



SNC•LAVALIN
Environment

**FINAL
REPORT**

**DEPARTMENT OF ENVIRONMENT AND
CONSERVATION**

**Surface Water and Sediment Sampling Report
Three Corner Pond and Denny's Pond**

**Upper Trinity South (New Harbour)
Waste Disposal Site**



Project No.: 508907-0001

October 2012



**SURFACE WATER AND SEDIMENT SAMPLING
AT THREE CORNER POND AND DENNY'S POND**

**UPPER TRINITY SOUTH (NEW HARBOUR)
WASTE DISPOSAL SITE**

Submitted to:

**Government of Newfoundland and Labrador
Department of Environment and Conservation**

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Submitted by:

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October 2012

October 31, 2012

**Government of Newfoundland and Labrador
Department of Environment and Conservation**

4th Floor West Block, Confederation Building
P.O. Box 8700
St. John's, Newfoundland and Labrador
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**Attention: Ms. Christa Curnew, P.Eng.
Project Manager**

Dear Ms. Curnew:

**RE: Final Report: Surface Water and Sediment Sampling At Three Corner Pond
And Denny's Pond, New Harbour Former Waste Disposal Site, Upper
Trinity South, Newfoundland and Labrador**

SNC-Lavalin, Inc., Environment Division is pleased to submit two (2) hard copies and one (1) electronic copy of our Final Report for the above referenced project.

Thank you for the opportunity to complete this report. Please do not hesitate to contact the undersigned if you have any questions.

Yours truly,

SNC♦LAVALIN ENVIRONMENT



Derek Heath, P.Geo.
Project Manager

DH/ap

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EXECUTIVE SUMMARY

In November 2011, SNC-Lavalin Inc. Environment Division (SNC) was retained by the Newfoundland and Labrador Department of Environment and Conservation (DOEC), to provide Environmental Consulting Services for the New Harbour Waste Disposal Site, Newfoundland and Labrador, between December 2011 and March 2012.

The original scope of work as part of these services is shown below:

1. Inspection of monitor wells and leachate control system;
2. Inspection of geomembrane (in fenced DOEC storage yard);
3. Completion of one groundwater and surface water monitoring event;
4. Depth interval sampling of surface water at Three Corner Pond and Denny's Pond, including the collection of water samples from the surface, mid-column, and bottom layers in conjunction with sediment samples from the deepest areas of these two ponds; and
5. Preparation of a report detailing the results of all work.

The above noted scope of items 1, 2, 3 and 5 were completed and reported under a separate cover in July 2012. Scope of work item 4 was not completed since the two ponds associated with this task were frozen at the time of the December 2012 site visit and therefore the sampling associated with this task was completed in June 2012, once the ponds thawed. The following report provides the technical details associated with scope of work item 4 presented above.

Surface water sampling included the collection of six (6) depth interval samples (three from each pond) and two (2) sediment samples. Analytical testing of surface water samples was conducted by Maxxam Analytics, Inc., and included total metals, general chemistry, polychlorinated biphenyls (PCBs), and dioxins and furans. Sediment samples were analyzed for total metals, BTEX/TPH, polycyclic aromatic hydrocarbons (PAHs), PCBs, volatile organic compounds (VOCs), and dioxins and furans.

Metals, general chemistry, PCBs and Dioxins/Furans analytical results for surface water associated with Denny's Pond and Three Corner Pond were reported by the analytical laboratory to be at levels either below applicable CCME freshwater aquatic life guidelines or at levels representative of background concentrations.

With the exception of elevated arsenic concentrations in sediment at the Denny's Pond site and the Three Corner Pond site, metals, BTEX/TPH, PAHs, PCBs, VOCs and Dioxins/Furans analytical results for sediment associated with Denny's Pond and Three Corner Pond were reported by the analytical laboratory to be at levels either below applicable CCME Canadian Sediment Quality Guidelines (CSQG) Probable Effect Levels (PEL) for freshwater sediment.

An arsenic exceedance of 19 mg/kg was encountered for the sediment sample collected from Denny's Pond, which was above the CCME CSQG (PEL) for freshwater sediment.

Based on the findings of the surface water and sediment sampling program carried out by SNC-Lavalin in June 2012, the following recommendations for further actions at the Site include:

- Develop and implement an environmental sampling program to further investigate arsenic impacts in sediment at the Denny's Pond Site.

1. INTRODUCTION

In November 2011, SNC-Lavalin Inc. Environment Division (SNC) was retained by the Newfoundland and Labrador Department of Environment and Conservation (DOEC), to provide Environmental Consulting Services for the New Harbour Waste Disposal Site, Newfoundland and Labrador, between December 2011 and March 2012 as described in SNC-Lavalin's Technical Proposal dated November 2011.

The original scope of work as part of these services is shown below:

1. Inspection of monitor wells and leachate control system;
2. Inspection of geomembrane (in fenced DOEC storage yard);
3. Completion of one groundwater and surface water monitoring event;
4. Depth interval sampling of surface water at Three Corner Pond and Denny's Pond, including the collection of water samples from the surface, mid-column, and bottom layers in conjunction with sediment samples from the deepest areas of these two ponds; and
5. Preparation of a report detailing the results of all work.

The above noted scope of items 1, 2, 3 and 5 were completed and reported under a separate cover in July 2012. Scope of work item 4 was not completed since the two ponds with this task were frozen at the time of the December 2012 site visit and therefore the sampling associated with this task was completed in June 2012, once the ponds thawed. The following report provides the technical details associated with scope of work item 4 presented above.

This report includes a summary of all activities completed at the New Harbour Waste Disposal site in June 2012. The sample location mapping is provided in Appendix A. Surface water field parameters and sediment depth data are included in Appendix B. A summary of analytical result tables are included in Appendix C. Laboratory certificates of analysis discussed in this report are attached in Appendix D. QA/QC analytical result tables are provided in Appendix E.

1.1. BACKGROUND

The Site is located on Route 73 on the Avalon Peninsula of Newfoundland, approximately 5 km from the junction of Route 80 and Route 73 near the community of New Harbour, Newfoundland and Labrador (Figure 1, Appendix A). The Site operated as a domestic waste disposal facility from the early 1970s (exact date not known) until September 2009. The facility accepted waste from the communities of Blaketown, Dildo, Green's Harbour, Hopeall, Markland,

New Harbour, Old Shope and South Dildo. The Site is an unlined waste disposal facility; however between 2006 and 2007 interception ditches and a leachate collection pond were constructed at the Site to manage potential leachate impacts. In addition, seven monitor wells were installed to monitor potential leachate impacts.

The Site is partially fenced along its northern boundary and contains an access gate. The site was operated by a local contractor (Cliff Cooper Construction) who collected waste from residents and businesses in the area and disposed of the material in excavated cells or pits at the Site. Waste delivered by private residents and businesses was often placed directly on the ground and left out in the open. Open burning was historically completed at the site to reduce the volume of garbage and to control pests. The Site was closed to the public in September 2009. Concrete barricades were placed outside the entrance gate in November 2009.

1.2. OBJECTIVES

The objectives/scope of work as part of these services is shown below:

- Depth interval sampling of surface water at Three Corner Pond and Denny's Pond including the collection of water samples from the surface, mid-column, and bottom layers in conjunction with sediment samples from the deepest areas of these two ponds; and
- Preparation of a report detailing the results of all work.

1.3. CONTAMINANT GUIDELINES

The Site is considered to be a commercial property based on past site use activities (i.e. waste disposal site). Site soils are considered to be coarse-grained and groundwater resources are not used for human consumption and therefore considered to be non-potable. Selected guidelines for this site were based on the environmental management and/or remediation objectives of the project.

The work completed during the surface water and sediment sampling programs was conducted in accordance with the recommended requirements of the Canadian Standards Association (CSA) Phase II Environmental Site Assessment Protocol Z769 and the Provincial Guidance Document for the Management of Impacted Sites, version 1.01, September 2005. In addition, the following regulatory guidance documents were applied:

1.3.1. SURFACE WATER

The analytical chemical data for metals and general water chemistry in surface water were compared against the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQG) for the protection of Freshwater Aquatic Life (FAL) (updated 2011). There are no CCME CWQG-FAL guidelines available for polychlorinated biphenyls (PCBs) and dioxins and furans in water. Surface Water analytical data was also compared to available background surface water presented within the *2010-2011 Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site* (AMEC, 2011).

1.3.2. SEDIMENT

Analytical chemistry data for sediment samples collected at the Site during the current monitoring program were assessed and evaluated using the following federal regulatory guidelines:

The analytical results for metals, PCBs, and PAHs were compared to the CCME Canadian Sediment Quality Guidelines (CSQG) Probable Effect Levels (PEL) for freshwater sediment. There are no CCME CSQG guidelines available for BTEX/TPH, volatile organic compounds (VOCs) or dioxins and furans in sediment. Sediment analytical data was also compared to available background surface water presented within the *2010-2011 Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site* (AMEC, 2011).

2. DESCRIPTION OF INVESTIGATION

The field program consisted of surface water and sediment sampling program completed on June 18th and June 27th, 2012. Interval sampling of surface water involved the collection of three (3) samples at each pond, one of each at the surface, mid-column and bottom layer. One (1) sediment sample was collected from each pond at the same location as the respective surface water sample. The surface water and sediment sample locations are presented in Figure 1 (Appendix A).

2.1. SURFACE WATER SAMPLING AND ANALYSES

Surface water samples were collected from Denny's Pond and Three Corner Pond on June 18th and June 27th, 2012, respectively. Prior to the surface water sampling, the depth of each pond water body was scanned using a fish finder device on a boat to identify the deepest water area at each pond. At both ponds, the deepest area identified was used as the sampling location for surface water. Field parameters associated with the surface water sampling at each pond are located in Appendix B.

Samples were collected at the surface (0 – 0.15 m in depth), mid-column (2.5 m in depth at Denny's Pond, and 0.5 m in depth at Three Corner Pond), and at the bottom layer (5.0 m in depth at Denny's Pond, and 1.0 m in depth at Three Corner Pond). A surface water interval sampler (Wildco Kemmerer) was used to collect the discrete surface water intervals during the field program.

Following SNC sampling protocol, a new pair of disposable latex gloves was used for the collection of each sample. The samples were placed in clean, laboratory supplied bottles and stored in a chilled container with a chain-of-custody for transport to the laboratory. All samples were marked with a unique sample location, project number, date, and the sampler's initials. Samples were submitted to an accredited laboratory, Maxxam Analytics, Inc. on June 19th (Denny's Pond samples) and June 28th (Three Corner Pond samples).

The surface water analyses included:

- 6 RCAP-MS (total metals and general chemistry);
- 6 PCBs; and
- 6 dioxins and furans.

2.2. SEDIMENT SAMPLING AND ANALYSES

One sediment sample was collected from the each of the two ponds at the same date and location as the surface water samples present in Section 2.1. The sediment samples were collected using a Ponar Type grab sampler. Following SNC protocol, a new pair of disposable latex gloves was used for the collection of each sample. The samples were placed in clean, laboratory supplied bottles and stored in a chilled container with a chain-of-custody for transport to the laboratory. All samples were marked with a unique sample location, project number, date, and the sampler's initials. Samples were submitted to an accredited laboratory, Maxxam Analytics, Inc. on June 19th (Denny's Pond samples) and June 28th (Three Corner Pond samples).

The sediment analyses included:

- 2 metals (including mercury) plus 1 QA/QC field duplicate sample;
- 2 BTEX/TPH plus 1 QA/QC field duplicate sample;
- 2 PAHs;
- 2 PCBs;
- 2 VOCs; and
- 2 dioxins and furans.

2.3. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM

The SNC QA/QC Program is based on its ISO 9001 Certification, the foundation of which is the eight Quality Management System standards of the revised ISO 9000 series. The quality control policy and documented Standard Operating Procedures can be summarized in four key points.

1. Understand the requirements of the client and provide services which satisfy the client's specified requirements for quality, cost and schedule;
2. Provide appropriately qualified and trained personnel and resources to fulfill the client's requirements;
3. Ensure implementation of the QC System by SNC personnel in conformity with ISO 9001 requirements; and
4. Establish and periodically review and update key quality objectives for continuous improvement of the quality of the product delivered.

The sampling Quality Assurance/Quality Control (QA/QC) Program consisted of the collection of duplicate field samples, laboratory duplicates, cleaning of sampling equipment between each sampling event, and the use of new nitrile gloves for each sample. All samples collected during the sampling program were given unique sample identifications (ID's), logged onto a chain-of-custody form, placed inside a cooler at a temperature of approximately 4°C to 6°C, and transported to the laboratory for analysis. Any samples collected that did not require analysis were stored at the laboratory in the event that further analysis was required. See Section 3.3 and for further discussion and comparison of QA/QC Results.

The Laboratory QA/QC program consists of duplicates, matrix spikes, and blanks. QA/QC samples for the laboratory are analyzed at a frequency of 15%. Maxxam Analytics Inc. does not specifically run QA/QC samples on a client-specific basis. Therefore, the laboratory does not specifically report sample ID numbers on their QA/QC results.

3. RESULTS OF INVESTIGATION & FINDINGS

The metals, general chemistry, PCBs and dioxins/furans analytical results for surface water are summarized in Tables C-1 through to C-4 (Appendix C), respectively. The metals, BTEX/TPH, PAH, PCBs, VOCs and dioxins/furans analytical results for sediment are summarized in Tables C-5 through to C-10 (Appendix C), respectively. All tabulated results are compared to the current applicable federal guidelines, as listed in Section 1.3. The laboratory reports for the June 2012 field investigation are provided in Appendix D.

3.1. SURFACE WATER ANALYTICAL RESULTS

3.1.1. METALS ANALYTICAL RESULTS

Metals analytical results for surface water (Table C-1) indicate one (1) metal exceedance from Denny's Pond and six (6) metals exceedances from Three Corner Pond when compared to CCME FAL guidelines.

The surface sample (0 – 0.15 m) at Denny's Pond indicates aluminum levels above the guideline of 100 µ/L (182 µ/L). All other metals analyses for the Denny's Pond samples were below the applicable guidelines.

Aluminum exceedances were also encountered at Three Corner Pond, at mid-column (0.5 m) (247 µ/L), and at the bottom level (1.0 m) (182 µ/L). In addition, cadmium exceeded the guideline of 0.017 µ/L at the mid-column (0.018 µ/L), and iron exceeded the guideline of 300 µ/L at mid-column (625 µ/L) and the bottom level (514 µ/L). The surface sample (0 – 0.15 m) collected from Three Corner Pond exceeded the copper guideline of 4 µ/L (5.1 µ/L). All other metals analytical results were below the CCME FAL guidelines for the Three Corner Pond samples.

According to background surface water concentrations for the area, aluminum exceedances are not uncommon for the area and background concentrations are within a range similar to the aluminum exceedances encountered at Denny's Pond and Three Corner Pond. The cadmium exceedance reported by the analytical lab for the Three Corner Pond mid-column sample is marginally above the CCME FAL guideline while the surface and bottom level samples are below the applicable CCME FAL guidelines. Based on averaging the cadmium analytical results for the three surface water sample horizons for Three Corner Pond, cadmium concentrations in surface water are not considered to be an environmental concern.

The copper exceedance reported by the analytical lab for the Three Corner Pond surface-column sample is slightly above the CCME FAL guideline while the mid and bottom level samples are below the applicable CCME FAL guidelines. Based on averaging the copper analytical results for the three surface water sample horizons for Three Corner Pond, copper concentrations in surface water are not considered to be an environmental concern. According to background surface water concentrations for the area, iron exceedances are not uncommon for the area and background concentrations are within a range similar to the iron exceedances encountered at Three Corner Pond.

3.1.2. GENERAL CHEMISTRY ANALYTICAL RESULTS

The analytical results for general chemistry (Table C-2) were below the applicable CCME FAL guidelines with the exception of pH, which was slightly below the applicable range of 6.5 – 9 for all three surface water samples collected from Denny's Pond (surface sample – 6.29, mid-column sample – 6.16, and bottom level sample – 6.13). According to background surface water concentrations for the area, slightly lower pH levels are not uncommon for the area and background concentrations are within a range similar to the pH levels encountered at Denny's Pond.

3.1.3. PCBs ANALYTICAL RESULTS

Analytical results for PCBs (Table C-3) were below the applicable CCME FAL guideline. All samples indicated non-detectable levels of PCBs in surface water.

3.1.4. DIOXINS AND FURANS ANALYTICAL RESULTS

Analytical results for dioxins and furans in surface water are shown in Table C-4. The concentrations of the Total Toxic Equivalent (TTE) of all dioxins and furans for all six surface water samples ranged between 1.53 pg/L (mid-column sample – Three Corner Pond) and 2.21 pg/L (surface sample – Denny's Pond).

3.2. SEDIMENT ANALYTICAL RESULTS

3.2.1. METALS ANALYTICAL RESULTS

An arsenic exceedance of 19 mg/kg was encountered for the sediment sample collected from Denny's Pond, which was above the CCME Canadian Sediment Quality Guidelines (CSQG) Probable Effect Levels (PEL) for freshwater sediment. All other metals in sediment concentrations for the two sediment samples collected were below the applicable CCME CSQG PELs. Metals in sediment analytical results are included in Table C-5.

3.2.2. BTEX/TPH ANALYTICAL RESULTS

While there are no guidelines related to levels of BTEX/TPH in sediment, the sediment sample collected from Denny's Pond was indicated by the analytical laboratory to have gasoline range/possible lube oil fraction resemblance. BTEX/TPH in sediment results are included in Table C-6.

3.2.3. PAHs ANALYTICAL RESULTS

PAH concentrations in sediment at both Denny's Pond and Three Corner Pond were not detectable with the exception of a perylene concentration (9.4 mg/kg) that was detected in the Denny's Pond sediment sample. However, there is not a CCME CSQG PEL guideline for perylene. Analytical results for PAHs in sediment are included in Table C-7.

3.2.4. PCBs ANALYTICAL RESULTS

PCB concentrations were at non-detectable levels for both sediment samples collected from Denny's Pond and Three Corner Pond. Table C-8 illustrates the analytical results for PCBs in sediment.

3.2.5. VOCs ANALYTICAL RESULTS

VOCs concentrations were at non-detectable levels for both sediment samples collected from Denny's Pond and Three Corner Pond. Analytical results for VOCs in sediment are included in Table C-9.

3.2.6. DIOXINS AND FURANS ANALYTICAL RESULTS

Analytical results for dioxins and furans in surface water are shown in Table C-4. The concentration of the Total Toxic Equivalent (TTE) of dioxins and furans for the Denny's Pond sediment sample was reported by the analytical laboratory to be 0.373 pg/g while the Three Corner Pond sediment sample was 1.58 pg/g. Dioxin and Furans in sediment laboratory results are included in Table C-10.

3.3. QA/QC DISCUSSION

Appendix E contains the QA/QC analytical summary tables. Table E1 shows the relative percent difference values for metals parameters analyzed in sediment for Denny's Pond. The mean relative percent difference for this metal in sediment sample was 9.0% which is considered to be within an acceptable range for the purposes of this report. Table E2 shows the relative percent difference values for BTEX/TPH parameters analyzed in sediment for Denny's Pond. The mean relative percent difference for this BTEX/TPH in sediment sample was 159.2%. The elevated values are attributed to sediment sample inhomogeneity.

4. FINDINGS AND RECOMMENDATIONS

4.1. FINDINGS

4.1.1. SURFACE WATER

Metals, general chemistry, PCBs and Dioxins/Furans analytical results for surface water associated with Denny's Pond and Three Corner Pond were reported by the analytical laboratory to be at levels either below applicable CCME FAL guidelines or at levels representative of background concentrations.

4.1.2. SEDIMENT

With the exception of elevated arsenic concentrations in sediment at the Denny's Pond site and the Three Corner Pond site, metals, BTEX/TPH, PAHs, PCBs, VOCs and Dioxins/Furans analytical results for sediment associated with Denny's Pond and Three Corner Pond were reported by the analytical laboratory to be at levels either below applicable CCME CSQG PEL for freshwater sediment or at levels representative of background concentrations.

An arsenic exceedance of 19 mg/kg was encountered for the sediment sample collected from Denny's Pond, which was above the CCME Canadian Sediment Quality Guidelines (CSQG) Probable Effect Levels (PEL) for freshwater sediment.

4.2. RECOMMENDATIONS

Based on the findings of the surface water and sediment sampling program carried out by SNC-Lavalin in June 2012, the following recommendations for further actions at the Site include:

- Develop and implement an environmental sampling program to further investigate arsenic impacts in sediment at the Denny's Pond Site.

5. REFERENCES

AMEC, 2011. 2010-2011 Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site. March 2011.

AMEC 2011. Removal of PCB Impacted Material, Upper Trinity South Waste Disposal Facility, New Harbour, NL. January 2011.

AMEC 2009b. 2009 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site., March 2009

AMEC 2009a. 2008 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site, February 2009.

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SGE Acres Limited. New Harbour, Part 1, Phase II, Environmental Testing, Draft Report, May 2003.

SNC-Lavalin Inc., 2012. 2011-2012 Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site. July 2011.

SNC-Lavalin Inc., 2010 Implementation of Previous Recommendations, Upper Trinity South (New Harbour) Waste Disposal Site, May 2010.

SNC-Lavalin Inc., 2010 Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site, March 2010.

6. LIMITATIONS

This report has been prepared by SNC-Lavalin for the NL Department of Environment and Conservation (DOEC). It is intended for the sole and exclusive use of DOEC, their affiliated companies and partners, and their respective insurers, agents, employees and advisors. Any use, reliance on or decision made by any person other than DOEC based on this report is the sole responsibility of such other person. DOEC and SNC-Lavalin make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, and decision made or any action taken based on this report or the work referred to in this report.

The investigation undertaken by SNC-Lavalin with respect to this report and any conclusions or recommendations made in this report reflect SNC-Lavalin's judgment based on the Site conditions observed at the time of the Site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to this Site and it is based, in part, upon visual observation of the Site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future Site conditions, portions of the Site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the Site, substances addressed by the investigation may exist in areas of the Site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken.

If Site conditions or applicable standards change or if any additional information becomes available at a future date, SNC-Lavalin requests notification so that we may decide if modifications to the findings, conclusions and recommendations in this report may be necessary.

Other than by DOEC, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of SNC-Lavalin. Nothing in this report is intended to constitute or provide a legal opinion.

As required under the Guidance Document for the Management of Impacted Sites (September 2005), SNC-Lavalin acknowledges that the persons signing this report have demonstrable experience, and are familiar with completing the work as described for the type of contamination at this property.