



Leak Repair Program Resolute Bay October 2010

Prepared For:
Department of Community and Government Services
Government of Nunavut

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1. Leak Repair Program Report

1.1 Overview

As per Trow's report "Sewage and Water Works Technical Evaluation – Phase 2", section 3.2.4 outlines the expected deterioration of the system and the sequence of detection and remedy necessary to improve the system to minimize public safety risks. This sequence initiated the following leak detection program.

Kudlik Construction Ltd. was retained in August 2010 to investigate the status of the utilidor water and sewer services, provide and install backflow preventers on all access vault bleeds, and clean out the access vaults of debris and hazardous substance. Kudlik contracted two specialized subcontractors for the utility service investigation, Veolia Environmental Services to conduct Closed Circuit Television (CCTV) within the sewers and Echologics to conduct a leak detection program on the water main. These two investigations highlighted defects within both the water main and sewer main.

The report Echologics provided pointed out approximately ten probable water leaks which should be addressed. These potential leak locations varied in size, quantity and confidence levels as per the vibrations resonating through the pipe, and the instruments used to record them.

These ten potential leak locations were then arranged in priority, evaluated by confidence levels and the quantity of the leak. A site sketch was then produced indicating the recommended order which these locations should be addressed. A copy of the site sketch is included in Appendix A.

1.2 Repair Works

Kudlik Construction was awarded the contract to repair the leaks as described in the Echologics report. The contract agreement between the GN and Kudlik would be on a time and materials basis. A detailed sequence of the repair program as recorded by the Trow representative is included in Appendix B.

Of the ten potential leaks identified in the Echologics report, three leaks were found and repaired. They included one leaking service connection (location 1) and two leaking electrofusion couples (locations 5 and 9). Photographs of the leaking couples are included in Appendix C. Although it is difficult to accurately quantify the size of the leaks that were found, they can all be classified as significant. In particular the two leaking electrofusion couples were contributing significantly to the amount of unaccounted water usage. It is believed that although the number of leaks repaired was less than anticipated, the overall reduction in water loss was equivalent to the amount anticipated in the original leak repair program.

After the potential leak locations identified were investigated and the leaks that were found were repaired, the water system operator indicated that there was still considerable unaccountable water usage. There is the continuing potential for other leaks that might be substantial within the water system. However, given that there was no indications if or

where the leaks may exist, and the only method to discover the location of a leak was random excavation of the water system, it was deemed not to be cost effective to continue the leak repair program.

1.3 Summary

The GN has applied all available technical resources to the task of identifying leaks from the existing water system. These efforts encountered significant challenges, in part due to the difficulties with leak detection with polyethylene piping. Based on the leak detection program three substantial leaks were located and repaired.

There is the continuing potential for other leaks that might be substantial. There is, unfortunately, currently no method to locate these leaks aside from uncovering the entire system. We agree that immediate action should be taken when additional leaks become apparent.

The issue of leakage raises the question of ongoing monitoring of the water and sewer system. The Phase 2 report of February recommended an ongoing monitoring scheme that included reporting of water consumption. If such information is available, conclusions can be developed regarding the impact of the recent repairs.

There is reportedly still a considerable amount of unaccounted water usage. There are two potential main sources of unaccounted water usage in Resolute Bay, water leaks and water bleeds. In the earlier report by Trow (February 2010), it was estimated that 1/3 of the total water usage was a result of water bleeds. This could be a conservative estimate of the actual water usage attributed to water bleeds. Prior to undertaking any additional leak detection and repair program, it is recommended that the GN attempt to quantify the quantity of unaccounted water usage due to water bleeds and water leaks. Based on this information, the GN could then make a decision on how to best control the amount of unaccounted water usage.

Appendix A: Site Sketch

- WATER LINE
- DIRECTION OF FLOW
- ACCESS VAULT
- ACCESS VAULT WITH FIRE HYDRANT
- ACCESS VAULT PART OF 2005 NEW DEVELOPMENTS
- AV21
- AV5(HYD)
- AV40

5-13m South of AV2
@ SECTION, 3-5gpm
POINT OF INTEREST

HYD @ AV3
CONFIRMED

25.8m North of AV21
@ SVC (possible)
3-5gpm
MEDIUM CONFIDENCE

8.1m North of AV21
@ SECTION, 3-5gpm
HIGH CONFIDENCE

6.2m South of AV23
@ SECTION, 4gpm
HIGH CONFIDENCE

7m East of AV27
@ BEND, 4-5gpm
HIGH CONFIDENCE

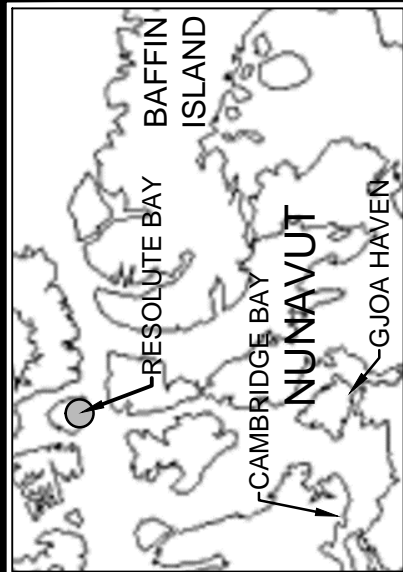
56m West of AV23
@ SVC, 4-5gpm
CONFIRMED

North side of AV6
@ JOINT(?), 3gpm
HIGH CONFIDENCE

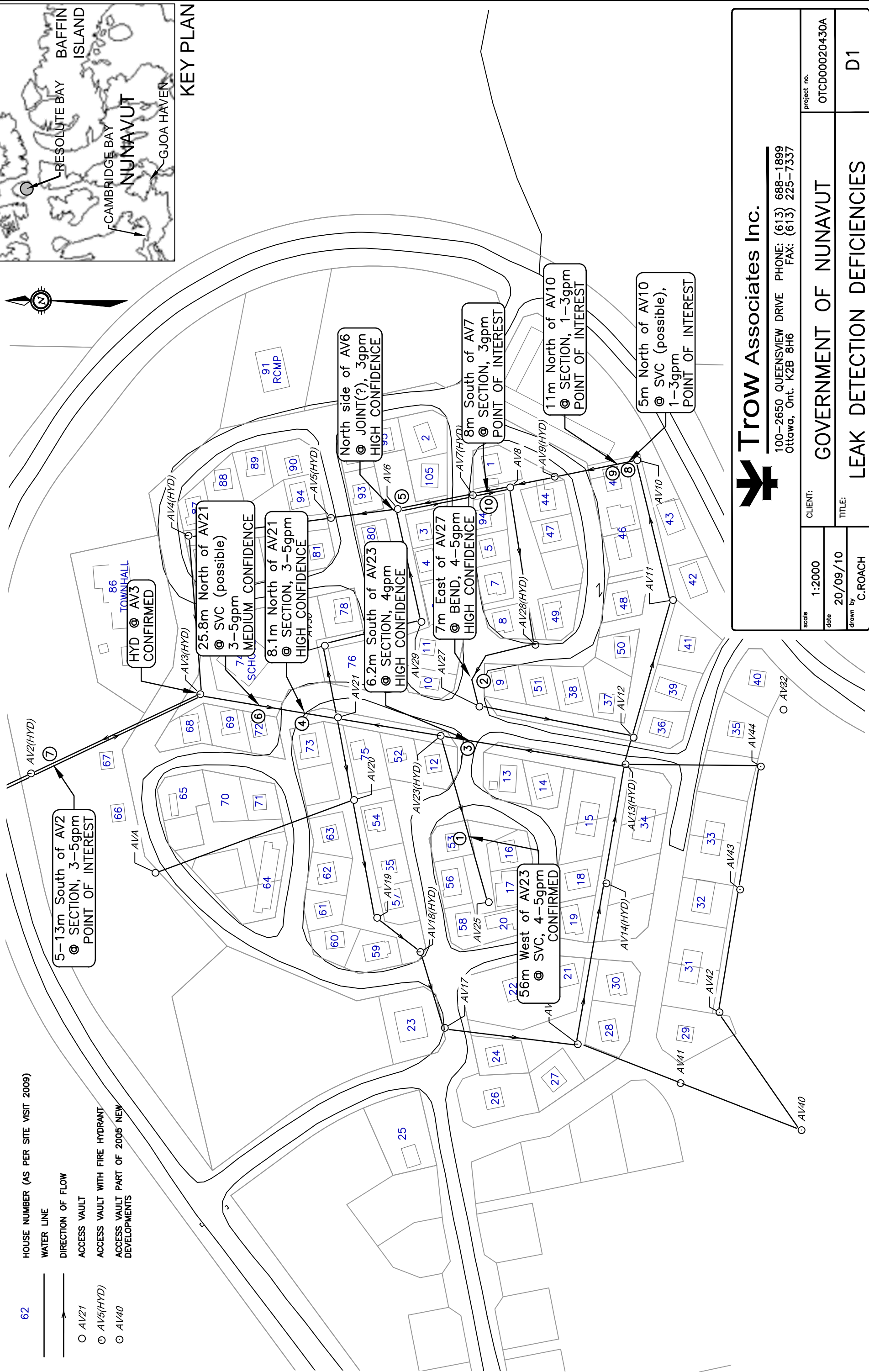
8m South of AV7
@ SECTION, 3gpm
POINT OF INTEREST

11m North of AV10
@ SECTION, 1-3gpm
POINT OF INTEREST

5m North of AV10
@ SVC (possible),
1-3gpm
POINT OF INTEREST



KEY PLAN



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scale 1:2000		CLIENT: GOVERNMENT OF NUNAVUT	project no. OTCD00020430A
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Appendix B: Field Review Report

FIELD REVIEW PROGRAM

Thursday September 30th

- 7:30 p.m. Trow's inspector Abdal arrived in Resolute Bay.
- Meeting with Aziz Kheraj revealed Kudlik started working on the water main repairs this morning and completed the repairs on one service connection.

Friday October 1st

Weather is light snow -10 (-18 with wind chill)

- 6:30 a.m. Meeting with Kudlik.
- Simon from Kudlik introduced the crew to Abdal.
- Typical daily starting time was set at 7:00 a.m.
- On site five men in total, 2 labour, 1 mechanic, operator, Simon (foreman) and an excavator.
- 7:15 a.m. continued excavation for repair no. 2 which was started Thursday afternoon.
- Told Kudlik that the leak could potentially be at the bend location.
- 8:30 a.m. excavation is at the bend location, no sign of leaks.
- 8:45 a.m. meeting with Aziz to carry out water testing. Test was done at the South Camp Hotel; water taken from the kitchen tap measured at 0.87 ppm of chlorine residual. Request was to keep it at 0.5 ppm.
- 10:30 a.m. Kudlik broke water main at proposed leak No. 2 location.
- With the help of Aziz, valves were shut down to isolate the break so that Kudlik could repair the main.
- 12:15 p.m. completed installing the repair clamps for the watermain break.
- 1:30 p.m. continued to excavate for leak no. 2.
- 6:00 p.m. End of work day.
- 6:00 p.m. Mechanic still on-site to fix the cracked bucket of the shovel for use the next day.

Saturday October 2nd

Weather is light snow -12 (-20 with wind chill)

- 7:00 a.m. Kudlik continued work on Repair No. 2.
- Excavated the remaining 20 m to AV 28 completing the entire pipe length.
- Exposed watermain showed no signs of leak, excavated ground was dry, ground below pipe was dry, and no ice blocks found along the main.
- 3:00 p.m. no leak found at location No. 2.
- Repair clamps at the water main break have been insulated and wrapped.
- 3:00 p.m. backfilling the trench underway.
- Leak no.2 is not found and the decision is made to move to the next location.
- 3:15 p.m. chlorine residual test is completed and found to be at 1.23 ppm. Aziz will try to adjust the level down.
- 6:00 p.m. Kudlik finished backfilling location No. 2.
- Material used: 1 Repair Clamp, Foam, Shrink Wrap 2 sheets.

Sunday October 3rd

Weather is light snow -13 (-22 with wind chill).

- 7:00 a.m. shovel started excavating the location of leak no. 3.
- Loader continued to backfill leak no. 2.
- 7:15 a.m. Abdal and Simon entered Signal Hill Filtration Plant and found the chlorine injector pump unplugged.
- Aziz arrived after 15 minutes and mentioned that the pump stopped working last night. He cleaned a connection and turned the chlorinator back on within approximately 15 minutes.
- 11:00 a.m. the watermain is exposed at location no. 3, 6.0 m south of AV23.
- No signs of a leak at the indicated location.
- Continued exposing the pipe around location no. 3.
- At approximately 15m south of AV23, a service saddle was found. The insulation was removed, but no leak was found.
- 1:00 p.m. Aziz completed a chlorine residual test, result 0.79 ppm.
- 2:00 p.m. Went around with Bernie from Kudlik and checked the work completed installation of the final backflow preventers in AV44, AV43, AV42, AV40, AV29, AV8, AV10, and AV28.
- 3:30 p.m. Exposed location no. 3 from AV 23 to about 20 m south without finding any leaks.
- Started backfilling the opened trench and moved on to location no. 4.
- Location no. 4 (8.0m north of AV 21) is situated between 2 guy wires for a utility pole. Before any excavation in the area, the utility companies would have to be notified, and a support system to brace the pole would be necessary. Therefore the decision was made to move on to the next site.
- Location no. 6 (measured 26 m North of AV 21) is situated at a service box. The cover was opened and the inside inspected. No leaks or trace of water was found.
- 5:00 p.m. moved to location no.7.
- 6:00 p.m. End of work day.

Monday October 4th

Weather is light snow -16 (-27 with wind chill)

- 7:00 a.m. shovel started excavating location no. 7.
- 11:00 a.m. loader is finished backfilling location no. 3.
- Continued excavating location no. 7.
- No signs of any leak.
- 1:00 p.m. backfilled location no. 7 and moved to location 8 and location 9 near the South Camp Hotel.
- Location no. 8 is the service connection to the South Camp hotel. The service connection inside is above ground and no leak was found.
- 1:00 p.m. Moved to excavate location no. 9.
- Water was found once the excavation began.
- An electrofusion connection was found leaking.
- To repair, Kudlik tried to isolate the area by closing valves before and after the leak. The valves did not work; therefore a plan for a larger shut down the following day was decided after advising the hamlet and the community.
- 2:00 p.m. Moved to location no.5.
- Water again was found near the surface.

- Kudlik exposed the leak and found a second electrofusion connection leaking.
- 4:30 p.m. a chlorine residual test was completed, result 0.38 ppm.
- 5:00 p.m. moved to location no. 10 and started excavating.
- 5:00 p.m. Loader is brought to support a hydro pole near the hole.
- 6:00 p.m. Finished work for the day.

Tuesday October 5th

Whether is light snow -13 (-22 with wind chill)

- 7:00 a.m. prepared for electrofusion at locations nos. 5 and 9.
- Kudlik continued to excavator location no. 5.
- Generator and fusion machine were needed all day for the repair.
- Water was shut down 9:00 a.m. by isolating half of the town (East Loop).
- 11:00 a.m. system is fully drained.
- The main valve feeding the hamlet water system was eventually shut off because the isolation loop valves leaked.
- Chlorine test 0.64 ppm.
- 2:15 p.m. location no. 5 was repaired with a 1.0m long section of HD Polyethylene pipe electrofused at both ends to the existing system.
- 2:30 p.m. location no. 9 was repaired with a 1.0m long section of HD Polyethylene pipe electrofused at both ends to the existing system.
- 4:30 p.m. water system was opened.
- 6:00 p.m. backfilling the 2 locations complete.
- Material used: 4 Electrofusion Parts, Foam, Shrink Wrap 4 sheets max.

Wednesday October 6th

Weather is light snow -9 (-19 with wind chill)

- 7:00 a.m. excavating location no. 10.
- 12:01 p.m. no leak found.
- End of scheduled repair program.
- House # 21 service frozen
- Hamlet Garage service frozen
- Kudlik fixed the frozen services by hot water pressure.
- Two bleeds found frozen this morning. The bleed valves were found to be closed.
- The two bleeds were thawed using hot air. Opened the valves.

Thursday October 7th

- Demobilized

Appendix C: Photographs

2010/10/04





2010/10/04

Photograph 2 - Leak at Location 5