Integrated Expertise. Locally Delivered.

#101 – 38026 Second Avenue, Squamish, BC V8B 0C3 T: 604.815.4646 F: 604.815.4647

January 13, 2025

Our Reference: 32564

Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC V8E 0X5

Attention: Chelsey Roberts, Manager, Infrastructure Services

Dear Madam:

Reference: Sewer Valve and Fittings Corrosion – Observations and Recommendations

1.0 Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by the Resort Municipality of Whistler (RMOW) to provide design, contract and construction management services associated with the 2024 Sewer and Water Valve and Fitting Repairs project. The sewer construction scope involved replacement of valves and fittings on the sanitary sewer system due to age and suspected corrosive attack. Coastal Mountain Excavations Ltd. was awarded the contract to perform the work. All replacements were located on Spruce Grove Way and Fitzsimmons Dike.

Figure 1 – Project Limits

2.0 Inspection

Upon completion of all sanitary sewer valve and fitting replacements, it can be confirmed that corrosion was present in all instances; however, the degree of corrosive attack varied. In general, the corrosion was the most extreme on the split ring restrainers and associated hardware (to the point of failure in several instances). All bends were PVC and therefore there was no corrosive degradation present. Cast iron couplings showed signs of minor surface corrosion and associated stainless hardware had no notable corrosion. Photos 1 to 4 show examples of the findings throughout this project. Further photos can be found in ISL's project completion submission.

Photo 1 - Corroded Restraining Rod (S2-13 45 ° Bend)

Photo 2 – Corroded Restraining Rod (S2-16 22.5° Bend)

Photo 3 - Corroded Restraining Rod (S2-14 22.5° Bend)

Photo 4 – Corroded Split Ring Restraining Ear (S2-19 22.5° Bend)

3.0 Conclusions/Recommendations

Upon analysis of our observations, it has become evident that the valve and fitting restraints were the primary target of corrosive degradation. The likelihood of future failures of these in certain instances is significant if left unaddressed.

ISL has the following comments/recommendations:

- Continue with valve and fitting replacement program focusing on areas where there have been recent failures and/or areas where extensive corrosion has been noted during excavation.
- Scheduled replacement will likely be more cost effective and less disruptive in comparison with emergency replacement in the unfortunate case of failure.
- When replacing any iron works, replace it with stainless steel where possible and wrap in Denso as per manufacturers specifications with three-part system.

Best regards,

Grant Wilburn, E.I.T.
Project Engineer

Reviewed by:

Graham Schulz, P.Eng.
Manager, Squamish Office/Senior Project Engineer

#101 – 38026 Second Avenue, Squamish, BC V8B 0C3 T: 604.815.4646 F: 604.815.4647

January 13, 2025

Our Reference: 32564

Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC V8E 0X5

Attention: Chelsey Roberts, Manager, Infrastructure Services

Dear Madam:

Reference: Water Valve and Fittings Corrosion – Observations and Recommendations

1.0 Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by the Resort Municipality of Whistler (RMOW) to provide design, contract and construction management services associated with the 2024 Sewer and Water Valve and Fitting Repairs project. The water construction scope involved replacement of valves and fittings on the water system due to age and suspected corrosive attack. Coastal Mountain Excavations Ltd. was awarded the contract to perform the work. All replacements were located on Spruce Grove Way, Fitzsimmons Road North and Fitzsimmons Dike.

Figure 1 – Project Limits

2.0 Inspection

Upon completion of all water valve and fitting replacements, it can be confirmed that corrosion was present in all instances; however, the degree of corrosive attack varied. In general, the corrosion was the most extreme on the valve and fitting flanged connection hardware and restraining hardware (to the point of failure in several instances). Photos 1 to 4 show examples of the findings throughout this project. Further photos can be found in ISL's project completion submission.

Photo 1 - Corroded Flange Connection Bolt (W4-23 Hydrant Tee)

Photo 2 – Corroded Restraining Rod (W4-23 Hydrant Lead)

Photo 3 - Corroded Restraining Rod (W4-25 Hydrant Tee)

Photo 4 – Corroded Flange Connection Bolts (W4-25 Hydrant Tee)

3.0 Conclusions/Recommendations

Upon analysis of our observations, it has become evident that the restraining hardware and valve/fitting flange connection hardware were the primary target of corrosive degradation. The likelihood of future failures of these in certain instances is significant if left unaddressed.

ISL has the following comments/recommendations:

- Continue with valve and fitting replacement program focusing on areas where there have been recent failures and/or areas where extensive corrosion has been noted during excavation.

- Scheduled replacement will likely be more cost effective and less disruptive in comparison with emergency replacement in the unfortunate case of failure.
- When replacing any iron works, replace it with stainless steel where possible and wrap in Denso as per manufacturers specifications with three-part system.

Best regards,

Grant Wilburn, E.I.T.
Project Engineer

Reviewed by:

Graham Schulz, P.Eng.
Manager, Squamish Office/Senior Project Engineer

#101 – 38026 Second Avenue, Squamish, BC V8B 0C3 T: 604.815.4646 F: 604.815.4647

February 15, 2024

Our Reference: 32564

Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC V8E 0X5

Attention: Chelsey Roberts, Capital Projects Manager, Infrastructure Services

Dear Madam:

Reference: Sewer Fittings Corrosion – Observations and Recommendations

1.0 Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by the Resort Municipality of Whistler (RMOW) to provide design, contract and construction management services associated with the 2023 Valves and Fittings Replacement Project. The construction scope involved replacement of fittings on the sanitary sewer system due to age and suspected corrosive attack. Coastal Mountain Excavations Ltd. was awarded the contract to perform the work. All replacements were located on Northlands Boulevard & Valley Trail paralleling Sea to Sky Highway across from Whistler Cay Drive.

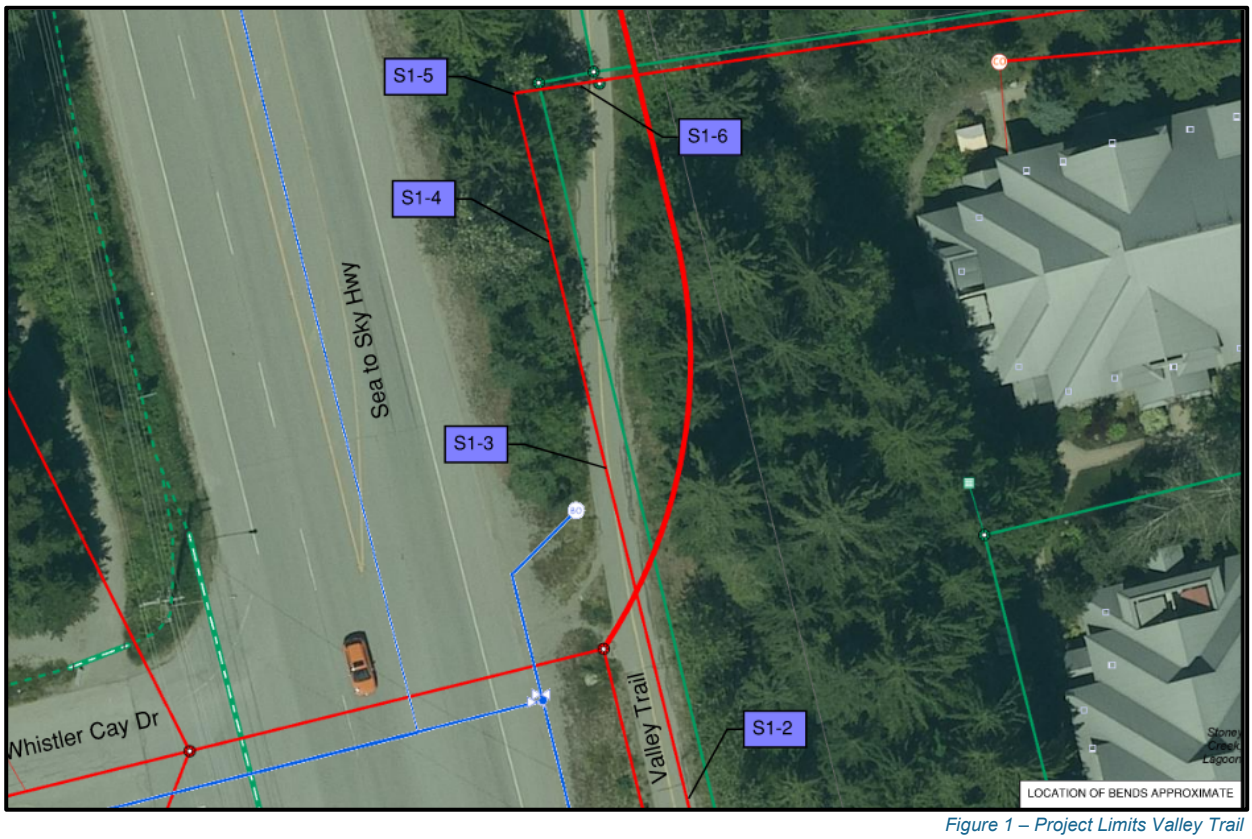

Figure 1 – Project Limits Valley Trail

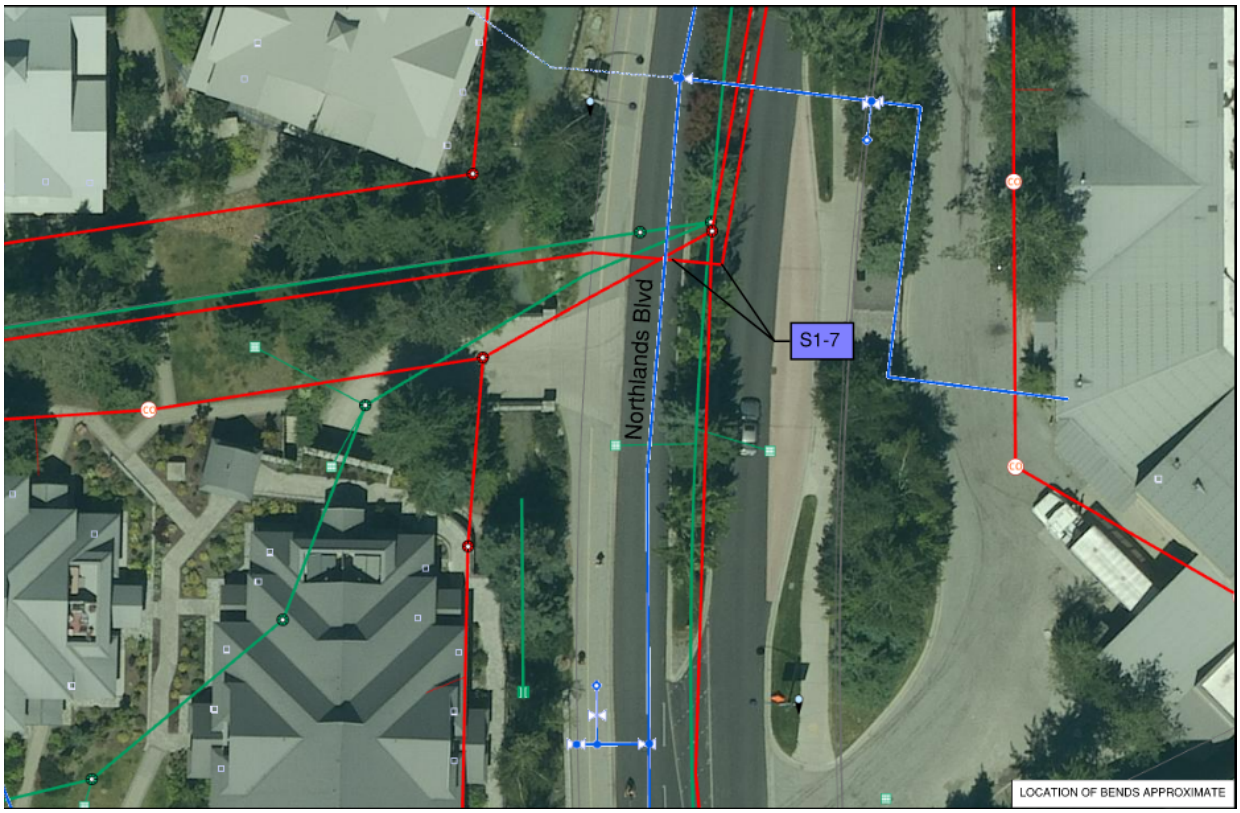

Figure 2 – Project Limits Northlands Boulevard

2.0 Inspection

Upon completion of all sanitary sewer fitting replacements, it can be confirmed that corrosive degradation of fittings and restraining rings was present but not severe. In some cases, encrustation and concrete made it difficult to determine the severity of degradation. The most extensive corrosive degradation was found on the restraining rods (specifically at S1-7 and S1-4). Photos 1 to 4 show examples of the findings throughout this project. Further photos can be found in ISL's project completion submission.

Photo 1 - Corroded Restraining Rod (S1-7 90° Bend)

Photo 2 – Encrustation and Surface Corrosion (S1-7 90° Bend)

Photo 3 - Corroded Restraining Rod (S1-4 11.25° Bend)

Photo 4 – Encrustation and Surface Corrosion (S1-6 11.25° Bend)

3.0 Conclusions/Recommendations

Upon analysis of our observations, it has become evident that the fitting restraining rods were the primary target of corrosive degradation. The likelihood of future failure of these rods in certain instances is significant if left unaddressed. Fittings themselves and restraining rings appeared to have less severe corrosive degradation.

ISL has the following comments/recommendations:

- Continue with fittings replacement program focusing on areas where there have been recent failures and/or areas that extensive corrosion has been noted during excavation.
- Scheduled replacement will likely be more cost effective and less disruptive in comparison with emergency replacement in the unfortunate case of failure.
- When replacing any iron works wrapping in Denso as per manufacturers specifications with the three-part system is imperative.
- Look into other methods of corrosion control available.

Best regards,

Grant Wilburn, E.I.T.
Project Engineer

Reviewed by:

Graham Schulz, P.Eng.
Manager, Squamish Office/Senior Project Engineer

#101 – 38026 Second Avenue, Squamish, BC V8B 0C3 T: 604.815.4646 F: 604.815.4647

February 15, 2024

Our Reference: 32683

Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC V8E 0X5

Attention: Chelsey Roberts, Capital Projects Manager, Infrastructure Services

Dear Madam:

Reference: Water Valve & Fittings Corrosion – Observations and Recommendations

1.0 Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by the Resort Municipality of Whistler (RMOW) to provide design, contract and construction management services associated with the 2023 Valves and Fittings Replacement Project. The construction scope involved replacement of valves and fittings on the water system due to age and suspected corrosive attack. Coastal Mountain Excavations Ltd. was awarded the contract to perform the work. All replacements were on Northlands Boulevard and the private trail behind Granite Court Condos (4405 Blackcomb Way).

Figure 1 – Project Limits

2.0 Inspection

Upon completion of all water valve and fitting replacements, it can be confirmed that corrosive degradation of valves, fittings and restraints was present but not severe. In some cases, encrustation made it difficult to determine the severity of degradation. Bonnet bolts on all valves were in good condition with no observed corrosive degradation.

Photos 1 to 4 show examples of findings throughout this project. Further photos can be found in ISL's project completion submission.

Photo 1 – Minor Surface Corrosion on Restraining Ring W1-17

Photo 2 – Minor Surface Corrosion Hydrant Valve W1-18

Photo 3 – W1-D Cross and Valves

Photo 4 – W1-D Valve Bonnet Bolts

3.0 Conclusions/Recommendations

Upon analysis of our observations, it has become evident that there was corrosive degradation on valves, fittings, and restraints; however, the degradation was not severe.

ISL has the following comments/recommendations:

- Continue with fittings replacement program focusing on areas where there have been recent failures and/or areas that extensive corrosion has been noted during excavation.
- When replacing any iron works wrapping in Denso as per manufacturers specifications with the three-part system is imperative.
- Look into other methods of corrosion control available.

Best regards,

Grant Wilburn, E.I.T.
Project Engineer

Reviewed by:

Graham Schulz, P.Eng.
Manager, Squamish Office/Senior Project Engineer

#101 – 38026 Second Avenue, Squamish, BC V8B 0C3 T: 604.815.4646 F: 604.815.4647

January 13, 2023

Our Reference: 32564

Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC V8E 0X5

Attention: Chelsey Roberts, Capital Projects Manager, Infrastructure Services

Dear Madam:

Reference: Sewer Fixture & Fittings Corrosion – Observations and Recommendations

1.0 Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by the Resort Municipality of Whistler (RMOW) to provide design, contract and construction management services associated with the 2022 valves and fittings replacement project. The construction scope involved replacement of valves and fittings on the sanitary sewer system due to age and suspected corrosive attack. Drake Excavating Ltd. was awarded the contract to perform the work. All replacements were located on Northlands Boulevard & Blackcomb Way North or Lorimer Rd, and on the trail behind 4405 Blackcomb Way.

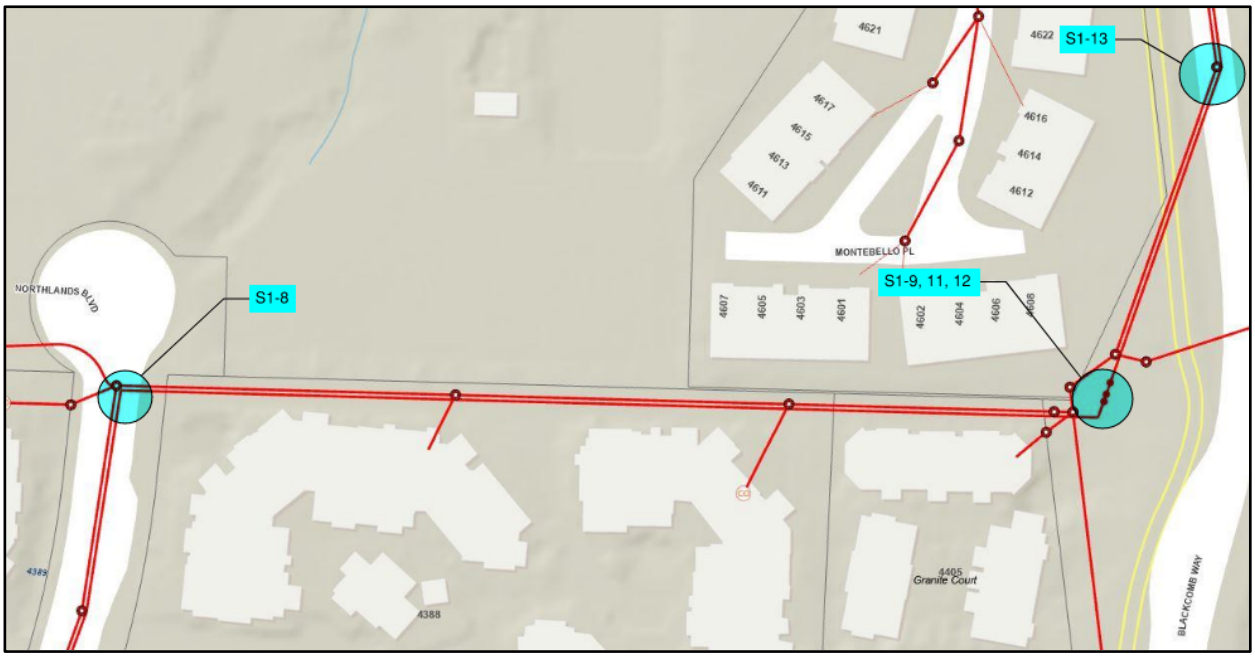

Figure 1 – Project Limits

2.0 Inspection

Upon completion of all sanitary sewer valve and fitting replacements, it can be confirmed that corrosion was present in all instances; however, the degree of corrosive attack varied. In general, the corrosion was the most extreme on the restraining rings and rods (to the point of near failure in some instances).

Photos 1 to 4 show examples of corrosion found throughout this project. Further photos can be found in ISL's project completion submission.

Photo 1 - Corroded Restraining Rod.

Photo 2 - Corroded 90° Bend Restraining Ear.

Photo 3 - Corroded Restraining Ring Ear.

Photo 4 - Corroded Restraining Ring Ear.

3.0 Conclusions/Recommendations

After review of our observations and findings it appears that corrosion was the worst in cases where there was heavy groundwater present in the trench. It was also noted that the restraining rings and rods were most subject to corrosive attack. Valves and the fittings themselves complete with hardware appeared to be less affected however corrosion was observed on these items and if left in place future failure of these fittings is considered likely.

ISL has the following comments/recommendations:

- Continue with fittings replacement program focusing on areas where there have been recent failures and/or areas that extensive corrosion has been noted during excavation.
- Scheduled replacement will likely be more cost effective and less disruptive in comparison with emergency replacement in the unfortunate case of failure.
- When replacing any iron works wrapping in Denso as per manufacturers specifications with the three-part system is imperative.
- Look into other methods of corrosion control available.

Best regards,

Grant Wilburn, E.I.T.
Project Engineer

Reviewed by:

Graham Schulz, P.Eng.
Manager, Squamish Office/Senior Project Engineer

#101 – 38026 Second Avenue, Squamish, BC V8B 0C3 T: 604.815.4646 F: 604.815.4647

January 13, 2023

Our Reference: 32683

Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC V8E 0X5

Attention: Chelsey Roberts, Capital Projects Manager, Infrastructure Services

Dear Madam:

Reference: Water Fixture & Fittings Corrosion – Observations and Recommendations

1.0 Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by the Resort Municipality of Whistler (RMOW) to provide design, contract and construction management services associated with the 2022 valves and fittings replacement project. The construction scope involved replacement of valves and fittings on the water sewer system due to age and suspected corrosive attack. Drake Excavating Ltd. was awarded the contract to perform the work. All replacements were on Northlands Boulevard north of Lorimer Road.

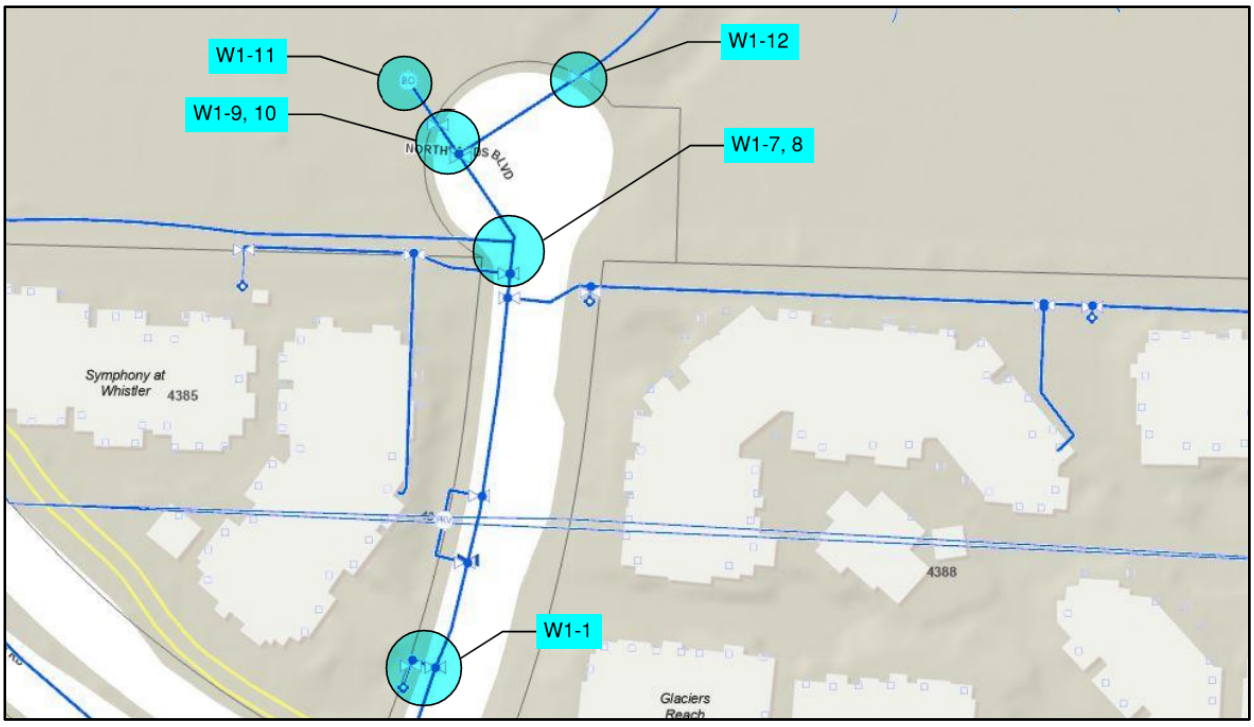

Figure 1 – Project Limits

2.0 Inspection

Upon completion of all water valve/fitting replacements, it can be confirmed that corrosion was present in all instances; however, the degree of corrosive attack varied. As Drake moved north on Northlands Boulevard the corrosion worsened. In general, the corrosion was the most extreme on the restraining rings and rods.

Photos 1 to 4 show examples of corrosion found throughout this project. Further photos can be found in ISL's project completion submission.

Photo 1 - Corroded Restraining Rod.

Photo 2 - Corroded Restraining Ring Ear.

Photo 3 – Blow-off Pipe Corrosion.

Photo 4 – Valve & Tee Corrosion.

3.0 Conclusions/Recommendations

After review of our observations/findings it appears that corrosion was the worst in cases where there was heavy groundwater present in the trench. It was also noted that the restraining rings and rods were most subject to corrosive attack. Valves and the fittings themselves complete with hardware appeared to be less affected however corrosion was observed on these items and if left in place future failure of these fittings is considered likely.

ISL has the following comments/recommendations:

- Continue with fittings replacement program focusing on areas where there have been recent failures and/or areas that extensive corrosion has been noted during excavation.
- Scheduled replacement will likely be more cost effective and less disruptive in comparison with emergency replacement in the unfortunate case of failure.
- When replacing any iron works wrapping in Denso as per manufacturers specifications with the three-part system is imperative.
- Look into other methods of corrosion control available.

Best regards,

Grant Wilburn, E.I.T.
Project Engineer

Reviewed by:

Graham Schulz, P.Eng.
Manager, Squamish Office/Senior Project Engineer