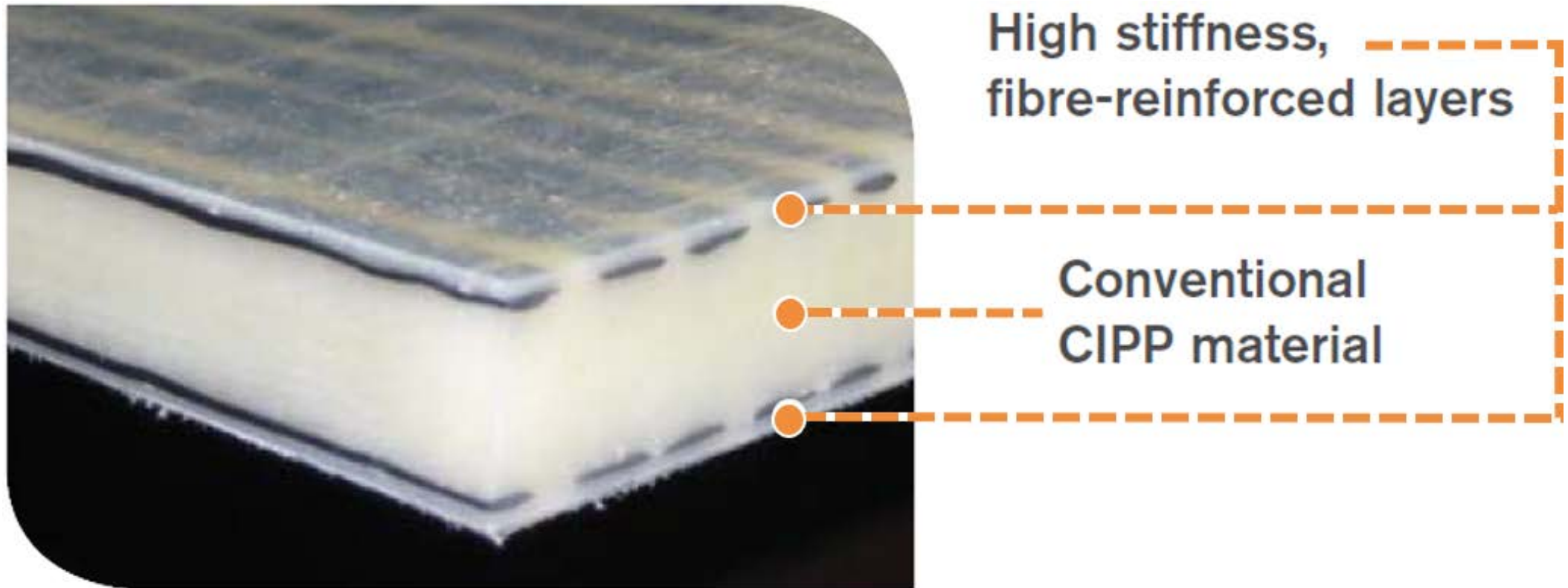
Designed by Contractor:
Liner = 38.5mm thick!

Resin is Expensive



Design - Solution

iPlus[®] Composite Liner - 22.5mm thick



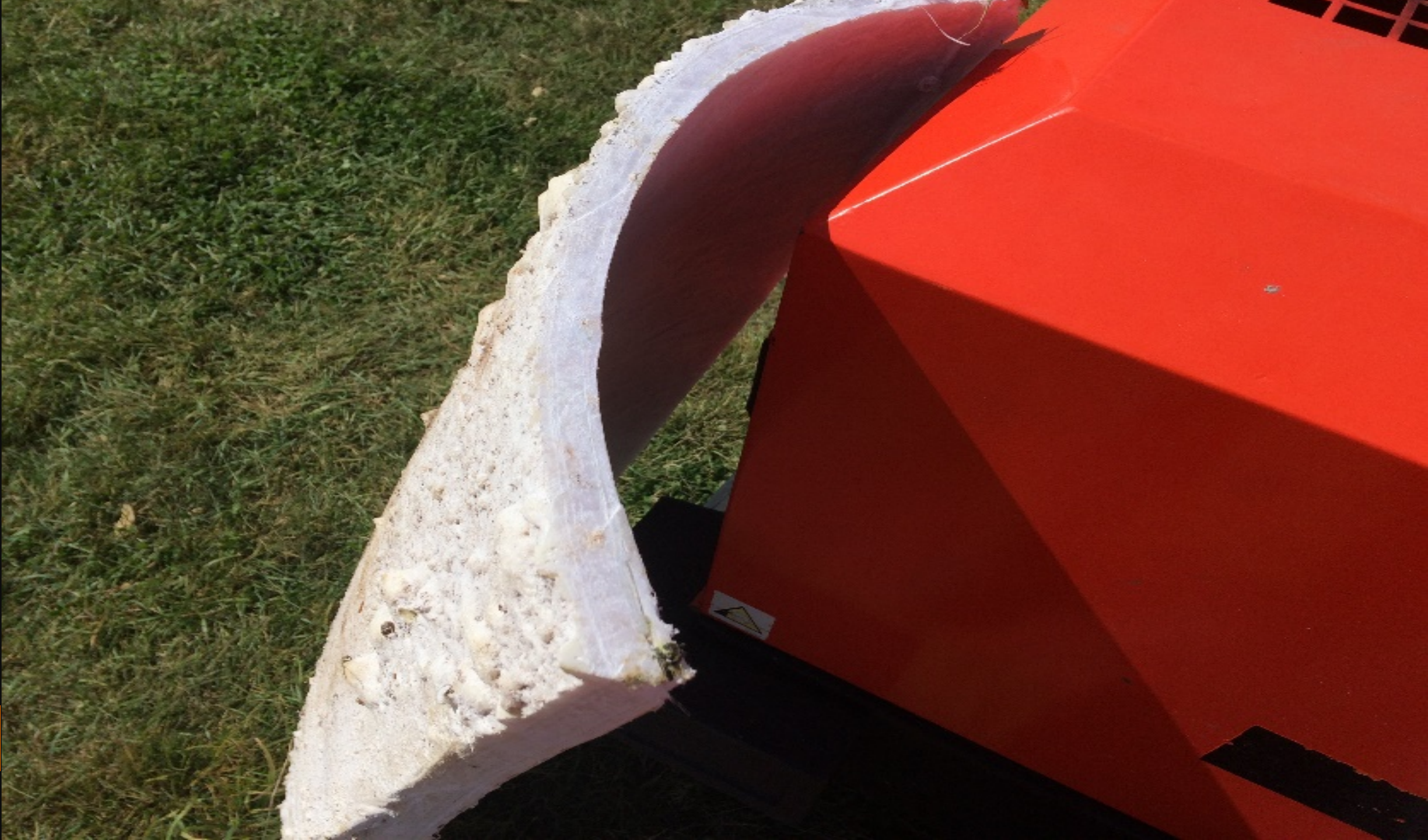
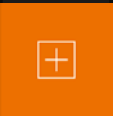












But.

Defects..

0.81 m.

██████████
S350216
S350215
DS-US

Longitudinal
Fins



13.34 m.

Invert
Wrinkling

S350215
S350214
U/S-D/S



40.98 m.

Longitudinal Fins

9350216
9350215
DS-US

Longitudinal Fins



Meet Mark



CONFINED SPACE ENTRY PERMIT

Valid only for date of issue. 18/5/17

CONTRACT # CP 223

CONTRACT NAME: White house road CONTRACTOR: Rehabilitation Solutions

Entry Team - I/we understand all the procedures, safe working practices, protective equipment and retrieval equipment required prior to any manhole entry
 Description of Work: Cipp - Cutting fins

Manhole categorisation	1 Up to 1.5m deep	Initial
Manhole categorisation	2 Over 1.5m deep	3.0m
Manhole categorisation	3 Worker out of sight from above	<input checked="" type="checkbox"/>

Authorized person in charge	A <u>Shameel</u>	Initial
Person entering confined space	B <u>MARK BAKER</u>	<u>MB</u>
Person entering confined space	C <u>ANDY LAKALAKI</u>	<u>AL</u>
Standby Person	D	
Standby Person	E <u>Sulhuo</u>	<u>SL</u>
Standby Person	F <u>Tuh Levi</u>	<u>TL</u>

All the following items have been Checked and Discussed:

- Protective clothing and equipment
- Gas monitoring Equipment
- Safety harness with life-lines
- Retrieval device (tripod and winch)
- Fire fighting equipment
- Bypass Pumping
- Emergency Procedures Reviewed
- Weather forecast checked
- All persons confined space entry trained
- Lights & torches intrinsically safe
- First aid kit
- Personal escape breathing apparatus
- BA (breathing apparatus) set
- Manhole ventilator
- Manhole Ventilation
- Cell phone or Radio
- Pre-Work check List completed
- Barriers erected

Gas detector has been zeroed
 Warning signs erected

GAS DETECTOR DETAILS
 Ref 73401.2

Calibration Date 0 22/8/17

SITE INFORMATION:
 SUSPEND / CANCEL / PERMIT - Reason: CUTTING FINS

THIS IS A MULTIPLE CONFINED SPACE ENTRY PERMIT •
 ENTER MH No. AND STREET ADDRESS BELOW

ENTRY 4 MANHOLE
13 WHITE HOUSE ROAD

4.00	2	B/C	E/F																
02	3																		
	4																		
	5																		
	6																		

PRE-ENTRY PERSON ENTERING MH <small>Use letters from list above</small>	STANDBY PERSONNEL <small>Use letters from list above</small>	ALL PRE-ENTRY CHECKS PASSED <small>Hazards identified. Communications established. Emergency procedures established</small>	ALL TEAM USING CORRECT PROTECTIVE CLOTHING AND EQUIPMENT	LOCKS & TAGS FITTED TO PIPELINES	PRE-ENTRY ATMOSPHERIC CONDITIONS IN CONFINED SPACE <small>(Enter actual figure recorded where available or tick to indicate the below alarm levels)</small>			AUTHORISE AS SAFE TO ENTER <small>(Person in charge to initial)</small>	ENTRY TIME	EXIT TIME	ALL WORK FINISHED. EQUIPMENT & TEAM REMOVED. ISOLATIONS REINSTATED	ALL AUTHORISED WORK IS COMPLETE <small>Person in charge to initial</small>
					>19.5% and < 23%	< 10%	OTHER Specify					
					%O ₂	%LEL	H ₂ S PPM					
					20.8	0	0	0				
					20.8	0	0	0				
					20.8	0	0	0		3:50	4:10	<input checked="" type="checkbox"/>
					20.8	0	0	0				
					20.8	0	0	0				

when



5350217 - 5350216



5350218 - 5350217





Defects – Causes – Lessons Learnt

Key Concern: Liner Expansion in the Pipeline

- Liner Composition – Unable to expand with reinforced layer
- Inversion Head – Pressure to expand as much as possible
- Angle of liner insertion – twist on the line during insertion
- Crane guidance – pressure on the liner during installation

Size of the bag could have been reduced – not the prevailing issue

Lessons Learnt

Key Takeaways:

- Lining is suitable where replacement is not.
- CIPP can line non-circular profiles using circular bags
- Consider the inversion head and smoothness of the insertion
- If cross sectional area can be reduced – consider a smaller bag



Questions.