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DISTRICT OF WELLS PRELIMINARY INFLOW & INFILTRATION REVIEW



Prepared for: District of Wells

October 2022 954-009-01

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1 PROJECT BACKGROUND

The District of Wells has retained R. Radloff & Associates (Radloff) to prepare a Feasibility Study to provide engineering and cost estimates for the upgrade of its wastewater treatment facility in order to achieve compliance with the *Canadian wastewater Systems Effluent Regulations* (WSER) and with the *BC Municipal Wastewater Regulation* (MWR). As part of this study, Radloff completed a high-level assessment of the wastewater collection system to assess possible areas of inflow and infiltration.

For the purposes of this study, the following definitions will be used:

Infiltration: The component of wastewater that enters a sewer system (including service connections and sewer mains) from the ground through means which include, but are not limited to, defective pipes, pipe joints, connections, or manhole barrel joints.

Inflow: The component of wastewater that enters a sewer system (including service connections) from sources that includes, but is not limited to the following:

- sump pumps
- roof leaders
- cellar drains
- yard drains
- manhole covers

- cross connections between storm sewers and sanitary sewers
- area drains
- drains from springs and swampy areas

To help identify potential spots of inflow and infiltration Radloff partnered with the District of Wells Public Works staff to perform a preliminary inflow and infiltration investigation to determine if there are measures that could be taken early in 2023 to help reduce the flow in the coming spring to the lagoon.

The two figures below show that there appears to be a correlation between the spring runoff in Willow River and the amount of flow the lift station handles . The red box over figure 1 highlights the time period within figure 2.

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Figure 1: Willow River Hydrograph



Figure 2: Daily Flows in Wells, BC



2 I&I INVESTIGATION

The I&I investigation tasks included visually inspecting manhole interiors, as well as smoke testing the collection system.

2.1 Manhole Inspections

Radloff performed the manhole inspections on May 31, 2022. All manhole inspections were completed from the surface. Inspectors looked for defects such as broken ladder rungs, cracks in concrete, or lid defects. Inspectors also looked for indications of possible inflow or infiltrations such as staining or root penetration.



Image #1: Typical Manhole



Image #2: 4-Inch PVC Pipe in Manhole #60

Manhole inspections showed that most manholes in the community are in good condition. Some of the manholes did show minor signs of staining and some minor groundwater seepage was present at the time of the inspection. Three (3) manholes were in fair condition, showing small amounts of infiltration. Three (3) manholes were in poor condition, showing major signs of infiltration. One manhole, manhole #60, had significant inflow issues. This manhole had a four-inch PVC pipe installed into the side of the manhole wall and out into the Willow River. It is unknown when or by whom the drainage pipe was installed. During normal operating conditions, the pipe would allow surface water to inflow into the collection system. However, during power outages or maintenance issues with the lift station, the collection system would back up and flow out into the Willow River. Upon finding the pipe, Radloff and the District of Wells immediately capped this pipe during the site visit, however a permanent cap should be installed. For reference to manhole conditions and manhole #60, refer to photos in *Appendix A*. For locations of the manholes refer to the drawings in *Appendix B*.

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2.2 Smoke Testing

October 2022

Radloff performed smoke testing from August 3-4, 2022. Prior to completing the smoke testing, a community notice was sent out to all residents to inform them about the smoke test, including the steps they should take in the event that smoke entered the home.

Smoke testing was performed by having a manhole blower force air into isolated sections of the wastewater collection system from a manhole. After the wastewater collection system has been primed for several minutes smoke candles are lit to introduce smoke into the system. Inspectors walk around the community on the section of the system that is being tested looking for smoke venting into the atmosphere.



Image #3: Smoke from Building Sewer Vent (typical)



Image #4: Smoke from Above Grade Cleanout

Smoke testing revealed a total of twelve (12) service cleanouts that were broken and can be a significant source for inflow. This does not include the cleanouts in the RV park. Three (3) cleanouts were not capped properly, two (2) cleanouts were visibly broken, four (4) cleanouts were leaking below grade, and the remaining three (3) cleanouts were visible but leaking below grade. The leaking cleanouts protruding above ground are believed to present only minor inflow volumes. The broken and below grade cleanouts could potentially be a source of significant inflow. In the RV park, there were multiple service cleanouts that were leaking. It is recommended that all these cleanouts be repaired/capped.

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Image #5: Manhole Repair with Hydrophobic Grout



Image #6: Smoke from Below Grade Cleanout

As significant infiltration was witnessed at manhole #65A during the previous manhole inspections completed earlier in the year, Radloff brought out confined space equipment and hydrophobic grout to enter the manhole if a leak was discovered during the inspection. This would allow inspectors to repair any major issues in the event one was located during the inspection.

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3 CONCLUSIONS AND RECOMMENDATIONS

Based on the interim report findings, it is evident that some remediation steps could be undertaken to reduce the amount of inflow and infiltration entering Wells' Wastewater Collection System as well as to prevent contamination of freshwater. The following recommendations aim to reduce inflow and infiltration to below two times the average dry weather flow to become compliant with Section 44(1) of MWR.

3.1 Inflow Repairs

Twelve (12) clean out locations were found during smoke testing that should be repaired to help reduce inflow and infiltration into the wastewater collection system. For reference to the inflow repair locations, refer to *Appendix B*. These should be lowered below the ground surface and capped. A covering metal sleeve/cap is to be installed below ground level and the cleanout buried with clay soil. The metal sleeve will permit the cleanout to be located in the event that access is needed for operations or maintenance purposes. For reference to the recommended repairs, refer to the drawing in *Appendix C*.

3.2 Infiltration Repairs

The manhole inspection revealed approximately six (6) sewer manholes where infiltration may enter the wastewater collection system.

The infiltration repair recommended is the sealing of leaking manhole barrel joints (e.g., manhole #60), and a permanent cap being installed on the capped drainage pipe on manhole #60. As the groundwater rises, the increased water pressure causes water to leak in through cracks or holes in the manhole riser joints. Traditional grouting alone has been known to fail over time due to inward pressure from the ground water. It is recommended that grouting be completed in combination with a hydrophobic grout injection. The hydrophobic grout is a rapid reacting material that expands when it contacts water and forms a seal around the manhole, cutting off the water and thus the infiltration. For the grout to work properly, it must be applied <u>during peak infiltration events.</u> With no high groundwater the product will not expand properly. Once the water source has been cut off, the manhole barrel joint should be re-grouted.

Sewer manhole #65A at the intersection between Highway 26 (Barkerville Highway) and Ski Hill Road showed a large amount of infiltration leaking into the sanitary system. Hydrophobic grout was used to patch the major leaks, but there were still several more minor leaks around the barrel joint and inflow pipe. The leaks in this manhole require further re-grouting.

Once repairs have been completed to the wastewater system, it is recommended that the lift station pump hours be recorded daily to determine the effectiveness of the interim repairs. If the lift station records continue to show I&I influences after the repairs, it is recommended that a camera inspection is done to better define the infiltration.

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Appendix A – Investigation Photos

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Figure 1: Cracked cleanout at ground level near 3879 Solibake St.



Figure 2: Inflow location - Manhole near Barkerville Highway bridge crossing Willow River



Figure 3: Cleanout without cap at 3968 Mooney Ln.



Figure 4: Hydrophobic grout injection in barrel joint of manhole #65A

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Figure 8: Smoke indicating broken cleanout below grade



Figure 6: Smoke exiting sewer vents correctly, as expected



Figure 7: Rust indicating infiltration



Figure 5: Smoke from ground around cleanout indicating breakage

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Figure 9: Dry manhole (no flow)



Figure 10: Backed up manhole



Figure 11: 4-inch pipe draining sewage into the Willow River



Figure 12: Capped 4-inch pipe (temporary fix)

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Appendix B – I&I Repair Locations

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2) LOCATION OF UNDERGROUND SERVICES HAS BEEN DETERMINED FROM "RECORD" DRAWINGS PREPARED BY OTHERS. R. RADLOFF & ASSOCIATES ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE "RECORD".

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DISTRICT OF WELLS SMOKE TESTING SHEET TITLE SOUTHSIDE LEAKING CLEANOUTS



Appendix C – I&I Repair Details

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