Solid Waste Management Report

Hamlet of Arviat

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1.0 Introduction

1.1 Background

The existing Solid Waste Management Facility is out of compliance with the NWB license and existing regulations. In 2008, Community and Government Services (CGS) of the Government of Nunavut (GN), retained Nuna Burnside Engineering and Environmental Ltd. (Nuna Burnside), on behalf of the Hamlet of Arviat, to conduct a project entitled "Detailed Design and Inspection Services for the New Municipal Site with Access Road, Arviat, Nunavut".

The subsequent studies determined the existing landfill site was nearing capacity, was unsuitable for expansion, and a new site in a new location was required. Studies and public consultation were conducted through 2009, including the assessment and design of a site west of the Hamlet.

The Hamlet has postponed deciding on the location of a new facility until after the Community Plan was completed in 2010, and final approvals and making the document public is expected in early 2011.

Until the Hamlet approves the type and location of a new Solid Waste Management Facility, the existing facilities will continue to be used.

In recognition of the fact the exiting facilities cannot be brought into full compliance, a best efforts policy is recommended to maximize the effectiveness and minimize the environmental impact of the existing facilities, until new facilities can be constructed, licensed, and commissioned.

1.2 Scope of Study

This report has been completed as a condition of the Nunavut Water Board licence 3AM-ARV1015 issued August 23, 2010. This report meets the requirements outlined in Part D, Item 14 of the licence. A copy of the licence is provided in Appendix A. The report includes the following aspects as required by the licence:

- As-built drawings of the Solid Waste Disposal Facility, Hazardous Waste Storage Area and Bulky Metals Area
- A capacity assessment of the Solid Waste Disposal Facility
- An inventory and assessment of contaminated soil and water at the Solid Waste Disposal Facility, Bulky Metals Area and Hazardous Waste Storage Area
- A plan for the treatment and disposal of contaminated soil and water including proposed effluent quality limits for dewatering contaminated soil

- Recommendations for water and wastewater containment, treatment and drainage control
- Recommended measures to optimize solid waste management, and
- A schedule for implementing recommended measures.

1.3 Site Description

The Hamlet of Arviat provides regular solid waste pickup for residents, businesses, and institutions. Solid waste is disposed of at the Hamlet's Solid Waste Management Facility. The Solid Waste Management Facility includes a landfill site for municipal solid waste and a long-term storage area for bulky metals. Currently waste oil, glycol, and other hazardous wastes are stored in a designated area next to the Public Works garage.

The current Solid Waste Management Facility consists of the following components:

- Municipal Solid Waste Disposal Area (Landfill) approximately 2.0 km south of the centre of the community
- Bulky Metals Waste Area (located north of the landfill approximately 1.5 km from the centre of the community but only 500 m from the south edge of the residential area)
- Hazardous Waste Storage Area (currently next to the Hamlet garage).

Figure 2 illustrates the locations of the solid waste disposal facilities in Arviat.

2.0 Physical Setting

2.1 Site Location

The Hamlet of Arviat is located within the Kivalliq Region, Nunavut, at general latitude 61°6'N and general longitude 94°3'W (Figure 1). The Community is located approximately 225 km south of Rankin Inlet and 265 km north of Churchill Manitoba. The Hamlet of Arviat is predominately residential with a few small commercial and institutional establishments. Hunting and fishing in the traditional manner is still a prime occupation for many of the inhabitants.

2.2 Topography and Drainage

The topography surrounding the Hamlet of Arviat is relatively flat with a sight rise when moving inland away from Hudson Bay. Local bedrock is generally overlain by glacial fluvial sediments. Arviat is located in the physiographic region of the Hudson Bay lowlands, characterized by low topographic relief, occasional bedrock outcrops and glacial and glacio-fluvial overburden sediments. Boulder fields and eskers are common. Approximately 20 to 30 percent of the land is shallow ponds with depths of 1 m or less. Land between the ponds is marshy, vegetated by grasses and sedges.

2.3 Geology and Morphology

The Hamlet of Arviat is located on the northern shore of a peninsula on the west coast of Hudson Bay, in a zone of continuous permafrost, extending from 30 m to over 100 m. The active layer varies between 0.5 and 0.3 m. The predominant local vegetation consists of mosses and lichens on rocky outcrops, with hardy grasses and sages in swampy and/or more sheltered areas.

2.4 Climate

The closest climate station to Arviat is the Rankin Inlet Airport Weather Station. The Rankin Inlet area receives an average of 18.1 cm of rainfall and 119.7 cm of snowfall per annum. Mean annual precipitation totals 29.7 cm per annum. July mean high and low temperatures are 14.9^{o}C and 5.9^{o}C, respectively. January mean high and low temperatures are -28.3^{o}C and -35.5^{o}C, respectively. Winds are generally north-west, and average 23 km/h (Rankin Inlet Weather Station, Climate Normals 1991-2000, Environment Canada, 2010).

3.0 Municipal Solid Waste Disposal Site

The municipal solid waste disposal site (landfill) is located 2.8 km southeast of Arviat (Figure 2). The landfill is located along the south esker, less than 1 km north of the Hudson Bay. The landfill site consists of a non-lined area surrounded by a three metre high containment berm. The landfill area footprint is about 160 x 200 m measured from the inside of the containment berms and 170 x 210 m when including the berms. Photographs of the landfill are included in Appendix B.

The landfill site began receiving waste in 1977. A Design and Operations Brief for the site was prepared by Associated Engineering Alberta Ltd in 1985 which described how the landfill should be expanded and how it should be operated. There are no plan drawings, as-built plans, or other documents describing the actual construction of the landfill. Figure 3 provides the current conditions of the landfill as recorded during a site visit in September 2010. These will have to be considered “as-builts” with respect to the requirements in the licence (Part H, Item 14-a) as no other drawings or information can be found.

3.1 Landfill Operations

3.1.1 Site Security

The landfill has operated without a dedicated operator or manager. A chain-link fence surrounds the landfill area, but locals and animals are free to enter through the entrance of the landfill. There is no gate.

3.1.2 Solid Waste Sources and Composition

The waste in the landfill generally consists of domestic wastes, construction debris, fuel drums, scrap wood, and animal carcasses. Municipal waste in remote northern communities like Arviat is generally composed of 60% to 80% paper and food and 15% to 30% recyclable materials such as aluminum and glass containers (GLL, 2007).

Over the past 30 years, waste disposal practices have changed with increasing government control and education. It can be assumed that small quantities of hazardous waste has been deposed of at the site. Historically waste included domestic sewage in the form of honey bags and unknown amounts of hazardous waste (EBA, 1995). In Arviat historic documentation and local knowledge indicates

sewage (including honey bags) has always been disposed of separately from the landfill.

3.1.3 Waste Placement History and Filling Methods

The landfill site began receiving waste in 1977 (AESL, 1985) and has operated as an open dump for approximately 30 years. Waste initially was dumped at the edge of the esker. The eastern berm of the sewage lagoon was used as the eastern boundary. Over the years the landfill has expanded with the construction of the south and western berms.

Historically there has been no compaction of waste and the landfill is covered infrequently with fill. Burning was historically used to reduce volumes of waste and is uncontrolled with no segregation of combustible material from non-combustible materials. Observations made in July, September, and November 2010 noted some separation of waste into burnable and non-burnable. Cover material had been applied in the summer of 2010 to reduce the amount of waste exposed at surface, and damaged fencing had been repaired.

3.2 New Municipal Waste Site

3.2.1 Background

In August 2008, Community and Government Services (CGS) issued a RFP for the provision of engineering services for a New Municipal Waste Site with Access Road for the Hamlet of Arviat.

The Hamlet and CGS had recognized that the existing landfill was nearing capacity and that it was situated too close to the airport. It was also recognized, the existing Bulky Metals Area was in the path of expanding residential development. The handling and storage of hazardous wastes were out of compliance with regulations. The project was awarded to Nuna Burnside and work commenced in September 2008.

3.2.2 Studies and Community Consultation

The project commenced with a desk top review of the community and consultation with Mayor and Council, SAO, CGS engineers, and community members.

The process included the following reports, which have been interspersed with consultation, site visits, and field studies:

- "Preliminary Report of Potential Locations New Municipal Waste Disposal Site and Access Road, Arviat, Nunavut", by Nuna Burnside Engineering and Environmental Ltd., September 2008

- "Selection of a New Municipal Solid Waste Disposal Site and Access Road, Arviat, Nunavut", by Nuna Burnside Engineering and Environmental Ltd., October 2008

- "Location of a New Solid Waste Disposal Site and Access Road, Arviat, Nunavut", by Nuna Burnside Engineering and Environmental Ltd., February 2009

- "Snowdrift Assessment, Proposed Landfill Access Road, Arviat, Nunavut", by RWDI Inc., February 5, 2009

- "Public Consultation for a New Municipal Solid Waste Disposal Site, Arviat, Nunavut", by Nuna Burnside Engineering and Environmental Ltd., August 2009

- "Solid Waste Disposal Site and Access Road, Hamlet of Arviat, Nunavut", Design Drawings Set by Nuna Burnside Engineering and Environmental Ltd., May 2009

- "Assessment of Potential Bird Hazards to Aircraft Safety Associated with Proposed Sites for a Landfill at Arviat, Nunavut – A Stage 1 Analysis", by LGL Limited, July 30, 2009.

3.2.3 Conclusions and Recommendations for a New Municipal Solid Waste Disposal Site

The reports concluded that the existing landfill site is nearing capacity and should be closed as soon as a new facility is located and constructed. This effort was undertaken by CGS in 2008, by retaining Nuna Burnside to conduct the work. In the winter of 2009, Mayor and Council approved a new site on the Dionne Road west of the Hamlet. Design Drawings were prepared. However, due to community concerns, the development of the new site was put on hold until further community consultation could be undertaken.

Community consultation was conducted in 2009, however no consensus could be reached. The Hamlet decided to postpone a decision until after the new Community Plan had been completed. In November 2010, the Hamlet indicated that the Community Plan had been completed, however it could not be released publically or to Nuna Burnside until the appropriate sign offs had been completed through the GN. This is expected sometime in the winter of 2011.

In the interim, Nuna Burnside has recommended following the best possible practices for utilizing the existing waste management facilities until a new facility can be constructed.

Based on the time line of a new site decision being made in 2011, a new facility could realistically be operating in two years. To be conservative and allow for contingencies, it is recommended that the closure of the exiting landfill site be based on a target date of 2015. For this reason, the remaining capacity of the exiting landfill has been based on a conceptual plan to have the waste level rise above the level of the berms prior to closure. This is outlined in the landfill capacity estimate and the Abandonment and Restoration Plan for the existing landfill.

3.3 Landfill Capacity Assessment

As early as 2008, CGS staff have planned to close the existing landfill site, as it was reaching capacity and plan for a new waste management facility for Arviat. The existing landfill was noted to be in an unsuitable location, due to the proximity of the airport, so expansion was not an option.

Ideally the landfill would be closed as soon as possible and a new facility developed, to address landfilling, bulky metals, and hazardous waste issues. Until a new facility can be constructed, the existing facilities must continue to operate.

Based on a conservative timeline to close the landfill following the construction, licensing, and commissioning of a new facility, a date of 2015 has been estimated. It is therefore necessary, as there is no practical alterative to plan the capacity of the existing landfill until 2015. This is not ideal, but there are no other realistic alternatives.

It is strongly recommended that a faster timeline be aggressively pursued. Based on a target closure date of prior to 2015, the landfill capacity has been estimated to fill the site level with the berms and then mound above this level as little as possible. The Abandonment and Restoration Plan for the site is based on this capacity assessment.

The estimate of the amount of waste the Hamlet will generate through to 2015 is based on population data provided by Census Canada and average annual waste generation rates for northern communities in Canada.

Solid waste projections for the Hamlet are provided in Appendix C. The table is based on the Census 2006 population of 2,060 and a growth rate of 3.2 percent. The table assumes that 20 percent of the waste is combustible and that there is no compaction. It also assumes that a volume of cover material is used annually equal to 20% of the annual volume of waste.

A topographic survey of the waste area was completed in September 2010 to create a contour map of the current waste in the landfill. Contours of the waste are shown in Figure 3. Volume calculations based on the contours estimates that the landfill has 12,800 m^3 left to fill waste to the level of the access road and berms.

Waste calculations show that in the next 5 years (2011 through 2015), the Hamlet will need 67,885 m^3 of space for their waste including cover volume (Appendix C). Once the landfill is filled level to the berms it will need to start building up from the berms. The waste will need to be piled and compacted on a 3.1 slope. A new landfill site will need to be constructed, licensed, and in operation prior to 2015.

3.4 Environmental Impact Assessment

3.4.1 Birds and Animals

A Bird Hazard to Aircraft Study was completed by LGL Limited in July 2009. The results of the study concluded that the landfill was too close to the airport as the birds attracted by the landfill are a hazard to aircraft. Since the application of soil cover is rare, the presence of scavengers is likely. Polar bears are observed at the landfill seasonally.

3.4.2 Surface Water Drainage

All precipitation that falls on the site eventually drains from the site as leachate. The average total precipitation for Arviat is 297 mm per year and the average evapotranspiration rate is 200 mm per year (Appendix C) thus resulting in a total input of precipitation to the landfill of 3,288 m^3/year.

A containment berm is built around the landfill area to contain surface water runoff from the site. Water that enters the landfill drains to areas of lowest elevation on the south side of the landfill. Surface water ponding is present at the south-east corner of the site and the south-west corner of the site. Water eventual discharges at the south-west corner of the site. After discharging from the landfill, the water collects in a pond adjacent to the south-west corner, and from there flows through a culvert under a road and west into a wetland area.

3.4.3 Environmental Sampling

Monitoring of the site is required by the NWB licence. The licence requires that water samples be taken from the discharge location (ARV-2a) monthly from May to September inclusive. ARV-2b would be from the new landfill site not yet located. In 2010 water samples were taken at ARV-2 (equivalent to ARV-2a) in July, August, September and

November. As shown on Figure 4, sample ARV-2 was actually collected at the discharge of a leachate impacted pond outside the landfill berm. It is proposed that this leachate pond be considered part of the landfill leachate discharge system, along with the outlined contaminant attenuation zone (CAZ).

In September 2010, a more extensive water sampling program was completed which included sampling of the leachate at the discharge point and within the down gradient contaminant attenuation zone (wetland). A test pit was excavated in November 2010 outside of ARV-2 to determine the depth of active zone and soil characteristics. Sampling locations are identified on Figure 4.

Water sample results were compared to the CCME's Canadian Water Quality Standards for Protection of Aquatic Life. A summary of the results is provided in Appendix D, Table D-1. At the landfill discharge point (ARV-2) exceedences were noted for the parameters of iron, lead, copper, zinc and phenols. All samples taken down gradient of the landfill within the wetland contaminant attenuation zone (CAZ) (LF-1 to LF-3) met the CCME water quality guidelines.

It should be noted that the CCME guidelines are generic guidelines and do not take into account regional differences in geology, soil, or climate, nor do they account for site-specific factors that may influence bioavailability or toxicity of contaminants. The guidelines are set to account for the most sensitive receptors that may be exposed to the contaminant. Because of their conservative nature, exceedences do not necessarily mean that there is a human or environmental risk. The above noted metals may be naturally present in soils around Arviat at the concentrations detected.

3.5 Recommendations

3.5.1 Contaminant Attenuation Zone (CAZ)

A Contaminant Attenuation Zone (CAZ) located down gradient of the landfill should be established and incorporated into the NWB licence. The wetland area identified as the CAZ in Figure 3 would act as a buffer and treatment area for the landfill discharge before leachate enters the natural environment.

Wetland CAZ systems operate by dispersing leachate over an area of sufficient size, to allow natural processes such as sedimentation, adsorption by soil particles, uptake, and digestion of nutrient components by plants, microbial decomposition of complex molecules, physical entrainment in changing flow regimes, and dilution by intermixing with the natural water system. The CAZ should be included in future amendments to the Community Land Use Plan and set aside so that the land can not

used for anything else. The CAZ should also be included as an amendment to the current NWB licence.

3.5.2 Leachate Management

The creation of leachate within the landfill is inevitable and the water must drain somewhere. The important thing is that the leachate does not harm the environment or public health. The landfill has been designed to drain leachate out of waste at the southwest corner of the site (Figure 3).

Currently a natural pond is located in this location. The pond drains through a culvert located under an ATV trail into the wetland. This culvert can be used as a control point for drainage. Sand bags could be piled in front of the culvert to hold back drainage, however the capacity of the pond is limited. Typically for landfills in Nunavut the design and operations plan includes sampling of the water would occur monthly during thawed conditions (as per Licence). Once the results of sampling are received (usually 5-7 working days after arrival of samples at lab) water can be released to the wetland as long as all water quality guidelines are met. If water does not meet water quality guidelines another disposal method should be used. Disposal options are dependent on the water quality and could include:

- Transportation and disposal in the sewage lagoon
- Pre-treatment (filter, chemical, etc.) prior to discharge to the sewage lagoon, or
- Containment and storage, if deemed to be hazardous waste.

Site specific water quality guidelines should be established that account for naturally occurring metals. A background study should be completed to determine a baseline for metal concentrations in surface water in the area. This would include taking surface water samples from wetlands around Arviat that are not near waste disposal sites. Once background levels are known, site specific guidelines should be submitted to the NWB for approval and used for comparison when sampling leachate from the landfill.

As the landfill reaches capacity and waste fills the area inside the berm, the pond between the berm and the culvert with the CAZ will become an important component of the leachate management system, as there will no longer be room for leachate to pond within the berms.

4.0 Bulky Metals Waste Area

A Bulky Metals Waste Area is located on the east side of the landfill access road and 500 m south of the edge of the residential area (Figure 5). Vehicles, heavy equipment, empty 45 gallon drums, fuel tanks and other metal wastes are disposed at this site.

There are no as-built drawings or plans for the bulky metals waste area. The site is located along an esker and is raised from the surrounding tundra. The approximate footprint of the site is approximately 39,000 m^2.

Photographs of the bulky waste area are included in Appendix B. Figure 5 provides a record of existing conditions on the site.

4.1 Waste Placement History and Filling Methods

Historical records indicate some burial occurred during the mid-1970's until 1977, when the area was used as a disposal area for domestic wastes. The filled area has been closed with a layer of fill.

Seven hundred and fifty m^3 of contaminated soil were reportedly removed from the N.W.T. Power Corporation (NWTPC) tank farm and brought to the Bulky Waste site for landfarming (EBA, 1995). Some of the soil has been spread over the former landfill with approximately half of the soil still in piles (~300 m^3). The soil is believed to be contaminated with diesel.

Metal wastes have been disposed of at the site manually by residents. Some segregation has occurred as vehicles tend to be stored along the south side of the site and "white waste" (appliances) are stored at the back of the site.

4.2 Site Security

The bulky metals waste dump area has operated without any dedicated operator or manager. It is common for community residents to be scavenging the dump for metal and spare parts. Reuse and recycling is encouraged. There is no fence around the site.

4.3 Environmental Conditions of the Site

Soil and water sampling was completed at the Bulky Metals Waste site in September and November 2010.

In September 2010, soil samples were taken from the contaminated soil piles. There are two main piles of soil at the site. Two samples were taken from each pile at approximately 20 to 30 cm below surface (HW-P1-A, HW-P1-B, HW-P2-A and HW-P2-B). A surface water sample (BW-1) was taken from ponded water just south of the Bulky Waste Area.

As part of the field program, a topographic survey was completed to outline the waste footprint and to determine the direction of drainage on the site. Contours and drainage are provided in Figure 5. The topographic survey was also used to estimate the volume of the contaminated soil piles. Based on the survey, the volume of soil is estimated to be approximately 218 m^3. It is assumed the remainder of the reported 750 m^3 of contaminated soil that was deposited at the site has been spread out over the site.

In November 2010, two test pits were excavated down gradient of site to identify and sample the active zone. The test pits were dug to a depth of 1.1 m. The test pit intersected vegetation from 0 to 0.2 m below ground surface (bgs). From 0.2 metres to 0.8 m was silty fine sand with roots and organics. From 0.8 to 1.1 m bgs was grey silty sand. A soil sample from each test pit (ARV-5-1 and ARV-5-2) was collected and submitted for grain size analysis. Grain size analysis results identified soil sample ARV-5-1 to be sandy loam and ARV-5-2 to be silt loam. A grain size distribution plot is provided in Appendix C.

Groundwater samples from the seepage into the test pits were also collected.

4.3.1 Sampling Results

Sampling locations are shown in Figure 6. A summary of the sampling results and certificates of analysis are provided in Appendix D.

Soil samples taken from the suspected contaminated soil piles were analyzed for metals, petroleum hydrocarbons, BTEX, PAHs, phenols and PCBs. The results were compared to CCME soil quality guidelines for industrial land use and coarse grained soil. Exceedences are provided in Table 1.

Table 1 Contaminated Soil Sample Results at Bulky Metals Area

Parameter	CCME Guideline	BW-P1-A	BW-P1-B	BW-P2-A	BW-P2-B
PH C6-C10 (F1)	320	<5	11	<5	<5
PH C>10-C16 (F2)	260	**1200**	**3400**	240	130

Parameter	CCME Guideline	BW-P1-A	BW-P1-B	BW-P2-A	BW-P2-B
PH C>13-C34 (F3)	1700	430	**1800**	**9100**	130
PH C>34-C50 (F4)	3300	<50	<50	730	79

PH = petroleum hydrocarbons

Samples from the contaminated soil piles exceeded the CCME guidelines for petroleum hydrocarbons F2 (C>10-C16) and F3 (C>16-C34).

Surface water sampled in September 2010 was analysed for petroleum hydrocarbons, PAHs and VOCs. The results were compared to the Canadian Water Quality Guidelines for the Protection of Aquatic Life – Fresh Water. No exceedences were identified.

Groundwater samples taken from seepage within the test pits were analysed for petroleum hydrocarbons, metals and inorganics, VOCs and BTEX. The results were compared to exceedences for some metals including aluminum, arsenic, barium, boron, iron, lead and zinc were identified.

4.4 Recommended Site Improvements

The Hamlet has identified the Bulky Waste Area as an area of public concern. Plans for a new Bulky Metals Area are included in the plans for a new Solid Waste Disposal Area for the Hamlet and will be built when the new site is built.

Until a new bulky waste area is commissioned, materials will continue to be placed in the current Bulky Materials Disposal Area. The site requires organization and removal and/or burial of waste that no longer has any reuse potential. Abandoned vehicles should be drained of all fluids and labelled to identify that they are no longer a risk for spills. Tanks and oil drums can be crushed to reduce their volume. Hazardous waste such as car batteries should be collected and moved to the Hamlet's hazardous waste storage area. The contaminated soil piles should be moved to the Solid Waste Disposal site and used as cover material.

Efforts should be made by the community to segregate any materials that may have a future use prior to the burial (e.g., recently placed material). Materials that no longer have recycling or reuse potential should to be buried in a suitable location acceptable to the community.

In the Hamlet's Community Plan, a 450 m buffer surrounds the waste disposal area and is designated as restrictive to development. The Hamlet is expanding to the south creating more residential housing which is approaching the 450 m buffer around the site. The 450 m buffer is typically used for landfill sites, used for the disposal of municipal

waste. Landfill sites receiving municipal waste generate dust and smoke (from burning), odours, noise, and attract scavengers (birds, foxes, and bears). The Bulky metals area does not contain putresible waste and does not have the same impacts as a landfill site. The contamination from the site does not extend 450 meters and that the site does not pose a threat to residential land use. Issues typical of waste disposal sites such as odour, attracting animals, noise and dust are not issues at the Bulky Metals site and thus a 450 meters buffer area is not required for health and safety issues. Until a new bulky metals site is commissioned, the buffer area around the site be reduced to 200 meters. The Bulky Metals area should not be expanded towards the north to avoid land use conflicts with proposed residential areas.

4.5 Abandonment and Restoration Plan

An Abandonment and Restoration Plan for the Bulky Metals Waste Area is discussed in the report “Solid Waste Management Facility Abandonment and Restoration Plan, by Nuna Burnside, dated December 2010.”

5.0 Hazardous Waste Storage Area

The Hamlet of Arviat currently stores hazardous waste beside the public works garage (Figure 7). Metal drums of waste oils and fuels are stored outside behind the garage in rows. Some of the drums are stacked on skids while others are on the ground. Photos of the area are included in Appendix B.

Based on information from the Hamlet and field observations there is approximately 100 drums of waste stored at the Hazardous Waste Storage Area. Contents in the drums included aviation fuel, waste oil and diesel fuel.

5.1 Assessment of Contaminated Soil and Water

A site visit of the area in September 2010 identified stained soil beside the waste oil drums. Samples of the stained area were collected and analyzed for hydrocarbons, PAHs and VOCs. All three samples exceeded the CCME soil quality standards for petroleum hydrocarbons F3 and F4 (Table 2). A summary of the results is provided in Table D-4 in Appendix D.

Table 2 Soil Samples at Hazardous Waste Storage Area

Parameter	CCME Guideline	HW-1	HW-2	HW-3
PH C6-C10 (F1)	320	<5	<5	<5
PH C>10-C16 (F2)	260	<10	<10	<10
PH C>13-C34 (F3)	1700	**26000**	**32000**	**24000**
PH C>34-C50 (F4)	3300	**4800**	**6000**	**4400**

PH = petroleum hydrocarbons

Surface water drainage from the site is towards the south (Figure 7). The NWB licence includes a monitoring program station at the Hazardous Waste Storage Area that requires monthly water quality sampling during periods of observed flow. During the site visits in September and November 2010 there was no flow in the immediate vicinity, thus samples were not collected.

5.2 Proposed Improvements to Site

A new Hazardous Waste Facility was included in the design of the new Solid Waste Management Facility in May 2009 however a site has not yet been approved by the Hamlet. In the interim, a designed hazardous waste area needs to be constructed at the Public Works yard. The area should be lined with an HDPE geomembrane and

surrounded with a perimeter berm. Ideally the area would be fenced to create a more permanent structure that would withstand weather and deter vehicles and residents from going in the area. The Environmental Guidelines for General Management of Hazardous Waste should be used as a reference for hazardous waste identification, storage, and control until an approved facility can be constructed.

Annually all accumulated drums should be labelled clearly with contents and stacked and strapped for easy transport. All wastes that have accumulated such as oils, fuels, batteries, antifreeze, solvents that cannot be rendered safe for landfilling or cannot be reused should be removed from the community and shipped to a proper disposal facility. Materials must be contained, manifested, and arrangements must be made with a shipper to back haul the materials to a licensed waste disposal site.

The Government of Nunavut Department of the Environment (GN-DOE) monitors the movement of hazardous wastes from generators, carriers to receivers of the wastes, through the use of a tracking document known as a Waste Manifest. A Waste Manifest must accompany all movements, and all parties must register with DOE by contacting:

- Robert Eno, Director, Environmental Protection Division (867) 975-7729 reno@gov.nu.ca
- Ian Rumbolt, Manager of Pollution, Department of Environment (867) 975-7748 irumbolt@gov.nu.ca
- Alain, Chouinard. Environmental Protection Officer – Arviat (867) 857-2828 AChouinard@gov.nu.ca.

Waste oils may be transported to a waste oil generator. A waste oil generator is located in the Hamlet of Rankin Inlet. The Hamlet would like to get an incinerator for its waste oil. The Community and Government Services (CGS) is in the process of evaluating this request.

6.0 Implementation Schedule

Once the NWB approves this report the Solid Waste Management Facility Operation & Maintenance Plan should be updated within 60 days. The updated O&M Plan will reflect the requirements of the new licence and recommendations in this report.

Refer to the plan for Compliance (separate document) for details.

7.0 Summary

The existing Solid Waste Management Facilities including the Solid Waste Disposal Site (landfill), the Bulky Metals Waste Area, and the Hazardous Waste Storage Area are all out of compliance with Nunavut regulations, the NWB license. as well as the recommendations of previous studies. The findings of recent studies and the proposed recommendation are provided to manage the facilities, is a practical cost effective manner with a “best efforts” approach to achieving compliance with the regulatory requirements as quickly as possible. The recommendations are included in the Plan for Compliance, which has been prepared (separate document) and submitted to the NWB. The Plan for Compliance outlines the work required and purposed schedule to address these issues.

Respectfully Submitted:

Stephanie Charity, P.Geo.

December 24, 2010
Date

Jim Walls, P.Geo.

December 24, 2010
Date

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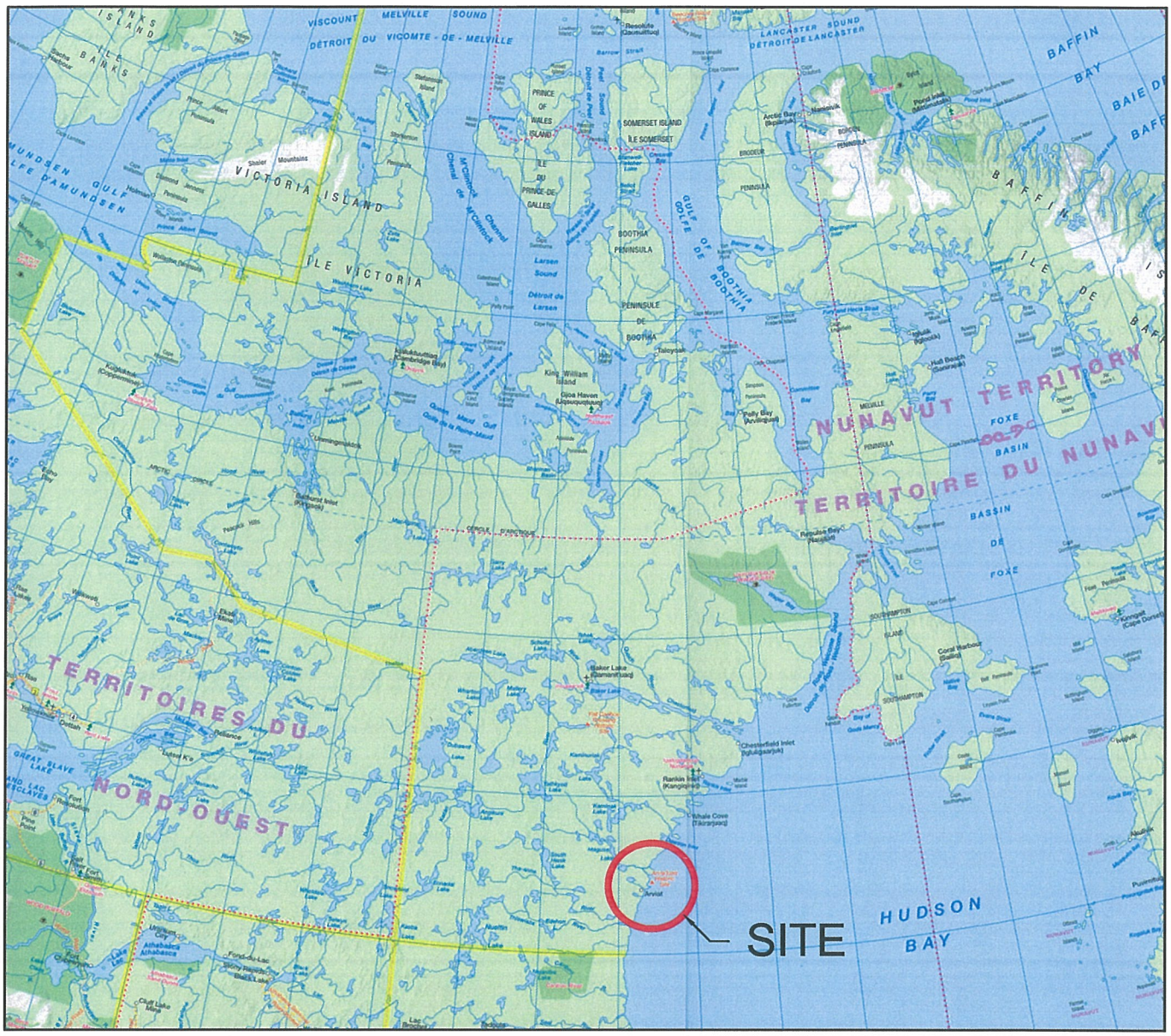
Figures



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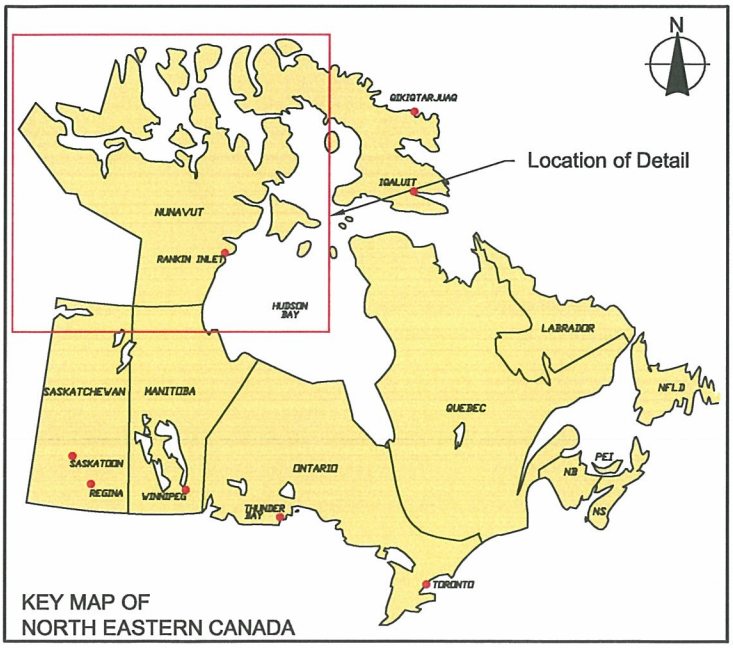
Map Art Publishing



KEY MAP OF
NORTH EASTERN CANADA

FIGURE 1 - SITE LOCATION MAP

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT

SOLID WASTE MANAGEMENT REPORT

December, 2010
Project Number: N-O157460

Prepared by: C. Dickie

Verified by: S. Charity

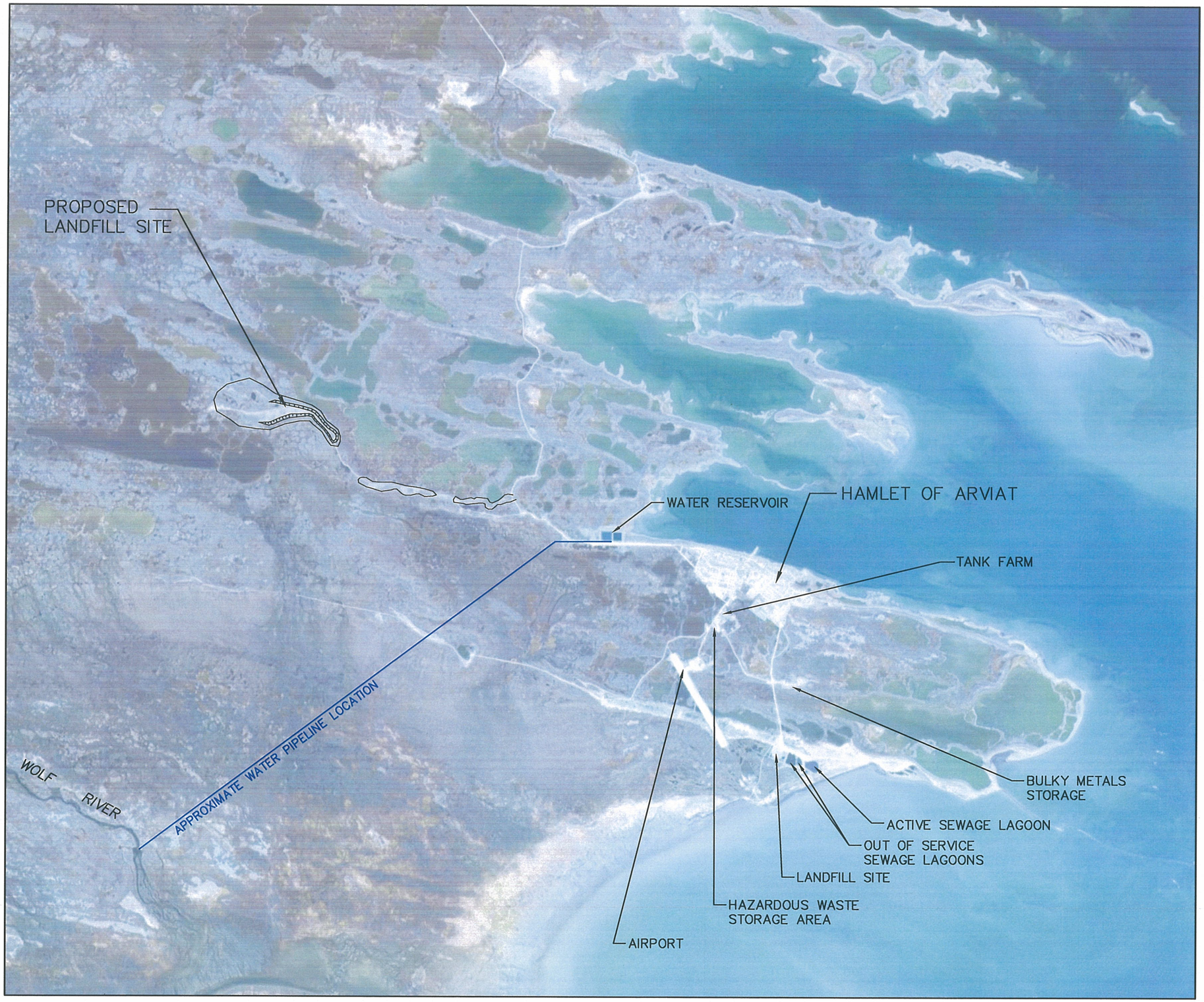
N-O15746 SWMR 2010 SL.dwg

Plot Time: Jan 21, 2011 - 1:17pm

FIGURE 2

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
SOLID WASTE MANAGEMENT REPORT

COMMUNITY PLAN



Satellite Image Source:
Background colour satellite image obtained from Google Earth Pro.

Map Source:
Background physical features obtained from the National Topographic Database Website.

N

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Kilometres

1:50,000
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity

NUNA BURNSIDE

N-O15746 SWMR 2010 CP.dwg

Plot time: Jan 21, 2011--1:19pm

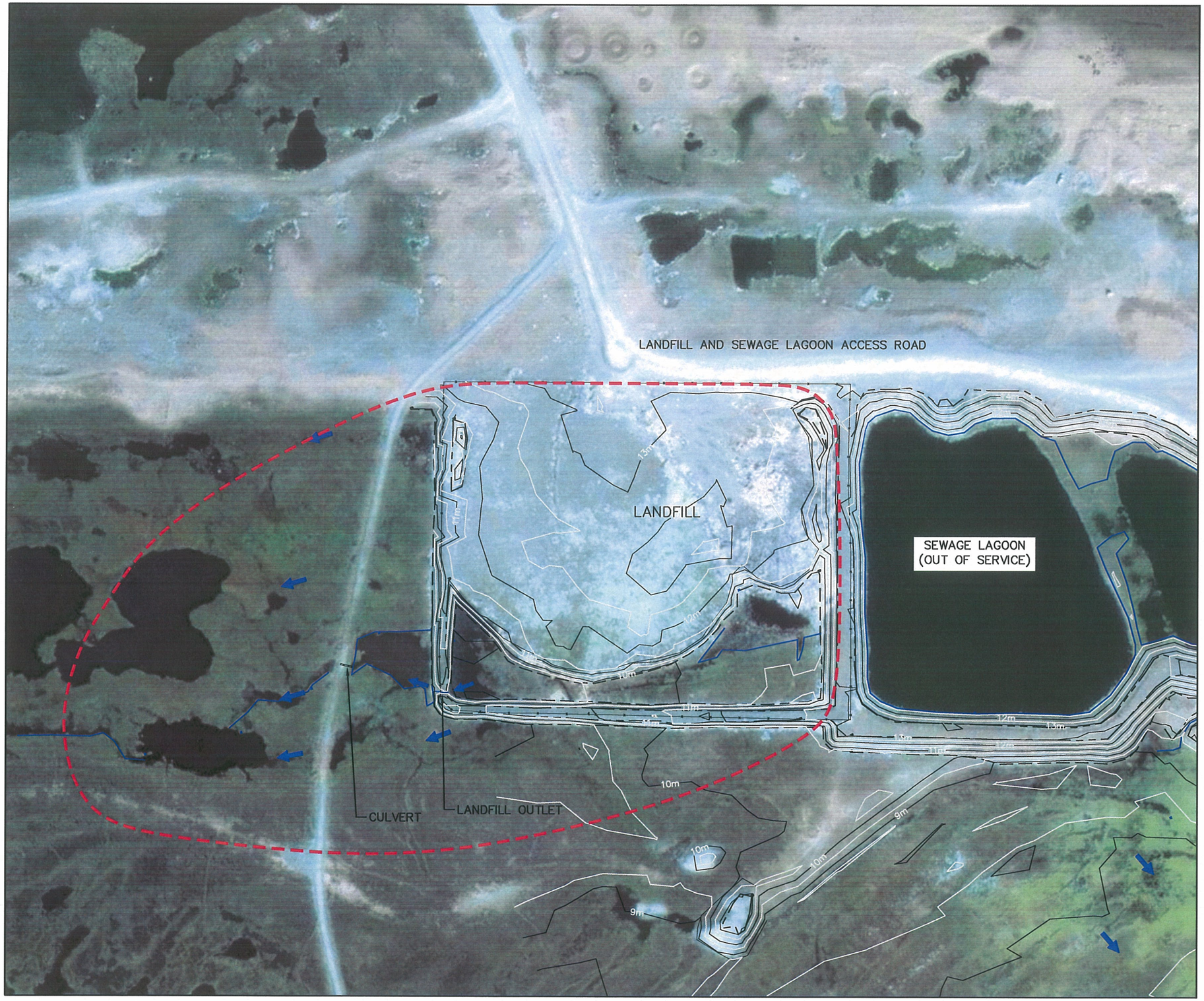

FIGURE 3

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
SOLID WASTE MANAGEMENT REPORT

SOLID WASTE DISPOSAL AREA

LEGEND

- CONTAMINANT ATTENUATION ZONE
- FLOW DIRECTION
- CONTAMINANT ATTENUATION ZONE
- 10m GROUND SURFACE / WASTE SURFACE CONTOUR *(Survey by Burnside, September 2010)*

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008

N

0 20 40 60 80 100 120 140 160
Metres

1:2,000
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity

BURNSIDE

N-O15746 SWMR SOLID WASTE DISPOSAL AREA.dwg

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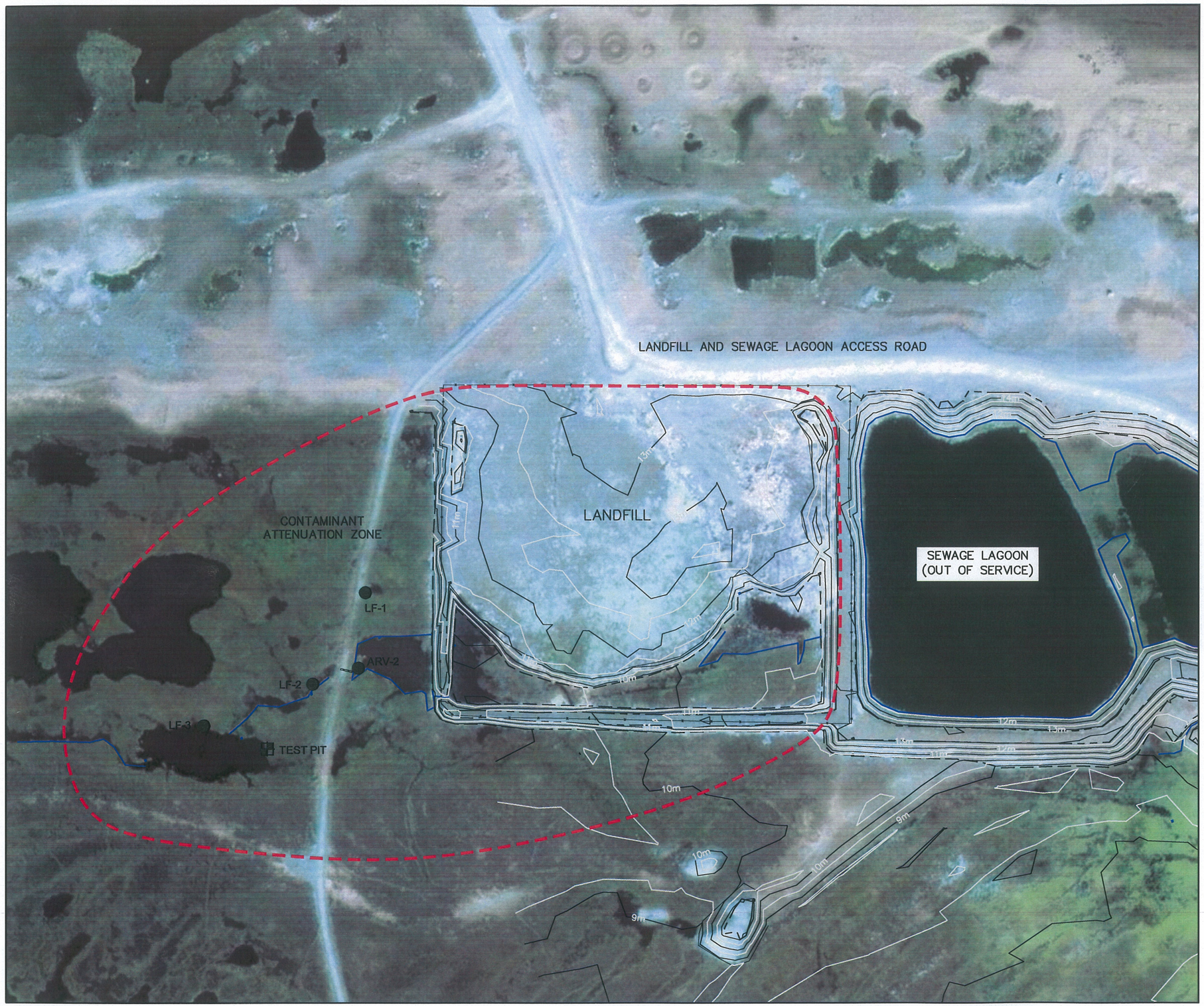

FIGURE 4

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT

SOLID WASTE MANAGEMENT REPORT

SOLID WASTE DISPOSAL AREA - SAMPLE LOCATIONS

LEGEND

- WATER SAMPLE LOCATION
- TEST PIT LOCATION
- CONTAMINANT ATTENUATION ZONE

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008

N

0 20 40 60 80 100 120 140 160
Metres

1:2,000
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity

BURNSIDE

N-O15746 SWMR SOLID WASTE SAMPLE LOCATIONS.dwg

Plot Time: Jan 21, 2011 - 3:46pm

FIGURE 5

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
SOLID WASTE MANAGEMENT REPORT

BULKY METALS WASTE AREA

LEGEND

- SURFACE WATER FLOW DIRECTION
- 10m — GROUND SURFACE CONTOUR *(Survey by Burnside, September 2010)*
- TOP OF BANK *(Survey by Burnside, September 2010)*
- BOTTOM OF BANK *(Survey by Burnside, September 2010)*
- GRAVEL DRIVE/ROAD *(Survey by Burnside, September 2010)*

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008

N

0 20 40 60 80 100 120 140 160
Metres

1:2,000
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity

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N-O15746 SWMR BULKY METALS AREA.dwg

Plot Time: Jan 21, 2011 - 2:38pm

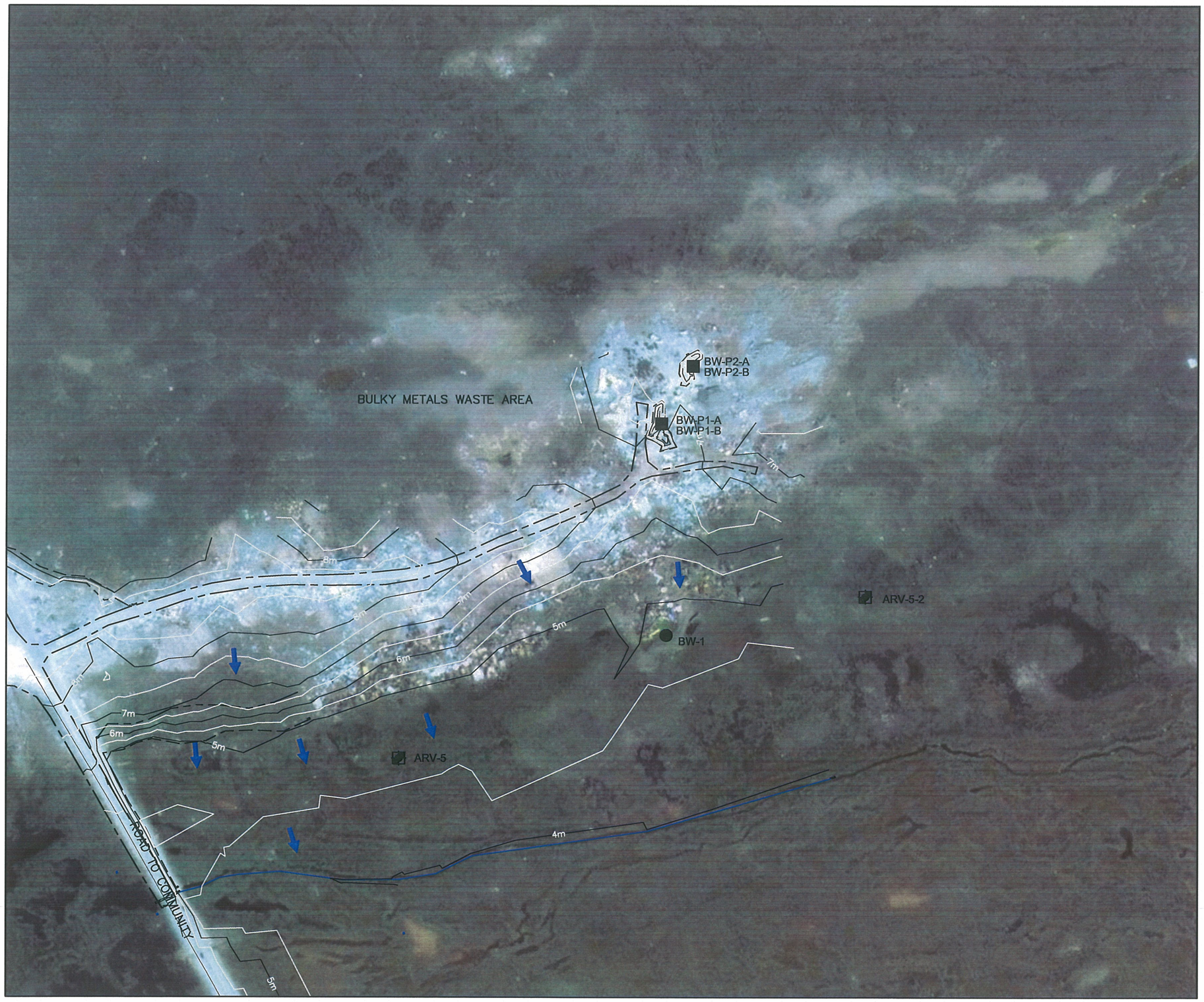

FIGURE 6

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
SOLID WASTE MANAGEMENT REPORT

BULKY METALS WASTE AREA - SAMPLE LOCATIONS

LEGEND

- WATER QUALITY SAMPLE LOCATION
- TEST PIT LOCATION WITH WATER QUALITY SAMPLE
- SOIL SAMPLE LOCATION
- SURFACE WATER FLOW DIRECTION
- 10m — GROUND SURFACE CONTOUR *(Survey by Burnside, September 2010)*

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008

N

0 20 40 60 80 100 120 140 160
Metres

1:2,000
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity

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N-O15746 SWMR BULKY METALS SAMPLE LOCATIONS.dwg

Plot Time: Jan 21, 2011–2:11pm

FIGURE 7

HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
SOLID WASTE MANAGEMENT REPORT

HAZARDOUS WASTE STORAGE AREA

LEGEND

- SOIL SAMPLE LOCATION
- SURFACE WATER DRAINAGE FLOW DIRECTION

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008

N

0 10 20 30 40 50 60
Metres

1:750
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity

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N-O15746 SWMR HAZARDOUS WASTE AREA.dwg

Plot Time: Jan 21, 2011 - 2:17pm

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Appendix A
Nunavut Water Board Licence

NUNAVUT WATER BOARD

WATER LICENCE NO: 3AM-ARV1015

Hamlet of Arviat, Nunavut

NUNAVUT WATER BOARD

LICENCE NO: 3AM-ARV1015

TABLE OF CONTENTS

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NUNAVUT WATER BOARD

WATER LICENCE No. 3AM-ARV1015

Pursuant to the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

HAMLET OF ARVIAT
(Licensee or Applicant)

ARVIAT, NUNAVUT X0C 0E0
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water or dispose of waste for a period subject to restrictions and conditions contained within this Licence:

Licence Number/Type:	3AM-ARV1015 TYPE "A"
Water Management Area:	NUNAVUT 06
Location:	ARVIAT, KIVALLIQ REGION, NUNAVUT LATITUDE: 61° 06' 30" N, LONGITUDE: 94° 03' 31" W
Classification:	MUNICIPAL UNDERTAKING
Purpose:	DIRECT USE OF WATER AND DEPOSIT OF WASTE
Quantity of Water use not to Exceed:	EIGHTY-SIX THOUSAND (86,000) CUBIC METRES PER ANNUM
Date of Licence Issuance:	AUGUST 23, 2010
Expiry of Licence:	AUGUST 31, 2015

This Licence, issued and recorded at Gjoa Haven, Nunavut, includes and is subject to the annexed conditions.

Thomas Kabloona,
Nunavut Water Board
Chair

APPROVED BY:

Minister of Indian and Northern Affairs Canada

DATE LICENCE APPROVED: _____

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. SCOPE

a. This Licence allows for the use of Water and disposal of Waste including operation of a Water Supply Facility, Solid Waste Disposal Facility, Hazardous Waste Storage Area, Bulky Metals Area, and Sewage Disposal Facility; as well as construction and operation of a New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, upon approval by the Board, by the Hamlet of Arviat, Nunavut for a municipal undertaking (Latitude 61° 06' 30" N and Longitude 94° 03' 31" W);

b. This Licence is issued subject to conditions contained herein with respect to the taking of Water and the depositing of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new regulations are made or existing regulations are amended by the Governor in Council under the Act, or other statutes imposing more stringent conditions relating to the quantity, type or manner under which any such Waste may be so deposited, this Licence shall be deemed to be subject to such requirements; and

c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with all applicable legislation, guidelines and directives.

2. DEFINITIONS

In this Licence, these definitions apply and changes may be made at the discretion of the Board.

"Act" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"Amendment" means a change to original terms and conditions of this Licence requiring correction, addition or deletion of specific terms and conditions of the Licence and/or modifications inconsistent with the terms of the set terms and conditions of the Licence;

"Analyst" means an Analyst designated by the Minister under Section 85 (1) of the Act;

"Applicant" means the Licensee;

"Appurtenant undertaking" means an undertaking in relation to which a use of Waters or a deposit of Waste is permitted by a licence issued by the Board;

"Board" means the Nunavut Water Board established under the *Nunavut Land Claims Agreement*;

"Bulky Metals Area" comprises the area and associated structures designed to contain bulky metal waste as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

"Effluent" means treated or untreated liquid waste material that is discharged into the environment from a structure such as a settling pond or a treatment plant;

"Engineer" means a professional engineer registered to practice in Nunavut in accordance with the *Consolidation of Engineers and Geoscientists Act S. Nu 2008, c.2* and the *Engineering and Geoscience Professions Act S.N.W.T. 2006, c.16 Amended by S.N.W.T. 2009, c.12*;

"Final Discharge Point" in respect of an Effluent, means an identifiable discharge point of a facility beyond which the operator of the facility no longer exercises control over the quality of the Effluent;

"Freeboard" means the vertical distance between water line and the designed maximum operating height on the crest of a dam or dyke's upstream slope;

"Geotechnical Engineer" means a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists and whose principal field of specialization is with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

"Grab Sample" means a single Water or wastewater sample taken at a time and place representative of the total discharge;

"Greywater" means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes;

"Hazardous Waste" means waste classified as "hazardous" by Nunavut Territorial or Federal legislation, or as "dangerous goods" under the *Transportation of Dangerous Goods Act*;

"Hazardous Waste Storage Area" comprises the area and associated structures designed to contain Hazardous Waste as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

"Hydrocarbon Impacted Soil Storage and Treatment Facility" means an area designed to treat Petroleum Hydrocarbon-Impacted Soil, as referred to in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

"Inspector" means an Inspector designated by the Minister under Section 85 (1) of the Act;

"Licensee" means the holder of this Licence;

"Modification" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion, and changes to the operating system that are consistent with the terms of this Licence and do not require amendment;

"Monitoring Program" means a monitoring program established to collect data on surface Water and groundwater quality, Waste and Waste deposition, to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

"New Solid Waste Disposal Facility" comprises the area and associated structures designed to contain solid waste as referred to in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

"Nunavut Land Claims Agreement" (NLCA) means the *"Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"Petroleum Hydrocarbon Impacted Soil" means soil in which the primary petroleum product present, as determined by laboratory analysis consistent with that described in the *Canada-Wide Standards for Petroleum Hydrocarbons in Soil*, generally consists of fuel oil, diesel fuel, gasoline and/or jet fuel;

"Sewage" means all Toilet Wastes and Greywater;

"Sewage Disposal Facilities" comprises the area, including wetland and engineered lagoon designed to contain Sewage as described in the Application for Water Licence filed by the Applicant on September 2, 2003, and illustrated in Arviat Sewage Lagoon drawings prepared by FSC Architects and Engineers for Government of Nunavut, Job No. 507-340, FSC Project No. 2003-0440-003, Submission for Tender July 11th, 2003;

"Sewage Sludge" means the semi-solid Sewage material which settles at the bottom of the Sewage lagoon;

"Solid Waste Disposal Facilities" comprises the area and associated structures designed to contain solid waste as described in the Application for Water Licence filed by the Applicant on September 2, 2003;

"Toilet Wastes" means all human excreta and associated products, but does not include Greywater;

"Waste" means, as defined in section 4 of the Act, any substance that, by itself or in combination with other substances found in Water, would have the effect of altering the quality of any Water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any Water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

"**Waste Disposal Facilities**" means all facilities designated for the disposal of Waste including the Sewage Disposal Facilities, Solid Waste Disposal Facilities, Hazardous Waste Storage Area, Bulky Metals Area, and upon approval by the Board, New Solid Waste Disposal Facility, and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

"Water" means water as defined in section 4 of the Act;

"Water Supply Facilities" comprises the area and associated intake infrastructure at the Wolf River Water Supply, as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009 and illustrated in Arviat Water Supply Filtration Upgrade drawings prepared by Dillon Consulting for Government of Nunavut Public Works and Services, Issued for Tender, April 2008, Project No. 078254; Figure 4 – Hamlet of Arviat Water Licence Submission Wolf River Water Intake drawing prepared by Nuna Burnside, December 2008, Project Number N-O15746;

"Work Plan" refers to the electronic document (letter) from Jim Walls, P.Geo., Nuna Burnside Engineering and Environmental Ltd., to Bryan Purdy, Government of Nunavut Community Government Services, Re: Work Plan to Address INAC, DFO, and NWB Licence Compliance Issues GN File 08-3025 Hamlet of Arviat, Nunavut File No. N-0 15746.1, dated June 23, 2010.

3. ENFORCEMENT

a. Failure to comply with this Licence will be a violation of the Act, subjecting the Licensee to the enforcement measures and the penalties provided for in the Act.

b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the Act.

c. For the purpose of enforcing this Licence and with respect to the use of Water and deposit or discharge of Waste by the Licensee, Inspectors appointed under the Act, hold all powers, privileges and protections that are conferred upon them by the Act or by other applicable law.

PART B: GENERAL CONDITIONS

1. This Licence incorporates a previously issued Type B licence, NWB3ARV0308, to the Hamlet of Arviat, which allowed for the use of water and disposal of waste.

2. In the event of a conflict between the previously issued Type B licences and this Type A Licence, the condition of this Type A Licence prevails.

3. The Licensee shall file an annual report with the Board for review, no later than March 31st

of the year following the calendar year being reported, which shall contain the following information collected during that period:

a. Tabular summaries of all data generated under the Monitoring Program;
b. The monthly and annual quantities of freshwater obtained from all sources;
c. The monthly and annual quantities of Wastes removed for disposal from Water Supply Facilities and Waste Disposal Facilities;
d. A summary of modifications and/or major maintenance work carried out on Water Supply Facilities and Waste Disposal Facilities including all associated structures and facilities;
e. A list of unauthorized discharges and summary of follow-up actions taken;
f. Any revisions to approved plans and manuals as required by Part B, Item 12, submitted in the form of an addendum;
g. A summary of the status of implementation of the Work Plan, including an indication of the status of the funding required to carry out the Work Plan and an estimated timeframe for receipt of the necessary funding;
h. A fiscal update of the Licensee's funding commitments associated with all facilities governed by this Licence including all associated structures and facilities for the upcoming year and identifying shortfalls in such funding commitments for the previous year;
i. A summary of abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;
j. A summary of any studies, reports and plans requested by the Board that relate to Waste disposal, Water use or reclamation, and a brief description of any future studies planned; and
k. Any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.

4. The Licensee shall comply with the Monitoring Program described in this Licence and any Amendments to the Monitoring Program as may be made from time to time, pursuant to the conditions of this Licence.

5. The Monitoring Program and compliance dates specified in the Licence may be modified at the discretion of the Board.

6. Metres, devices or other such methods used for measuring the volumes of Water used and Waste discharged, shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

7. The Licensee shall, within ninety (90) days after the first visit by the Inspector following approval of this Licence, post the necessary signs, to identify the stations of the Monitoring Program. All signage postings shall be in Inuktitut and English.

8. The Licensee shall, for all plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted, cannot be undertaken without subsequent written Board approval and direction. The Board may alter or modify a plan if necessary to

achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the plan.

9. In the event that a plan is not found acceptable to the Board, the Licensee shall, within thirty (30) days of notification by the Board, provide a revised version to the Board, for approval in writing.

10. The Licensee shall, for all plans submitted under this Licence, implement the plan as approved by the Board in writing.

11. Every plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and conditions imposed upon approval of a plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a plan where appropriate.

12. The Licensee shall review the plans and manuals referred to in this Licence as required by changes in operation and/or technology and revise accordingly. Revisions to the plans or manuals are to be submitted in the form of an addendum to be included with the annual report required by Part B, Item 3, complete with a revisions list detailing where significant content changes are made.

13. The Licensee shall ensure a copy of this Licence is maintained at the municipal office and at the site of operation at all times.

14. Any communication with respect to this Licence shall be made in writing to the attention of:

Manager of Licensing
Nunavut Water Board
P. O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nunavutwaterboard.org

15. Any notice made to an Inspector shall be made in writing to the attention of:

Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

16. The Licensee shall submit one (1) paper copy and one (1) electronic copy of all reports, studies, and plans to the Board or as otherwise requested by the Board. Reports or studies submitted to the Board by the Licensee shall include an executive summary in English and

Inuktitut.

17. The Licensee shall ensure that any document(s) or correspondence submitted by the Licensee to the Board, is received by the Board and maintain on file a copy of the acknowledgment of receipt issued by the Manager of Licensing.

18. This Licence is assignable as provided for in Section 44 of the Act.

19. The expiry or cancellation of this Licence does not relieve the Licensee from any obligation imposed by the Licence, or any other regulatory requirement.

20. The Licensee shall file a Water Licence Renewal Application with the Board no later than September 1, 2014.

PART C: CONDITIONS APPLYING TO WATER USE AND MANAGEMENT

1. The Licensee shall obtain all freshwater from Wolf River at Monitoring Program Station ARV-1 as otherwise approved by the Board in writing.

2. The annual quantity of water used for all purposes shall not exceed eighty-six thousand (86, 000) cubic metres per annum, or as otherwise approved by the Board in writing.

3. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw Water at a rate such that fish do not become impinged on the screen.

4. The Licensee shall submit to the Board for approval in writing by December 31, 2010, as-built drawings stamped and signed by an Engineer confirming compliance with the DFO guideline "Freshwater Intake End of Pipe Fish Screen Guideline". The drawings shall include information regarding the operating capacity of the pump used and the intake screen size.

5. The Licensee shall not remove any material from below the ordinary high water mark of any Water body.

6. The Licensee shall not cause erosion to the banks of any body of Water and shall provide necessary controls to prevent such erosion.

7. Sediment and erosion control measures shall be implemented prior to and maintained during construction and operation to prevent entry of sediment into Water.

8. The Licensee shall submit to the Board for review by December 31, 2010, the Water balance assessment for Wolf River and an assessment of the potential effects of drawdown of Wolf River on the aquatic environment. The assessment shall include recommended mitigation measures and an implementation schedule.

9. The Licensee shall maintain the Water Supply Facilities to the satisfaction of the Inspector.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL AND MANAGEMENT

1. The Licensee shall direct all Sewage to the Sewage Disposal Facility.

2. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Program Station ARV-4 shall not exceed the following Effluent quality limits, or as otherwise approved by the Board in writing:

Parameter	Maximum Concentration of any Grab Sample
Fecal Coliform	1×10^4 CFU/dl
BOD_5	80 mg/l
Total Suspended Solids	100 mg/l
Oil and Grease	No visible sheen
pH	Between 6 and 9

3. A Freeboard limit of 1.0 metre, or as recommended by a qualified Geotechnical Engineer and as approved by the Board in writing, shall be maintained at all dams, dyke or structures intended to contain, withhold, divert or retain Water or Wastes.

4. The Licensee shall provide at least ten (10) days notification to an Inspector, prior to initiating any planned discharges from any Waste Disposal Facility.

5. The Licensee shall submit to the Board for approval in writing by December 31, 2010, a Sewage Disposal Facility Report. The Report shall include:

   a. As-built drawings and design plans of the Sewage Disposal Facility (including the lagoon and wetland) signed and stamped by an Engineer;
   b. A preliminary discharge and wetland hydrology assessment;
   c. The results of an inspection by a Geotechnical Engineer of the Sewage Disposal Facility lagoon including its berms and an evaluation of the impact of sewage seepage through the lagoon berms on the environment;
   d. An evaluation of the long term impacts of the Sewage Disposal Facility on the environment;
   e. A Sludge Management Plan that addresses sludge assessment and disposal methods. The Plan shall be incorporated in to the Sewage Disposal Facility Operations and Maintenance Manual referred to in Part F Item 1b;
   f. Recommended measures to optimize the Sewage Disposal Facility; and
   g. A schedule for implementing recommended measures.

6. The Licensee shall, prior to commissioning of the New Solid Waste Disposal Facility, or as otherwise approved by the Board in writing:

a. Dispose of and contain all non-Hazardous, non-bulky metal, solid Waste at the Solid Waste Disposal Facility;
b. Dispose of and contain all bulky metal Waste at the Bulky Metals Area; and
c. Segregate and securely store all hazardous materials and Hazardous Waste within the Hazardous Waste Storage Area in a manner as to prevent the deposit of deleterious substances into any Water, until such a time that the materials have been removed for proper disposal at a licensed facility.

7. The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, styrofoam, asbestos or painted wood to prevent the deposition of Waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding Waters, or as otherwise approved by the Board in writing.

8. The Licensee shall maintain records of all Waste removed from site and records of confirmation of proper disposal of removed Waste. These records shall be made available to an Inspector upon request.

9. The Licensee shall store and contain all Petroleum Hydrocarbon Impacted Soil in a manner as to prevent the deposit of deleterious substances into any Water.

10. The Licensee shall submit to the Board for approval in writing, at least sixty (60) days prior to the commissioning of a Hydrocarbon Impacted Soil Storage and Treatment Facility, a Hydrocarbon Impacted Soil Storage and Treatment Facility Management Plan including proposed Effluent quality limits for Monitoring Program Station ARV-10.

11. The Licensee shall dispose of all Effluent from contaminated soil areas and the Hydrocarbon Impacted Soil Storage and Treatment Facility, that exceed Effluent quality limits approved by the Board in Part D Item 14 (c) and Part D Item 10 respectively, off site at a licensed hazardous waste facility, or as otherwise approved by the Board in writing.

12. The discharge locations for all treated Effluents from the Hydrocarbon Impacted Soil Storage and Treatment Facility and contaminated soil areas shall be located at a minimum of thirty one (31) metres from the ordinary high water mark of any Water body and where direct or indirect flow into a Water body is not possible and no additional impacts are created.

13. The Licensee shall, prior to the removal of any treated soil from the Hydrocarbon Impacted Soil Storage and Treatment Facility, obtain written documentation from the Government of Nunavut Environmental Protection Service, confirming that the soils have been treated in accordance with the Government of Nunavut's "*Environmental Guideline for Contaminated Site Remediation, 2009"* for its intended use.

14. The Licensee shall submit to the Board for approval in writing by December 31, 2010, a Solid Waste Management Report. The Report shall include:

a. As-built drawings of the Solid Waste Disposal Facility, Hazardous Waste Storage Area, and Bulky Metals Area, signed and stamped by an Engineer;
b. Capacity assessment of the Solid Waste Disposal Facility;
c. An inventory and assessment of contaminated soil and water at the Solid Waste Disposal Facility, Bulky Metals Area, and Hazardous Waste Storage Area, and a plan for the treatment and disposal of contaminated soil and water including proposed Effluent quality limits for Monitoring Program Station ARV-11;
d. Recommendations for Water and wastewater containment, treatment, and drainage control. This Plan shall be incorporated into the Solid Waste Disposal Facility Operations and Maintenance Plan referred to in Part F Item 2d.
e. Recommended measures to optimize solid waste management; and
f. A schedule for implementing recommended measures.

15. Licensee shall implement measures to ensure hazardous materials and/or leachate from the Waste Disposal Facilities does not enter Water.

16. Licensee shall, annually between the months of June and September, undertake a geotechnical inspection to be carried out by a Geotechnical Engineer that takes into account all facilities intended to contain, withhold, divert or retain Water or Wastes. The inspection shall be conducted in accordance with the Canadian Dam Safety Guidelines, where applicable.

17. The Licensee shall, within sixty (60) days of completion of the geotechnical inspection referred to in Part D, Item 16, submit to the Board for review, the Geotechnical Engineer's inspection Report. The Licensee shall include a cover letter outlining an implementation plan to address the recommendations of the Geotechnical Engineer.

18. The Licensee shall maintain and operate all Water Supply Facilities and Waste Disposal Facilities in such a manner as to prevent structural failure.

PART E: CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION

1. The Licensee shall, at least sixty (60) days prior to construction of the New Solid Waste Disposal Facility and/or the Hydrocarbon Impacted Soil Storage and Treatment Facility, or any dams, dykes or structures intended to contain, withhold, divert or retain Water or Wastes, submit to the Board, for approval in writing, final design Plans and construction drawings signed and stamped by an Engineer.

2. The Licensee shall obtained approval from the Board in writing prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain Water or Wastes.

3. The Licensee may, without written approval from the Board, carry out Modifications provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

a. The Licensee has notified the Board in writing of such proposed Modifications at least sixty (60) days prior to beginning the Modifications to include:
   i. A description of the facilities and/or works to be constructed;
   ii. The proposed location of the structure(s);
   iii. Identification of any potential impacts to the receiving environment;
   iv. A description of any monitoring required, including sampling locations, parameters measured and frequencies of sampling;
   v. Schedule for construction;
   vi. Drawings of engineered structures signed and stamped by an Engineer; and
   vii. Proposed sediment and erosion control measures.
b. The proposed Modifications do not place the Licensee in contravention of the Licence or the Act;
c. The Board has not, within sixty (60) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
d. The Board has not rejected the proposed Modifications;

4. Modifications for which any of the conditions referred to above have not been met can be carried out only with approval from the Board in writing.

5. The Licensee shall provide as-built plans and drawings of the construction and/or Modifications referred to in Part E of this Licence within ninety (90) days of completion of the Construction or Modification. These plans and drawings shall be signed and stamped by an Engineer.

PART F: CONDITIONS APPLYING TO OPERATIONS AND MAINTENACE

1. The Licensee shall, within sixty (60) days following Board approval of the Sewage Disposal Facility Report referred to in Part D, Item 5, submit to the Board, for approval in writing, a revision to the Plan entitled "Sewage Treatment Facility Operation and Maintenance (O&M) Plan, Hamlet of Arviat" May 2009, revised May 2010, to address the following:

   a. Requirements of the Licence;
   b. Sludge Management Plan referred to in Part D Item 5e; and
   c. Results of the Sewage Disposal Facility Report referred to in Part D Item 5.

2. The Licensee shall, within sixty (60) days following Board approval of the Solid Waste Disposal Facility Report referred to in Part D Item 14, submit to the Board, for approval in writing, a revision to the Plan entitled "Solid Waste Management Facility Operation and Maintenance (O&M) Plan, Hamlet of Arviat" January 2009, revised May 2010, to address the following:

   a. Requirements of the Licence;
   b. Bulky Waste Management Plan;

c. Hazardous Waste Management Plan including Hazardous Waste containment and segregation measures, and procedures for the movement of Hazardous Waste;
d. Recommendations for Water and wastewater containment, treatment, and drainage control as referred to in Part D Item 14(d); and
e. Results of the Solid Waste Disposal Facility Report referred to in Part D Item 14.

3. The Licensee shall, at least three (3) months prior to commissioning the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, submit to the Board, for approval in writing, a revised Solid Waste Management Facility Operations and Maintenance (O&M) Plan referred to in Part F Item 2 to address the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility.

4. The Licensee shall, in preparation of the revised plan referred to in Part F, Item 3, consult Environment Canada for guidance related to Petroleum Hydrocarbon Impacted Soils storage and treatment facility design, siting, operation, monitoring, sampling and analytical methods, decommissioning and closure, as well as record keeping and reporting.

5. The Licensee shall, by December 31, 2010, submit to the Board for review, an Addendum to the approved Plan entitled "Environmental Emergency Contingency Plan, Hamlet of Arviat" May 2009, revised May 2010, to address reviewers' comments including the following:

   a. Procedures for the movement of Hazardous Waste;
   b. Contact information for the Government of Nunavut Department of Environment Manager of Pollution; and
   c. Detailed information regarding clean-up methods/procedures for spills on Water or ice.

6. If, during the period of this Licence, an unauthorized discharge of Waste and or Effluent occurs, or if such discharge is foreseeable, the Licensee shall:

   a. Employ as required, the approved Environmental Emergency Contingency Plan referred to in Part F Item 5;
   b. Report the incident immediately via the 24-Hour Spill Reporting Line (867) 920-8130 and to the Inspector at (867) 975-4295; and
   c. For each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event, which includes the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain, clean up and restore the spill site.

PART G: CONDITIONS APPLYING TO ABANDONMENT, RESTORATION AND CLOSURE

1. The Licensee shall, by December 31, 2010, submit to the Board, for review, an interim Abandonment and Restoration Plan for the Solid Waste Disposal Facility, Bulky Metals Area, Hazardous Waste Storage Area and any contaminated sites identified in the Solid Waste Management Report referred to in Part D Item 14 (c). The Plan shall incorporate, where applicable, the appropriate sections described in Part G Item 3.

2. The Licensee shall, by December 31, 2010, submit to the Board, for approval in writing, a Final Abandonment and Restoration Plan for the two abandoned sewage lagoons. The Plan shall incorporate, where applicable, the appropriate sections described in Part G Item 3.

3. The Licensee shall, at least six (6) months prior to abandoning any facilities or upon submission of final design drawings for the construction of new facilities to replace existing ones, submit to the Board, for approval in writing, a Final Abandonment and Restoration Plan for the facilities being decommissioned. The Plan shall incorporate, where applicable, information on the following:

    a. Water intake facilities;
    b. The water treatment and waste disposal sites and facilities;
    c. Former dump sites;
    d. Petroleum and chemical storage areas;
    e. Any site affected by waste spills;
    f. Leachate prevention;
    g. An implementation and completion schedule;
    h. Maps delineating all disturbed areas, and site facilities;
    i. Consideration of altered drainage patterns;
    j. Type and source of cover materials;
    k. Future area use;
    l. Hazardous Wastes; and
    m. A proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

4. The Licensee shall carry out progressive reclamation of any Water Supply Facilities and Waste Disposal Facilities no longer required for the Licensee's operations.

5. In order to promote growth of vegetation and the needed microclimate for seed deposition, all disturbed surfaces shall be prepared by ripping, grading, or scarifying the surface to conform to the natural topography.

6. The Licensee shall, prior to the use of reclaimed soils that have been contaminated by hydrocarbons, or soils referred to in Part D, Item 14(c), consult with the Government of Nunavut, Department of Environment and obtain written confirmation that the soil meets

the objectives as outlined in the Government of Nunavut's *Environmental Guideline for Contaminated Site Remediation*, March 2009 (Revised).

7. The Licensee shall complete the restoration work within the time schedule specified in an approved Abandonment and Restoration Plan, or as subsequently revised and approved by the Board in writing.

8. The Licensee shall complete all restoration work prior to the expiry of this Licence.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Monitoring Program Stations at the following locations:

Station Number	Description	Frequency	Status
ARV-1	Raw water supply at Wolf River prior to treatment.	Monthly	Active (Volume)
ARV-2a	Effluent from the discharge point of the Solid Waste Disposal Facility.	Quality Monthly during the months of May to August and prior to discharge of accumulated impacted water. Acute Toxicity Annually	Active (Quality and Acute Toxicity)
ARV-2b	Effluent from the discharge point of the New Solid Waste Disposal Facility.	Quality Monthly during the months of May to August and prior to discharge of accumulated impacted water. Acute Toxicity Annually	Active (Quality and Acute Toxicity)
ARV-3	Raw Sewage at truck offload point.	Monthly	Not active

ARV-4	Effluent from the discharge point of the Sewage Disposal Facility (end of Wetland).	Quality Monthly during the months of May to August. Acute Toxicity Annually	Active (Quality and Acute Toxicity)
ARV-5	Discharge from the Bulky Metal Waste Area.	Monthly during periods of observed flow.	New (Quality)
ARV-6	Discharge from the Hazardous Waste Storage Area.	Monthly during periods of observed flow.	New (Quality)
ARV-7	Water level in Wolf River.	Monthly during periods of open water.	New (Water level)
ARV-8	Water level in Sewage Disposal Facility lagoon.	Monthly during thawed conditions.	New (Sewage level)
ARV-9	Sewage Sludge removed from the Sewage Disposal Facility.	Monthly	New (Volume)
ARV-10	Effluent from the Final Discharge Point of the Hydrocarbon Impacted Soil Storage and Treatment Facility	To be determined in accordance with Part D Item 10	New (To be determined in accordance with Part D Item 10)
ARV-11	Effluent discharge from dewatering contaminated soil areas.	To be determined in accordance with Part D Item 14 (c)	New (To be determined in accordance with Part D Item 14 (c))

2. The Licensee shall, by December 31, 2010, maintain a water level Monitoring Program Station (ARV-7) at Wolf River.

3. The Licensee shall, by December 31, 2010, maintain a lagoon level Monitoring Program Station (ARV-8) at the Sewage Disposal Facility.

4. The Licensee shall provide the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of all locations where sources of Water are utilized for all purposes and at all Monitoring Program Stations.

5. The Licensee shall confirm the locations and GPS coordinates for all Monitoring Program Stations referred to in Part H Item 1 with an Inspector.

6. The Licensee shall determine the locations and GPS coordinates of any additional Monitoring Program Stations required for any new Waste Disposal Facilities with an Inspector.

7. The Licensee shall measure and record in cubic metres, the monthly and annual quantities of Water extracted for all purposes at Monitoring Program Station ARV-1.

8. The Licensee shall carry out, at a minimum, weekly inspections at Monitoring Program Stations ARV-2a, ARV-5, ARV-6, and Station ARV-2b upon commissioning of the New Solid Waste Disposal Facility, from May to August inclusive, to identify Effluent or Water flow in order to fulfill the monitoring requirements of Part H, Item 9. A record of inspections shall be retained and made available to an Inspector upon request.

9. The Licensee shall sample monthly at Monitoring Program Stations ARV-2a, ARV-4, ARV-5, ARV-6, and Station ARV-2b upon commissioning of the New Solid Waste Disposal Facility, during the months of May to August, inclusive. Samples shall be analyzed for the following parameters:

BOD_5	Faecal Coliforms
pH	Conductivity
Total Suspended Solids	Ammonia Nitrogen
Nitrate – Nitrite	Oil and Grease (visual)
Total Phenols	Sulphate
Sodium	Potassium
Magnesium	Calcium
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	Total Phosphorous

10. The Licensee shall conduct the following acute toxicity tests at Monitoring Program Stations ARV-2a and ARV-4, and Station ARV-2b upon commissioning of the New Solid Waste Disposal Facility, once annually between June and September, approximately mid-way through the discharge period:

    a. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout (Reference Method EPS 1/RM/13), July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time
    b. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna (Reference Method EPS 1/RM/14), July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time.

11. The Licensee shall, when flow volumes at Monitoring Program Stations ARV- 2a, ARV-2b and ARV-4 are not sufficient to conduct the tests required by Part H Item 10, collect samples upstream where adequate flow volume exists.

12. The Licensee shall record water elevation monthly, during open water at Monitoring Program Station ARV-7.

13. The Licensee shall record water elevations monthly during thawed conditions at Monitoring Program Station ARV-8.

14. The Licensee shall measure and record in cubic metres the monthly and annual quantities of Sewage sludge removed from the Sewage Disposal Facility at Monitoring Program Station ARV-9.

15. The Licensee shall submit to the Board for review, by December 31, 2010 a revision to the approved Plan entitled "Environmental Monitoring Program and Quality Assurance/Quality Control (QA/QC) Plan, Hamlet of Arviat" May 2009, revised May 2010, to address the following:

    a. All monitoring requirements listed under Part H of the Licence;
    b. A covering letter from an accredited laboratory confirming acceptance of the Quality Assurance/ Quality Control (QA/QC) Plan for analyses to be performed under this Licence as required under Part H, Item 17.

16. The Licensee shall, at least six (60) days prior to commissioning the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, submit to the Board, for approval in writing, a revision to the Environmental Monitoring Program and Quality Assurance/Quality Control (QA/QC) Plan, referred to in Part H Item 15, to address the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility.

17. The Licensee shall annually review the QA/QC Plan referred to in Part H, Item 15 and modify it as necessary. The revised QA/QC Plan shall be submitted to the Board for review, accompanied by a current approval letter from an accredited lab and shall meet the standards as set out in Part H, Item 20 and Part H, Item 21 of the Licence.

18. The Licensee shall measure and record the volume of all contaminated soil, from all locations entering the Hydrocarbon Impacted Soil Storage and Treatment Facility.

19. The Licensee shall assess and record the concentration of Petroleum Hydrocarbon Impacted Soil entering any Hydrocarbon Impacted Soil Storage and Treatment Facility from all sources, as per the CCME *Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil, User Guide, January 2008*.

20. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*, or by such other methods approved by the Board.

21. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

22. The Licensee shall include all of the data and information required by the Monitoring Program in the Licensee's Annual Report, as required per Part B, Item 3(a) or as otherwise requested by an Inspector.

23. Modifications to the Monitoring Program may be made only upon written request and subsequent approval of the Board in writing.

provide the findings with recommendations by December 31, 2010[85] as well as the commitments outlined in the Licensee's Work Plan.[86]

Specifically, Part D Item 5 of the Licence requires the Licensee to submit to the Board for approval in writing by December 31, 2010 a Sewage Disposal Facility Report. The Report shall include:

a. As-built drawings and design plans of the Sewage Disposal Facility (including the lagoon and wetland) signed and stamped by an Engineer;
b. A preliminary discharge and wetland hydrology assessment;
c. The results of an inspection by a Geotechnical Engineer of the Sewage Disposal Facility lagoon including its berms and an evaluation of the impact of sewage seepage through the lagoon berms on the environment;
d. An evaluation of the long term impacts of the Sewage Disposal Facility on the environment;
e. A Sludge Management Plan that addresses sludge assessment and disposal methods. The Plan shall be incorporated in to the Sewage Disposal Facility Operations and Maintenance Manual;
f. Recommended measures to optimize the Sewage Disposal Facility; and
g. A schedule for implementing recommended measures.

Solid Waste including Bulky Metal Waste and Hazardous Waste

As identified by INAC[87] at the Hearing, the Hamlet operates a Bulky Metal Waste Area and Hazardous Waste Storage area in addition to the Solid Waste Disposal Facility, and these areas are not addressed in the expired licence NWB3ARV0308. To address this issue, the Board requires the Licensee as a condition in Part D Item 6 of the Licence to, unless otherwise approved by the Board in writing:

a. Dispose of and contain all non-hazardous, non-bulky metal, solid waste at the Solid Waste Disposal Facility;
b. Dispose of and contain all bulky metal waste at the Bulky Metals Area; and
c. Segregate and securely store all hazardous materials and Hazardous Waste within the Hazardous Waste Storage Area in a manner as to prevent the deposit of deleterious substances into any water, until such a time that the materials have been removed for proper disposal at a licensed facility.

To address the issues presented by parties regarding solid waste disposal including management of contaminated soils[88], and runoff management[89], the Board accepts the Licensee's request to include conditions in the Licence to conduct studies and provide the

[85] Transcript, Jim Walls, Nuna Burnside, at p. 35-36, lines 22-11.
[86] Exhibits 3 and 4, Work Plan to Address INAC, DFO and NWB License Compliance Issues, from Jim Walls to Bryan Purdy, dated June 23, 2010.
[87] Transcript, Ian Parsons, INAC, at p. 76 -77, lines 15-8
[88] Transcript, Ian Parson, INAC, at p. 76-77, lines 21-2 and Paula Smith, INAC, at p. 92-93, lines 26-13.
[89] Transcript, Ian Parsons, INAC, at p. 76, lines 5-8 and Paula Smith, EC, at p. 92, lines 10-23.

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Appendix B
Photographs

Solid Waste Disposal Site - Landfill, looking south across fill area at front of landfill. Date: 9/11/2010

Solid Waste Disposal Site - Northwest side of landfill with waste covered. Date: 9/11/2010

Solid Waste Disposal Site - Looking southeast along north fence of landfill.
Date: 9/11/2010

Solid Waste Disposal Site - Accumulated surface water at southeast corner of landfill.
Date: 9/11/2010

Solid Waste Disposal Site - Outside of south berm of landfill.

Date: 9/11/2010

Solid Waste Disposal Site - Outside of west berm of landfill.

Date: 9/11/2010

Solid Waste Disposal Site - Discharge point of surface water from landfill.
Date: 7/26/2010

Solid Waste Disposal Site - ARV-2 monitoring station sample location at culvert, downstream of landfill discharge. Date: 7/26/2010

Solid Waste Disposal Site - Wetland area down gradient of landfill, Contaminant Attenuation Zone. Date: 9/9/2010

Bulky Metals Waste Area - Contaminated soil piles and old fuel tanks and drums. Date: 9/8/2010

Bulky Metals Waste Area - Stock piles of contaminated soil.
Date: 9/8/2010

Bulky Metals Waste Area - Looking towards waste area from wetland south of site.
Date: 9/8/2010

Bulky Metals Waste Area - Water ponding on south side of disposal area, sample location BW-1. Date: 9/8/2010

Hazardous Waste Storage Area - Waste oil drums stored next to Hamlet garage. Date: 9/9/2010

Hazardous Waste Storage Area - Stained soil beside waste oil drums.
Date: 9/9/2010

Hazardous Waste Storage Area - Surface drainage on south side of Hazardous Waste Storage Area. Date: 9/9/2010

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Appendix C
Calculation Worksheets

Waste uantity Calculations - Hamlet of Arviat Nunavut

Calendar ear	Pro ected Population people	Annual olume of Solid Waste m^3	Annual olume of Combustible Solid Waste m^3	Annual olume of Combustible Solid Waste After Burning m^3	Annual olume of ncombustible Solid Waste m^3	Total Annual olume of ncombustible and Combusted (Burned) Solid Waste m^3	Annual olume of Cover Material m^3	Total Annual olume of Waste and Cover Material m^3
2006	2060	10527	2105	632	8421	9053	1811	10863
2007	2126	10864	2173	652	8691	9343	1869	11212
2008	2195	11216	2243	673	8973	9646	1929	11575
2009	2266	11579	2316	695	9263	9958	1992	11950
2010	2339	11952	2390	717	9562	10279	2056	12335
2011	2414	12336	2467	740	9868	10609	2122	12730
2012	2492	12734	2547	764	10187	10951	2190	13142
2013	2572	13143	2629	789	10514	11303	2261	13563
2014	2655	13567	2713	814	10854	11668	2334	14001
2015	2740	14001	2800	840	11201	12041	2408	14449
2016	2828	14451	2890	867	11561	12428	2486	14914
2017	2919	14916	2983	895	11933	12828	2566	15393
2018	3013	15396	3079	924	12317	13241	2648	15889
2019	3110	15892	3178	954	12714	13667	2733	16401
2020	3210	16403	3281	984	13122	14107	2821	16928
2021	3313	16929	3386	1016	13544	14559	2912	17471
2022	3420	17476	3495	1049	13981	15030	3006	18035
2023	3530	18038	3608	1082	14431	15513	3103	18616
2024	3643	18616	3723	1117	14893	16010	3202	19211
2025	3760	19214	3843	1153	15371	16524	3305	19828
2026	3881	19832	3966	1190	15866	17055	3411	20467
2027	4006	20471	4094	1228	16377	17605	3521	21126
2028	4135	21130	4226	1268	16903.9	18172	3634	21806
2029	4268	21809	4362	1309	17447.6	18756	3751	22507

Calculation Assumptions
20% of waste is combustible
30% of combustible waste is remaining after burning
There is no compaction.
20% cover material required per volume of garbage
Population growth rate is 3.2%

Hydrology Calculations Hamlet of Arviat

Annual Rainfall (m/year)	0.2972
Evapotranspiration (m/year)	0.200

Canadian Climate Normals 1971-2000, Environment Canada, Rankin Inlet Airport Weather Station

Specific values for Arviat were not available, estimated using several references, see below.

Surface Area of Landfill (m^2)	33825
Rain (m^3/year)	10,053
Evapotranspiration (m^3/year)	6,765
Net Precipitation Input to Landfill (m^3/year)	3,288

Evapotranspiration Rates

Location	alue (mm)	Reference
Arviat, Nunavut	203	FSC Architects & Engineers, 2003
Mackenzie Basin, Yukon	241	Serrereze et al, 2003
Lena Basin, Russai	182	Serrereze et al, 2003
Knob Lake, Quebec	280	Church, 1974
Boot Creek, Inuvik, NWT	75	Church, 1974
Mackenzie River Basin, Yukon	216	Yi Yip, 2008
Average	**200**	

References

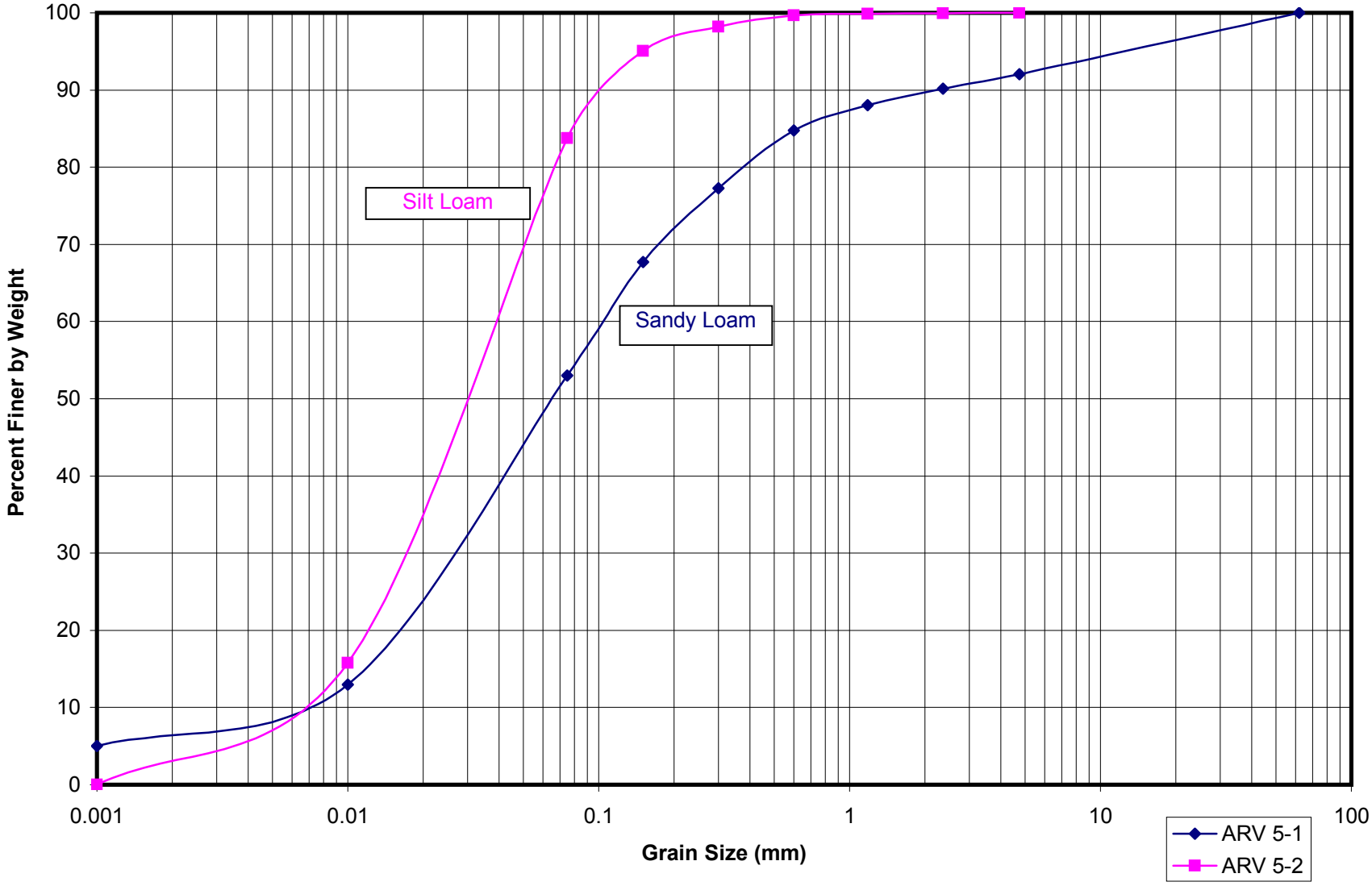
FSC Architects & Engineers, 2003. Design Concept for Arviat Sewage Lagoon prepared for Department of Community Government and Transportation, Government of Nunavut.

Church, M. 1974. Hydrology and Permafrost with Reference to Northern North America. In Proceedings: Workshop Seminar on Permafrost Hydrology, 7-20. Ottawa: Canadian National Committee, International Hydrological Decade (IHD).

Yi Yip, Q.M. 2008. Climate Impacts on Hydrometric Variables in Mackenzie River Basin. University of Waterloo, Waterloo, 2008.

Serreze, M.C., D.H. Bromwich, M.P. Clark, A.J. Etringer, T. Zhang and R. Lammers, 2003. Large-scale hydro-climatology of the terrestrial Arctic drainage system. Journal Geophysical Research, 108(D2). Doi:10. 1029/2002JD000919

Grain Size Distribution Plot -
Soil Samples from Bulky Waste Storage Area



Nuna Burnside Engineering and Environmental Ltd.
15746_SWM_Calculations.xls
Dec 2010

Hamlet of Arviat
N-O157460

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Appendix D
Sampling Results

Table D-1 Summary of Water uality Analysis - Landfill

Parameter	nit	Detection Limits	CCME Guidelines	AR -2	AR -2	AR -2
				7 23 2010	9 1 2010	9 10 2010
Colour	TCU	5		102	-	-
Electrical Conductivity	S/cm	2		2010	2520	2630
pH	N/A	-		8.07	8.11	8.21
Turbidity	NTU	0.5		8.1	-	-
Total Suspended Solids	mg/L	10		14	<5.0	8
Alkalinity (as CaCO3)	mg/L	5		440	-	-
Bicarbonate (as CaCO3)	mg/L	5		440	-	-
Total Hardness (as CaCO3)	mg/L	10		783	-	-
Ammonia as N	mg/L	0.02		11	12.9	13.3
Nitrate as N	mg/L	0.05		<0.05	<0.25	<0.25
Nitrite as N	mg/L	0.05		<0.05	<0.25	<0.25
Calcium	mg/L	0.05		248	244	230
Chloride	mg/L	0.1		244	-	-
Fluoride	mg/L	0.05		<0.05	-	-
Magnesium	mg/L	0.05		39.7	43	49
Orthophosphate as P	mg/L	0.1		0.33	-	-
Potassium	mg/L	0.05		44.7	43.9	44
Reactive Silica	mg/L	0.05		9.17	-	-
Sodium	mg/L	0.05		178	228	243
Sulphate	mg/L	0.1		539	461	475
Total Dissolved Solids	mg/L	20		1570	-	-
Total Organic Carbon	mg/L	0.5		52	-	-
Total Phosphorus	mg/L	0.05		0.64	0.62	0.56
$BOD_{(5)}$	mg/L	1		13	6.4	<6.0
Fecal Coliform	MPN/100ml	3		-	430	38
Escherichia coli	MPN/100ml	3		-	-	-
Aluminum	mg/L	0.004	0.1	0.02	0.0219	0.0095
Arsenic	mg/L	0.003	0.005	0.005	0.00468	0.00482
Barium	mg/L	0.002		0.05	0.0471	0.0458
Boron	mg/L	0.01		1.22	1.49	1.34
Cadmium	mg/L	0.002	0.00054-0.00004[1]	<0.002	<0.00001	<0.00010
Chromium Total	mg/L	0.003		0.013	<0.001	<0.0010
Chromium VI	mg/L	0.005	0.001	<0.005	-	-
Cobalt	mg/L	-		-	0.00051	0.00051
Copper	mg/L	0.003	0.002-0.004[1]	**0.007**	0.00129	0.00149
Iron	mg/L	0.01	0.30	**0.936**	**0.516**	**0.529**
Lead	mg/L	0.002	0.001-0.007[1]	**0.028**	0.000153	0.000145
Manganese	mg/L	0.002		0.983	0.663	0.599
Mercury	mg/L	0.0001	0.000026	<0.0001	<0.00005	<0.000050
Molybdenum	mg/L	0.002	0.073	<0.002	0.00039	0.00036
Nickel	mg/L	0.003	0.025-0.15[1]	0.004	0.0024	<0.0020
Selenium	mg/L	0.004	0.001	<0.004	<0.001	<0.0010
Silver	mg/L	0.002	0.0001	<0.002	<0.0001	<0.00010
Strontium	mg/L	0.005		1.68	1.53	1.66
Thallium	mg/L	0.006	0.0008	<0.006	<0.0001	<0.00010
Titanium	mg/L	0.002		0.01	0.00166	0.00299
Uranium	mg/L	0.002		<0.002	0.00064	0.00063
Vanadium	mg/L	0.002		<0.002	0.00071	0.00061
Zinc	mg/L	0.005	0.03	**0.077**	0.0203	0.016
Phenols	mg/L	0.001	0.004	**0.005**	<0.001	0.002
Total Oil and Grease	mg/L	0.5		5.2	2.4	<1.0

BOLD - indicates exceedence of CCME standards

CCME - Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Updated 2007

[1] Value depends on water hardness, see CCME Guidelines

TNTC - indicates Too Numerous To Count

Table D-1 Summary of Water uality Analysis - Landfill

Parameter	nit	Detection Limits	CCME Guidelines	LF-1	LF-2	LF-3	AR -2
				9 9 2010	9 9 2010	9 9 2010	11 1 2010
Colour	TCU	5		30	55	49	-
Electrical Conductivity	S/cm	2		1750	2040	2070	-
pH	N/A	-		7.9	8.03	8.27	-
Turbidity	NTU	0.5		0.9	3.3	1.6	-
Total Suspended Solids	mg/L	10		288	21	<10	-
Alkalinity (as CaCO3)	mg/L	5		252	322	263	-
Bicarbonate (as CaCO3)	mg/L	5		252	322	263	-
Total Hardness (as CaCO3)	mg/L	10		808	735	599	-
Ammonia as N	mg/L	0.02		<0.02	1.23	0.26	-
Nitrate as N	mg/L	0.05		<0.05	0.81	<0.05	-
Nitrite as N	mg/L	0.05		-	-	-	-
Calcium	mg/L	0.05		283	225	169	-
Chloride	mg/L	0.1		114	267	334	-
Fluoride	mg/L	0.05		<0.05	<0.05	<0.05	-
Magnesium	mg/L	0.05		24.5	42.1	43.1	-
Orthophosphate as P	mg/L	0.1		<0.1	<0.1	<0.1	-
Potassium	mg/L	0.05		20.8	30.6	37.5	-
Reactive Silica	mg/L	0.05		15.9	8.84	9.34	-
Sodium	mg/L	0.05		82.5	171	204	-
Sulphate	mg/L	0.1		650	518	469	-
Total Dissolved Solids	mg/L	20		1440	1520	1450	-
Total Organic Carbon	mg/L	0.5		36.5	25.8	26.5	-
Total Phosphorus	mg/L	0.05		1.57	0.34	0.2	-
BOD $_{(5)}$	mg/L	1		27.4	6.0	2.6	34
Fecal Coliform	MPN/100ml	3		23	9	4	TNTC
Escherichia coli	MPN/100ml	3		-	-	-	TNTC
Aluminum	mg/L	0.004	0.1	<0.004	0.006	0.004	-
Arsenic	mg/L	0.003	0.005	<0.003	0.003	0.003	-
Barium	mg/L	0.002		0.045	0.041	0.035	-
Boron	mg/L	0.01		0.736	0.805	0.773	-
Cadmium	mg/L	0.002	0.00054-0.00004[1]	<0.002	<0.002	<0.002	-
Chromium Total	mg/L	0.003		<0.003	0.006	0.006	-
Chromium VI	mg/L	0.005	0.001	<0.005	<0.005	<0.005	-
Cobalt	mg/L	-		-	-	-	-
Copper	mg/L	0.003	0.002-0.004[1]	<0.003	<0.003	<0.003	-
Iron	mg/L	0.01	0.30	<0.01	0.074	0.02	-
Lead	mg/L	0.002	0.001-0.007[1]	<0.002	<0.002	<0.002	-
Manganese	mg/L	0.002		0.045	0.216	0.226	-
Mercury	mg/L	0.0001	0.000026	<0.0001	<0.0001	<0.0001	-
Molybdenum	mg/L	0.002	0.073	<0.002	<0.002	<0.002	-
Nickel	mg/L	0.003	0.025-0.15[1]	<0.003	0.003	<0.003	-
Selenium	mg/L	0.004	0.001	<0.004	<0.004	<0.004	-
Silver	mg/L	0.002	0.0001	<0.002	<0.002	<0.002	-
Strontium	mg/L	0.005		2.54	1.71	1.31	-
Thallium	mg/L	0.006	0.0008	<0.006	<0.006	<0.006	-
Titanium	mg/L	0.002		0.008	0.007	0.006	-
Uranium	mg/L	0.002		<0.002	<0.002	<0.002	-
Vanadium	mg/L	0.002		<0.002	<0.002	<0.002	-
Zinc	mg/L	0.005	0.03	0.007	0.013	0.009	-
Phenols	mg/L	0.001	0.004	-	0.002	0.001	-
Total Oil and Grease	mg/L	0.5		-	-	-	-

BOLD - indicates exceedence of CCME standards

CCME - Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for th

[1] Value depends on water hardness, see CCME Guidelines

TNTC - indicates Too Numerous To Count

Table D-1 Summary of Water uality Analysis - Landfill

Parameter	nit	Reported Detection Limits	CCME Guidelines - Fresh Water	AR -2 9 10 2010
Petroleum Hydrocarbon F1 - F4 in Water (With PAHs)				
C6 - C10 (F1)	g/L	25		<25
C6 - C10 (F1 minus BTEX)	g/L	25		<25
C>10 - C16 (F2)	g/L	100		<100
C>10 - C16 (F2 minus Naphthalene)	g/L	100		<100
C6 - C16 (F1 F2)	g/L	100		<100
C>16 - C34 (F3)	g/L	100		<100
C>16 - C34 (F3 minus PAHs)	g/L	100		<100
C>34 - C50 (F4)	g/L	100		<100
C>16 - C50 (F3 F4)	g/L	100		<100
Gravimetric Heavy Hydrocarbons	g/L	500		NA
PAHs in Water				
Naphthalene	g/L	0.12		<0.12
Acenaphthylene	g/L	0.11		<0.11
Acenaphthene	g/L	0.10	5.8	<0.10
Fluorene	g/L	0.09	3	<0.09
Phenanthrene	g/L	0.10	0.4	<0.10
Anthracene	g/L	0.07		<0.07
Fluoranthene	g/L	0.12	0.04	<0.12
Pyrene	g/L	0.12	0.025	<0.12
Benzo(a)anthracene	g/L	0.08	0.018	<0.08
Chrysene	g/L	0.05		<0.05
Benzo(b)fluoranthene	g/L	0.05		<0.05
Benzo(k)fluoranthene	g/L	0.06		<0.06
Benzo(a)pyrene	g/L	0.01	0.015	<0.01
Indeno(1,2,3-cd)pyrene	g/L	0.03		<0.03
Dibenzo(a,h)anthracene	g/L	0.09		<0.09
Benzo(g,h,i)perylene	g/L	0.06		<0.06
2-and 1-methyl Napthalene	g/L	0.20	1.1	<0.20
Chrysene-d12	%			98
olatile Organic Compounds in Water (OC s)				
Dichlorodifluoromethane	g/L	0.80		<0.80
Chloromethane	g/L	1.60		<1.60
Vinyl Chloride	g/L	0.68		<0.68
Bromomethane	g/L	0.80		<0.80
Chloroethane	g/L	0.80		<0.80
Trichlorofluoromethane	g/L	1.60		<1.60
Acetone	g/L	4.0		<4.0
1,1 Dichloroethylene	g/L	1.20		<1.20
Methylene Chloride	g/L	1.20		<1.20
trans- 1,2-dichloroethylene	g/L	0.80		<0.80
Methyl tert-butyl ether	g/L	0.80		<0.80
1,1-Dichloroethane	g/L	1.20		<1.20
Methyl Ethyl Ketone	g/L	4.0		<4.0
cis- 1,2-Dichloroethylene	g/L	0.80		<0.80
Chloroform	g/L	0.80	1.8	<0.80
1,2 - Dichloroethane	g/L	0.80	100	<0.80
1,1,1-Trichloroethane	g/L	1.20		<1.20
Carbon Tetrachloride	g/L	0.80		<0.80
Benzene	g/L	0.80		<0.80
1,2-Dichloropropane	g/L	0.80		<0.80
Trichloroethylene	g/L	0.80		<0.80
Bromodichloromethane	g/L	0.80		<0.80
cis-1,3-Dichloropropene	ug/L	0.80		<0.80
Methyl Isobutyl Ketone	g/L	4.0		<4.0
trans-1,3-Dichloropropene	g/L	1.20		<1.20
1,1,2-Trichloroethane	g/L	0.80		<0.80
Toluene	g/L	0.80		<0.80
2-Hexanone	g/L	1.20		<1.20
Dibromochloromethane	g/L	0.40		<0.40
Ethylene Dibromide	g/L	0.80		<0.80
Tetrachloroethylene	g/L	0.80		<0.80
1,1,1,2-Tetrachloroethane	g/L	0.40		<0.40
Chlorobenzene	g/L	0.40		<0.40
Ethylbenzene	g/L	0.40		<0.40
m & p-Xylene	g/L	0.80		<0.80
Bromoform	g/L	0.40		<0.40
Styrene	g/L	0.40		<0.40
1,1,2,2-Tetrachloroethane	g/L	0.40		<0.40
o-Xylene	g/L	0.40		<0.40
1,3-Dichlorobenzene	g/L	0.40	150	<0.40
1,4-Dichlorobenzene	g/L	0.40	26	<0.40
1,2-Dichlorobenzene	g/L	0.40	0.7	<0.40
1,2,4-Trichlorobenzene	g/L	1.20	24	<1.20
1,3-Dichloropropene (Cis Trans)	g/L	1.20		<1.20
Xylene Mixture (Total)	g/L	0.80		<0.80
n-Hexane	g/L	0.80		<0.80
Toluene-d8	% Recovery			99
4-Bromofluorobenzene	% Recovery			92

CCME - Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Updated 2007

Table D-2 Summary of Water uality Analysis
Bulky Metals Area

Parameter	nit	Reported Detection Limits (Sept)	Reported Detection Limits (Nov)	CCME Guidelines	BW-1	AR -5	AR -5-2
					9 9 2010	11 2 2010	11 2 2010
Petroleum Hydrocarbon F1 - F4 in Water (With PAHs)							
C6 - C10 (F1)	g/L	25	25		<25	<25	<25
C6 - C10 (F1 minus BTEX)	g/L	25	25		<25	<25	<25
C>10 - C16 (F2)	g/L	100	100		<100	<100	<100
C>10 - C16 (F2 minus Naphthalene)	g/L	100	100		<100	<100	<100
C6 - C16 (F1 F2)	g/L	100	100		<100	<100	<100
C>16 - C34 (F3)	g/L	100	100		<100	<100	<100
C>16 - C34 (F3 minus PAHs)	g/L	100	100		<100	<100	<100
C>34 - C50 (F4)	g/L	100	100		<100	<100	<100
C>16 - C50 (F3 F4)	g/L	100	100		<100	<100	<100
Gravimetric Heavy Hydrocarbons	g/L	500	500		NA	NA	NA
PAHs in Water							
Naphthalene	g/L	0.12	0.12		<0.12	-	-
Acenaphthylene	g/L	0.11	0.11		<0.11	-	-
Acenaphthene	g/L	0.10	0.10	5.8	<0.10	-	-
Fluorene	g/L	0.09	0.09	3	<0.09	-	-
Phenanthrene	g/L	0.10	0.10	0.4	<0.10	-	-
Anthracene	g/L	0.07	0.07		<0.07	-	-
Fluoranthene	g/L	0.12	0.12	0.04	<0.12	-	-
Pyrene	g/L	0.12	0.12	0.025	<0.12	-	-
Benzo(a)anthracene	g/L	0.08	0.08	0.018	<0.08	-	-
Chrysene	g/L	0.05	0.05		<0.05	-	-
Benzo(b)fluoranthene	g/L	0.05	0.05		<0.05	-	-
Benzo(k)fluoranthene	g/L	0.06	0.06		<0.06	-	-
Benzo(a)pyrene	g/L	0.01	0.01	0.015	<0.01	-	-
Indeno(1,2,3-cd)pyrene	g/L	0.03	0.03		<0.03	-	-
Dibenzo(a,h)anthracene	g/L	0.09	0.09		<0.09	-	-
Benzo(g,h,i)perylene	g/L	0.06	0.06		<0.06	-	-
2-and 1-methyl Napthalene	g/L	0.20	0.20	1.1	<0.20	-	-
Chrysene-d12	%				97	-	-
olatile Organic Compounds in Water (OC s)							
1,1 Dichloroethylene	g/L	0.30	0.60		<0.30	<0.60	<3.00
1,1,1,2-Tetrachloroethane	g/L	0.10	0.20		<0.10	<0.20	<1.00
1,1,1-Trichloroethane	g/L	0.30	0.60		<0.30	<0.60	<3.00
1,1,2,2-Tetrachloroethane	g/L	0.10	0.20		<0.10	<0.20	<1.00
1,1,2-Trichloroethane	g/L	0.20	0.40		<0.20	<0.40	<2.00
1,1-Dichloroethane	g/L	0.30	0.60		<0.30	<0.60	<3.00
1,2 - Dichloroethane	g/L	0.20	0.40	100	<0.20	<0.40	<2.00
1,2,4-Trichlorobenzene	g/L	0.30	0.60	24	<0.30	<0.60	<3.00
1,2-Dichlorobenzene	g/L	0.10	0.20	0.7	<0.10	<0.20	<1.00
1,2-Dichloropropane	g/L	0.20	0.40		<0.20	<0.40	<2.00
1,3-Dichlorobenzene	g/L	0.10	0.20	150	<0.10	<0.20	<1.00
1,3-Dichloropropene (Cis Trans)	g/L	0.30	0.60		<0.30	<0.60	<3.00
1,4-Dichlorobenzene	g/L	0.10	0.20	26	<0.10	<0.20	<1.00
2-Hexanone	g/L	0.30	0.60		<0.30	<0.60	<3.00
4-Bromofluorobenzene	% Recovery				92	89	85
Acetone	g/L	1.0	10.0		<1.0	<2.0	<10.0
Benzene	g/L	0.20	0.40	370	<0.20	<0.40	<2.00
Bromodichloromethane	g/L	0.20	0.40		<0.20	<0.40	<2.00
Bromoform	g/L	0.10	0.20		<0.10	<0.20	<1.00
Bromomethane	g/L	0.20	0.40		<0.20	<0.40	<2.00
Carbon Tetrachloride	g/L	0.20	0.40		<0.20	<0.40	<2.00
Chlorobenzene	g/L	0.10	0.20		<0.10	<0.20	<1.00
Chloroethane	g/L	0.20	0.40		<0.20	<0.40	<2.00
Chloroform	g/L	0.20	0.40	1.8	<0.20	<0.40	<2.00
Chloromethane	g/L	0.40	0.80		<0.40	<0.80	<4.00
cis- 1,2-Dichloroethylene	g/L	0.20	0.40		<0.20	<0.40	<2.00
cis-1,3-Dichloropropene	ug/L	0.20	0.40		<0.20	<0.40	<2.00
Dibromochloromethane	g/L	0.10	0.20		<0.10	<0.20	<1.00
Dichlorodifluoromethane	g/L	0.20	0.40		20	<0.40	<2.00
Ethylbenzene	g/L	0.10	0.20		<0.10	<0.20	<1.00
Ethylene Dibromide	g/L	0.20	0.40		<0.20	<0.40	<2.00
m & p-Xylene	g/L	0.20	0.40		<0.20	<0.40	<2.00
Methyl Ethyl Ketone	g/L	1.0	10.0		<1.0	<2.0	<10.0
Methyl Isobutyl Ketone	g/L	1.0	10.0		<1.0	<2.0	<10.0
Methyl tert-butyl ether	g/L	0.20	0.40		<0.20	<0.40	<2.00
Methylene Chloride	g/L	0.30	0.60		<0.30	<0.60	<3.00
n-Hexane	g/L	0.20	0.40		<0.20	<0.40	<2.00
o-Xylene	g/L	0.10	0.20		<0.10	<0.20	<1.00
Styrene	g/L	0.10	0.20		<0.10	<0.20	<1.00
Tetrachloroethylene	g/L	0.20	0.40		<0.20	<0.40	<2.00
Toluene	g/L	0.20	0.40		<0.20	<0.40	<2.00
Toluene-d8	% Recovery				100	76	74
trans- 1,2-dichloroethylene	g/L	0.20	0.40		<0.20	<0.40	<2.00
trans-1,3-Dichloropropene	g/L	0.30	0.60		<0.30	<0.60	<3.00
Trichloroethylene	g/L	0.20	0.40		<0.20	<0.40	<2.00
Trichlorofluoromethane	g/L	0.40	0.80		17	<0.80	<4.00
Vinyl Chloride	g/L	0.17	0.34		<0.17	<0.34	<1.70
Xylene Mixture (Total)	g/L	0.20	0.40		<0.20	<0.40	<2.00

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BOLD - indicates exceedence of CCME standards

Table D-2 Summary of Water uality Analysis
Bulky Metals Area

Parameter	nit	Reported Detection Limits	CCME Guidelines	AR -5	AR -5-2
				11 2 2010	11 2 2010
Colour	TCU	5		113	1050
Electrical Conductivity	S/cm	2		1200	9230
pH	N/A	-		6.61	6.31
Turbidity	NTU	0.5		369	239
Alkalinity (as CaCO3)	mg/L	5		47	118
Bicarbonate (as CaCO3)	mg/L	5		47	118
Total Hardness (as CaCO3)	mg/L	10		248	1460
Ammonia as N	mg/L	0.02		<0.02	20.8
Nitrate as N	mg/L	0.05		<0.05	<0.05
Nitrite as N	mg/L	0.05		<0.05	<0.05
Calcium	mg/L	0.05		45.5	106
Chloride	mg/L	0.1		340	3110
Fluoride	mg/L	0.05		<0.05	<0.05
Magnesium	mg/L	0.05		32.7	290
Orthophosphate as P	mg/L	0.1		<0.1	<1.00
Potassium	mg/L	0.05		7.66	57.1
Reactive Silica	mg/L	0.05		13.8	31.8
Sodium	mg/L	0.05		160	1640
Sulphate	mg/L	0.1		55.9	636
Total Dissolved Solids	mg/L	20		816	5930
Total Organic Carbon	mg/L	0.5		53.6	240
Total Phosphorus	mg/L	0.05		0.87	2.42
Aluminum	mg/L	0.004	0.1	**3.92**	**6.13**
Arsenic	mg/L	0.003	0.005	**0.008**	**0.012**
Barium	mg/L	0.002		**0.073**	**0.074**
Boron	mg/L	0.01		**0.045**	**0.769**
Cadmium	mg/L	0.002	0.00054-0.00004[1]	<0.002	**0.003**
Chromium Total	mg/L	0.003		0.01	0.111
Copper	mg/L	0.003	0.002-0.004[1]	0.01	0.039
Iron	mg/L	0.01	0.3	**5.85**	**131.0**
Lead	mg/L	0.002	0.001-0.007[1]	**0.008**	**0.01**
Manganese	mg/L	0.002		0.49	0.831
Mercury	mg/L	0.0001	0.000026	<0.0001	<0.0001
Molybdenum	mg/L	0.002	0.073	<0.002	0.003
Nickel	mg/L	0.003	0.025-0.15[1]	0.012	0.049
Selenium	mg/L	0.004	0.001	<0.004	<0.004
Silver	mg/L	0.002	0.0001	<0.002	<0.002
Strontium	mg/L	0.005		0.408	1.5
Thallium	mg/L	0.006	0.0008	<0.006	<0.006
Titanium	mg/L	0.002		0.114	0.132
Uranium	mg/L	0.002		<0.002	0.004
Vanadium	mg/L	0.002		0.022	0.056
Zinc	mg/L	0.005	0.03	**0.068**	**0.079**

CCME - Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Updated 2007
BOLD - indicates exceedence of CCME standards

Table D-3 Summary of Analysis - Soil Samples at Bulky Waste Area

Parameter	nit	Reported Detection Limit	CCME Guidelines	BW-P1-A	BW-P1-B	BW-P2-A	BW-P2-B
				9 9 2010	9 9 2010	9 9 2010	9 9 2010
Metals							
Antimony	g/g	0.8		<0.8	<0.8	<0.8	<0.8
Arsenic	g/g	1	12	3	1	2	1
Barium	g/g	2	2000	26	35	31	31
Beryllium	g/g	0.5		<0.5	<0.5	<0.5	<0.5
Boron	g/g	5		<5	<5	<5	<5
Cadmium	g/g	0.5	22	<0.5	<0.5	<0.5	<0.5
Chromium	g/g	2	87	11	15	13	12
Cobalt	g/g	0.5		2.7	3.9	3.2	3.2
Copper	g/g	1	91	11	10	18	9
Lead	g/g	1	600	4	4	9	5
Molybdenum	g/g	0.5		0.7	<0.5	0.6	<0.5
Nickel	g/g	1	50	6	9	8	7
Selenium	g/g	0.4	2.9	<0.4	<0.4	<0.4	<0.4
Silver	g/g	0.2		<0.2	<0.2	<0.2	<0.2
Thallium	g/g	0.4	1	<0.4	<0.4	<0.4	<0.4
Uranium	ug/g	0.5	300	1.2	1.4	1	1.3
Vanadium	g/g	1	130	14	18	14	16
Zinc	g/g	5	360	25	34	54	20
Petroleum Hydrocarbons and BTE							
Benzene	g/g	0.002	0.03	<0.002	<0.002	<0.002	<0.002
Toluene	g/g	0.002	0.37	<0.002	<0.002	<0.002	<0.002
Ethylbenzene	g/g	0.002	0.082	<0.002	<0.002	<0.002	<0.002
m & p-Xylene	g/g	0.002		<0.002	<0.002	<0.002	<0.002
o-Xylene	g/g	0.002		<0.002	<0.002	<0.002	<0.002
Xylene Mixture (Total)	g/g	0.002	11	<0.002	<0.002	<0.002	<0.002
Toluene-d8	% Recovery			113	106	112	94
4-Bromofluorobenzene	% Recovery			115	103	109	122
C6 - C10 (F1)	g/g	5	320	<5	11	<5	<5
C6 - C10 (F1 minus BTEX)	g/g	5		<5	11	<5	<5
C>10 - C16 (F2)	g/g	10	260	**1200**	**3400**	240	130
C>10 - C16 (F2 minus Naphthalene)	g/g	10		1200	3400	240	130
C>16 - C34 (F3)	g/g	50	1700	430	**1800**	**9100**	130
C>16 - C34 (F3 minus PAHs)	g/g	50		430	1800	9100	130
C>34 - C50 (F4)	g/g	50	3300	<50	<50	730	79
Moisture Content	%	0.1		7.2	8.4	4.2	3
PAHs							
Naphthalene	g/g	0.03	22	<0.03	0.04	0.04	<0.03
Acenaphthylene	g/g	0.02		<0.02	0.04	<0.02	<0.02
Acenaphthene	g/g	0.03		<0.03	0.03	<0.03	<0.03
Fluorene	g/g	0.02		0.02	0.15	<0.02	<0.02
Phenanthrene	g/g	0.02		<0.02	0.03	<0.02	<0.02
Anthracene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
Fluoranthene	g/g	0.02		<0.02	0.03	<0.02	<0.02
Pyrene	g/g	0.02		0.02	0.06	0.03	<0.02
Benzo(a)anthracene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
Chrysene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
Benzo(b)fluoranthene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
Benzo(a)pyrene	g/g	0.02	0.7	<0.02	<0.02	<0.02	<0.02
Indeno(1,2,3-cd)pyrene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
Dibenz(a,h)anthracene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
Benzo(g,h,i)perylene	g/g	0.02		<0.02	<0.02	<0.02	<0.02
2-and 1-methyl Naphthalene	g/g	0.05		<0.05	<0.05	<0.05	<0.05
Chrysene-d12	%			79	89	100	93
Other Parameters							
Phenols, Total	mg/kg	1	3.8	<1	<1	<1	<1
PCBs	g/g	0.1	33	<0.1	<0.1	<0.1	<0.1
Decachlorobiphenyl	%			97	120	80	90

Guidelines sed

Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health - Industrial Land Use, Coarse Grained
Canada-Wide Standard for Petroleum Hydrocarbonds in Soil, CCME 2008-2009

Table D-4 Summary of Soil Analysis - Hazardous Waste Storage Area

Parameter	nit	Reported Detection Limit	CCME Guidelines	HW-1	HW-2	HW-3
				9 10 2010	9 10 2010	9 10 2010
Metals						
Antimony	g/g	0.8		<0.8	<0.8	<0.8
Arsenic	g/g	1	12	2	4	2
Barium	g/g	2	2000	22	23	21
Beryllium	g/g	0.5		<0.5	<0.5	<0.5
Boron	g/g	5		<5	<5	<5
Cadmium	g/g	0.5	22	<0.5	<0.5	<0.5
Chromium	g/g	2	87	8	15	9
Cobalt	g/g	0.5		2.4	2.7	2.4
Copper	g/g	1	91	7	6	9
Lead	g/g	1	600	4	3	3
Molybdenum	g/g	0.5		<0.5	1	0.5
Nickel	g/g	1	50	5	7	5
Selenium	g/g	0.4	2.9	<0.4	<0.4	<0.4
Silver	g/g	0.2		<0.2	<0.2	<0.2
Thallium	g/g	0.4	1	<0.4	<0.4	<0.4
Uranium	ug/g	0.5	300	0.9	0.9	1.2
Vanadium	g/g	1	130	12	13	14
Zinc	g/g	5	360	159	125	31
Petroleum Hydrocarbons and BTE						
Benzene	g/g	0.002	0.03	<0.002	<0.002	<0.002
Toluene	g/g	0.002	0.37	<0.002	<0.002	<0.002
Ethylbenzene	g/g	0.002	0.082	<0.002	<0.002	<0.002
m & p-Xylene	g/g	0.002		<0.002	<0.002	<0.002
o-Xylene	g/g	0.002		<0.002	<0.002	<0.002
Xylene Mixture (Total)	g/g	0.002	11	<0.002	<0.002	<0.002
Toluene-d8	% Recovery			100	113	99
4-Bromofluorobenzene	% Recovery			120	104	113
C6 - C10 (F1)	g/g	5	320	<5	<5	<5
C6 - C10 (F1 minus BTEX)	g/g	5		<5	<5	<5
C>10 - C16 (F2)	g/g	10	260	<10	<10	<10
C>10 - C16 (F2 minus Naphthalene)	g/g	10		<10	<10	<10
C>16 - C34 (F3)	g/g	50	1700	**26000**	**32000**	**24000**
C>16 - C34 (F3 minus PAHs)	g/g	50		26000	32000	24000
C>34 - C50 (F4)	g/g	50	3300	**4800**	**6000**	**4400**
Moisture Content	%	0.1		7.5	2.2	6.3
PAHs						
Naphthalene	g/g	0.03	22	0.03	<0.03	0.05
Acenaphthylene	g/g	0.02		<0.02	<0.02	<0.02
Acenaphthene	g/g	0.03		<0.03	<0.03	<0.03
Fluorene	g/g	0.02		<0.02	<0.02	<0.02
Phenanthrene	g/g	0.02		<0.02	<0.02	<0.02
Anthracene	g/g	0.02		<0.02	<0.02	<0.02
Fluoranthene	g/g	0.02		0.02	<0.02	<0.02
Pyrene	g/g	0.02		0.04	0.02	0.03
Benzo(a)anthracene	g/g	0.02		0.21	0.11	0.14
Chrysene	g/g	0.02		0.11	0.07	0.1
Benzo(b)fluoranthene	g/g	0.02		0.07	0.05	0.04
Benzo(k)fluoranthene	g/g	0.02		0.02	<0.02	0.02
Benzo(a)pyrene	g/g	0.02	0.7	0.13	0.09	0.07
Indeno(1,2,3-cd)pyrene	g/g	0.02		0.05	0.03	0.03
Dibenz(a,h)anthracene	g/g	0.02		<0.02	<0.02	<0.02
Benzo(g,h,i)perylene	g/g	0.02		0.08	0.05	0.04
2-and 1-methyl Naphthalene	g/g	0.05		0.05	<0.05	<0.05
Chrysene-d12	%			89	95	89
Other Parameters						
Phenols, Total	mg/kg	1	3.8	<1	<1	<1
PCBs	g/g	0.1	33	<0.1	<0.1	<0.1
Decachlorobiphenyl	%			63	82	89

Guidelines sed
Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health - Industrial Land Use, Coarse Grained

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Certificate of Analysis

AGAT WORK ORDER: 10T421969
PROJECT NO: Arviat

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Jim Walls

Microbiological Analysis (water)

DATE SAMPLED: Jul 23, 2010 | DATE RECEIVED: Jul 24, 2010 | DATE REPORTED: Aug 04, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-4 1889491
Escherichia coli	CFU/1mL	1	1	17700
Total Coliforms	CFU/1mL	1	1	TNTC
Fecal Coliform	CFU/1mL	1	1	13100
Heterotrophic Plate Count	CFU/mL		10	TNTC

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard: Refers to SDWA -Schedule 23

1889491 The bacteria counts refer to a 1 mL sample aliquot diluted to 100 mL prior to filtration and incubation. A larger aliquot resulted in an overgrown plates.

Certified By: Elizabeth Rolokowska

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AGAT WORK ORDER: 10T421969
PROJECT NO: Arviat

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Jim Walls

Oil and Grease water

DATE SAMPLED: Jul 23, 2010 | DATE RECEIVED: Jul 24, 2010 | DATE REPORTED: Aug 04, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 1889489	ARV-4 1889491
Oil and Grease (animal/vegetable)	mg/L		0.5	5.2	19
Oil and Grease (mineral) in water	mg/L		0.5	<0.5	1.5
Oil and Grease (Total) in water	mg/L		0.5	5.2	21

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T421969
PROJECT NO: Arviat

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Jim Walls

BURNSIDE - Water Quality Assessment BOD, TSS, Phenols & Cr VI

DATE SAMPLED: Jul 23, 2010 | DATE RECEIVED: Jul 24, 2010 | DATE REPORTED: Aug 04, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 1889489	ARV-4 1889491
Aluminum	mg/L		0.004	0.020	1.90
Arsenic	mg/L		0.003	0.005	0.020
Barium	mg/L		0.002	0.050	0.723
Boron	mg/L		0.010	1.22	0.223
Cadmium	mg/L		0.002	<0.002	<0.002
Calcium	mg/L		0.05	248	8.57
Chromium	mg/L		0.003	0.013	0.015
Copper	mg/L		0.003	0.007	0.246
Iron	mg/L		0.010	0.936	56.4
Potassium	mg/L		0.05	44.7	19.7
Magnesium	mg/L		0.05	39.7	4.83
Mercury	mg/L		0.0001	<0.0001	<0.0001
Manganese	mg/L		0.002	0.983	1.65
Molybdenum	mg/L		0.002	<0.002	<0.002
Sodium	mg/L		0.05	178	61.3
Nickel	mg/L		0.003	0.004	0.018
Total Phosphorus	mg/L		0.05	0.64	6.63
Lead	mg/L		0.002	0.028	0.057
Selenium	mg/L		0.004	<0.004	<0.004
Silver	mg/L		0.002	<0.002	<0.002
Strontium	mg/L		0.005	1.68	0.561
Thallium	mg/L		0.006	<0.006	<0.006
Titanium	mg/L		0.002	0.010	0.016
Uranium	mg/L		0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.020
Zinc	mg/L		0.005	0.077	0.226
Fluoride	mg/L		0.05	<0.05	<0.05
Chloride	mg/L		0.10	244	71.2
Nitrite as N	mg/L		0.05	<0.05	<0.05
Ortho phosphate as P	mg/L		0.10	0.33	6.89
Bromide	mg/L		0.05	1.87	<0.05
Nitrate as N	mg/L		0.05	<0.05	<0.05
Sulphate	mg/L		0.10	539	0.98

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AGAT WORK ORDER: 10T421969
PROJECT NO: Arviat

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Jim Walls

BURNSIDE - Water Quality Assessment BOD, TSS, Phenols & Cr VI

DATE SAMPLED: Jul 23, 2010 | DATE RECEIVED: Jul 24, 2010 | DATE REPORTED: Aug 04, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 1889489	ARV-4 1889491
pH	pH Units		NA	8.07	7.68
Ammonia as N	mg/L		0.02	11.0	72.1
Total Organic Carbon	mg/L		0.5	52.0	157
Electrical Conductivity	uS/cm		2	2010	827
Total Dissolved Solids	mg/L		20	1570	322
Saturation pH				6.36	7.76
% Difference/ Ion Balance			0.1	3.0	5.9
Total Hardness (as CaCO3)	mg/L		10	783	41
Langlier Index				1.71	-0.08
Carbonate (as CaCO3)	mg/L		5	<5	<5
Bicarbonate (as CaCO3)	mg/L		5	440	305
Turbidity	NTU		0.5	8.1	38
Alkalinity (as CaCO3)	mg/L		5	440	305
Hydroxide (as CaCO3)	mg/L		5	<5	<5
Reactive Silica	mg/L		0.05	9.17	11.2
Colour	TCU		5	102	266
BOD (5)	mg/L		5	13	98
Total Suspended Solids	mg/L		10	14	104
Phenols	mg/L		0.001	0.005	0.187
Chromium VI	mg/L		0.005	<0.005	<0.005

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 10T421969

PROJECT NO: Arviat

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ATTENTION TO: Jim Walls

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
1889491	ARV-4	SDWA -Schedule 23	Microbiological Analysis (water)	Escherichia coli	1	17700
1889491	ARV-4	SDWA -Schedule 23	Microbiological Analysis (water)	Fecal Coliform	1	13100

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Certificate of Analysis

R.J. BURNSIDE

ATTN: STEPHANIE CHARITY / JIM WALLS

292 SPEEDVALE AVE., WEST
UNIT #7
GUELPH ON N1H 1C4

Report Date: 14-SEP-10 13:45 (MT)
Version: FINAL

Lab Work Order #: L927467 **Date Received:** 02-SEP-10

Project P.O. #: NOT SUBMITTED
Job Reference: N-015746
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

Paul Nicolas
Account Manager

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ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L927467-1 ARV-2 Sampled By: CLIENT on 01-SEP-10 @ 15:45 Matrix: WATER							
Physical Tests							
Conductivity	2520		0.40	umhos/cm		03-SEP-10	R1459503
pH	8.11		0.10	pH units		03-SEP-10	R1459503
Total Suspended Solids	<5.0		5.0	mg/L		08-SEP-10	R1461947
Anions and Nutrients							
Ammonia as N	12.9		0.050	mg/L		14-SEP-10	R1465344
Nitrate and Nitrite as N	<0.35		0.35	mg/L		07-SEP-10	
Nitrate-N	<0.25		0.25	mg/L		03-SEP-10	R1459992
Nitrite-N	<0.25		0.25	mg/L		03-SEP-10	R1459992
Sulfate	461		2.5	mg/L		03-SEP-10	R1459992
Bacteriological Tests							
Fecal Coliforms	430		3	MPN/100mL		06-SEP-10	R1459728
Total Metals							
Aluminum (Al)-Total	0.0219		0.0050	mg/L	07-SEP-10	07-SEP-10	R1460846
Antimony (Sb)-Total	0.00405		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Arsenic (As)-Total	0.00468		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Barium (Ba)-Total	0.0471		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Beryllium (Be)-Total	<0.00020		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Bismuth (Bi)-Total	<0.00020		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Boron (B)-Total	1.49		0.010	mg/L	07-SEP-10	07-SEP-10	R1460846
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	07-SEP-10	07-SEP-10	R1460846
Calcium (Ca)-Total	244		0.10	mg/L	07-SEP-10	07-SEP-10	R1460846
Cesium (Cs)-Total	<0.00010		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Chromium (Cr)-Total	<0.0010		0.0010	mg/L	07-SEP-10	07-SEP-10	R1460846
Cobalt (Co)-Total	0.00051		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Copper (Cu)-Total	0.00129		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Iron (Fe)-Total	0.516		0.020	mg/L	07-SEP-10	07-SEP-10	R1460846
Lead (Pb)-Total	0.000153		0.000090	mg/L	07-SEP-10	07-SEP-10	R1460846
Lithium (Li)-Total	0.0363		0.0020	mg/L	07-SEP-10	07-SEP-10	R1460846
Magnesium (Mg)-Total	43.0		0.010	mg/L	07-SEP-10	07-SEP-10	R1460846
Manganese (Mn)-Total	0.663		0.00030	mg/L	07-SEP-10	07-SEP-10	R1460846
Mercury (Hg)-Total	<0.000050		0.000050	mg/L	03-SEP-10	03-SEP-10	R1459886
Molybdenum (Mo)-Total	0.00039		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Nickel (Ni)-Total	0.0024		0.0020	mg/L	07-SEP-10	07-SEP-10	R1460846
Phosphorus (P)-Total	0.62		0.20	mg/L	07-SEP-10	07-SEP-10	R1460846
Potassium (K)-Total	43.9		0.020	mg/L	07-SEP-10	07-SEP-10	R1460846
Rubidium (Rb)-Total	0.0411		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Selenium (Se)-Total	<0.0010		0.0010	mg/L	07-SEP-10	07-SEP-10	R1460846
Silicon (Si)-Total	5.34		0.050	mg/L	07-SEP-10	07-SEP-10	R1460846
Silver (Ag)-Total	<0.00010		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Sodium (Na)-Total	228		0.030	mg/L	07-SEP-10	07-SEP-10	R1460846
Strontium (Sr)-Total	1.53		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L927467-1 ARV-2 Sampled By: CLIENT on 01-SEP-10 @ 15:45 Matrix: WATER							
Total Metals							
Thallium (Tl)-Total	<0.00010		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Thorium (Th)-Total	<0.00010		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Tin (Sn)-Total	<0.00020		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Titanium (Ti)-Total	0.00166		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Tungsten (W)-Total	<0.0010		0.0010	mg/L	07-SEP-10	07-SEP-10	R1460846
Uranium (U)-Total	0.00064		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Vanadium (V)-Total	0.00071		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Zinc (Zn)-Total	0.0203		0.0050	mg/L	07-SEP-10	07-SEP-10	R1460846
Zirconium (Zr)-Total	0.00047		0.00040	mg/L	07-SEP-10	07-SEP-10	R1460846
Aggregate Organics							
Biochemical Oxygen Demand	6.4		1.0	mg/L	03-SEP-10	08-SEP-10	R1460687
Total Oil and Grease	2.4	DLM	2.0	mg/L	10-SEP-10	10-SEP-10	R1459975
Phenols (4AAP)	<0.0010		0.0010	mg/L	08-SEP-10	08-SEP-10	R1461126
L927467-2 ARV-4 Sampled By: CLIENT on 01-SEP-10 @ 15:45 Matrix: WATER							
Physical Tests							
Conductivity	1130		0.40	umhos/cm		03-SEP-10	R1459503
pH	7.43		0.10	pH units		03-SEP-10	R1459503
Total Suspended Solids	91.1		5.0	mg/L		08-SEP-10	R1461947
Anions and Nutrients							
Ammonia as N	47.9		0.050	mg/L		14-SEP-10	R1465344
Nitrate and Nitrite as N	<0.35		0.35	mg/L		07-SEP-10	
Nitrate-N	<0.25		0.25	mg/L		03-SEP-10	R1459992
Nitrite-N	<0.25		0.25	mg/L		03-SEP-10	R1459992
Sulfate	9.3		2.5	mg/L		03-SEP-10	R1459992
Bacteriological Tests							
Fecal Coliforms	110000		3	MPN/100mL		06-SEP-10	R1459728
Total Metals							
Aluminum (Al)-Total	0.366		0.0050	mg/L	07-SEP-10	07-SEP-10	R1460846
Antimony (Sb)-Total	0.00038		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Arsenic (As)-Total	0.0128		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Barium (Ba)-Total	0.0424		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Beryllium (Be)-Total	<0.00020		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Bismuth (Bi)-Total	0.00020		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Boron (B)-Total	0.220		0.010	mg/L	07-SEP-10	07-SEP-10	R1460846
Cadmium (Cd)-Total	0.000138		0.000010	mg/L	07-SEP-10	07-SEP-10	R1460846
Calcium (Ca)-Total	14.3		0.10	mg/L	07-SEP-10	07-SEP-10	R1460846
Cesium (Cs)-Total	<0.00010		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Chromium (Cr)-Total	0.0012		0.0010	mg/L	07-SEP-10	07-SEP-10	R1460846
Cobalt (Co)-Total	0.00250		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Copper (Cu)-Total	0.0547		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L927467-2 ARV-4 Sampled By: CLIENT on 01-SEP-10 @ 15:45 Matrix: WATER							
Total Metals							
Iron (Fe)-Total	8.09		0.020	mg/L	07-SEP-10	07-SEP-10	R1460846
Lead (Pb)-Total	0.00202		0.000090	mg/L	07-SEP-10	07-SEP-10	R1460846
Lithium (Li)-Total	0.0108		0.0020	mg/L	07-SEP-10	07-SEP-10	R1460846
Magnesium (Mg)-Total	9.17		0.010	mg/L	07-SEP-10	07-SEP-10	R1460846
Manganese (Mn)-Total	0.428		0.00030	mg/L	07-SEP-10	07-SEP-10	R1460846
Mercury (Hg)-Total	<0.000050		0.000050	mg/L	03-SEP-10	03-SEP-10	R1459886
Molybdenum (Mo)-Total	0.00210		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Nickel (Ni)-Total	0.0078		0.0020	mg/L	07-SEP-10	07-SEP-10	R1460846
Phosphorus (P)-Total	6.53		0.20	mg/L	07-SEP-10	07-SEP-10	R1460846
Potassium (K)-Total	23.3		0.020	mg/L	07-SEP-10	07-SEP-10	R1460846
Rubidium (Rb)-Total	0.0255		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Selenium (Se)-Total	<0.0010		0.0010	mg/L	07-SEP-10	07-SEP-10	R1460846
Silicon (Si)-Total	6.52		0.050	mg/L	07-SEP-10	07-SEP-10	R1460846
Silver (Ag)-Total	0.00035		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Sodium (Na)-Total	98.4		0.030	mg/L	07-SEP-10	07-SEP-10	R1460846
Strontium (Sr)-Total	0.128		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Thallium (Tl)-Total	<0.00010		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Thorium (Th)-Total	0.00024		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Tin (Sn)-Total	0.00083		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Titanium (Ti)-Total	0.0205		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Tungsten (W)-Total	<0.0010		0.0010	mg/L	07-SEP-10	07-SEP-10	R1460846
Uranium (U)-Total	0.00041		0.00010	mg/L	07-SEP-10	07-SEP-10	R1460846
Vanadium (V)-Total	0.00707		0.00020	mg/L	07-SEP-10	07-SEP-10	R1460846
Zinc (Zn)-Total	0.0462		0.0050	mg/L	07-SEP-10	07-SEP-10	R1460846
Zirconium (Zr)-Total	0.00122		0.00040	mg/L	07-SEP-10	07-SEP-10	R1460846
Aggregate Organics							
Biochemical Oxygen Demand	40.0		6.0	mg/L	03-SEP-10	08-SEP-10	R1460687
Total Oil and Grease	6.7	DLM	2.0	mg/L	10-SEP-10	10-SEP-10	R1459975
Phenols (4AAP)	0.0750		0.0010	mg/L	08-SEP-10	08-SEP-10	R1461126

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS5-IC-WP	Water	Anions scan (IC)	EPA 300.1 IC
This analysis is carried out using procedures adapted from EPA Method 300.1 "Determination of Inorganic Anions in Drinking Water by Ion Chromatography".			
BOD-WP	Water	Biochemical Oxygen Demand (BOD)	APHA 5210 B
The sample is incubated for 5 days at 20 degrees Celcius. Comparison of dissolved oxygen content at the beginning and end of incubation provides a measure of biochemical oxygen demand. If carbonaceous BOD is requested, TCMP is added to the sample to chemically inhibit nitrogenous oxygen demand. If soluble BOD is requested, the sample is filtered prior to analysis. Surface waters have a DL of 1 mg/L. Effluents are diluted according to their history and will have a sample DL of 6 mg/L or greater, depending on the dilutions used.			
EC-WP	Water	Conductivity	APHA 2510B
Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.			
FC-MPN-WP	Water	Fecal Coliform	APHA 9221A-C
The Most Probable Number (MPN) method is based on the Multiple Tube Fermentation technique. The results of examination of replicate tubes and dilutions of a sample are reported after confirmations specific to total coliform, fecal coliform and E. coli are performed. Results are reported in MPN/100 mL for water and MPN/gram for food and solid samples.			
HG-T-CVAF-WP	Water	Mercury Total	EPA245.7 V2.0
Mercury in filtered and unfiltered waters is oxidized with Bromine monochloride and analyzed by cold-vapour atomic fluorescence spectrometry.			
MET-T-L-MS-WP	Water	Total Metals by ICP-MS	U.S. EPA 200.8-TL
Total Metals by ICP-MS: This analysis is carried out using sample preparation procedures adapted from Standard Methods for the examination of Water and Wastewater Method 3030E and analytical procedures adapted from U.S EPA Method 200.8 for analyis of metals by inductively coupled-mass spectrometery.			
NH3-COL-WP	Water	Ammonia by colour	APHA 4500 NH3 F
Ammonia - Colourimeric using Salicylate-nitroprusside and hypochlorite, in an alkaline phosphate buffer.			
NO2+NO3-CALC-WP	Water	Nitrate+Nitrite	CALCULATION
OGG-IR-WP	Water	Total Oil and Grease	APHA METHOD 5520C
PH-WP	Water	pH	APHA 4500H
pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.			
PHENOLS-4AAP-WT	Water	Phenols (4AAP)	EPA 9066
An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.			
SOLIDS-TOTSUS-WP	Water	Total Suspended Solids	APHA 2540
The residue retained by a prepared 1.5 um Whatman 934-AH glass microfibre filter dried at 105 degrees C.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS LABORATORY GROUP - WINNIPEG, MANITOBA, CANADA
WT	ALS LABORATORY GROUP - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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Certificate of Analysis

AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg 153 Petroleum Hydrocarbon F1 - F4 in Water (With PAHs)

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	BW-1 1988754
C6 - C10 (F1)	g/L		25	<25
C6 - C10 (F1 minus BTEX)	g/L		25	<25
C>10 - C16 (F2)	g/L		100	<100
C>10 - C16 (F2 minus Naphthalene)	g/L		100	<100
C6 - C16 (F1 F2)	g/L		100	<100
C>16 - C34 (F3)	g/L		100	<100
C>16 - C34 (F3 minus PAHs)	g/L		100	<100
C>34 - C50 (F4)	g/L		100	<100
C>16 - C50 (F3 F4)	g/L		100	<100
Gravimetric Heavy Hydrocarbons	g/L		500	NA

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

1988754
The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and nC34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16 - C50 and are only determined if the chromatogram of the C34 - C50 Hydrocarbons indicated that hydrocarbons >C50 are present.
Total C6-C50 results are corrected for BTEX and PAH contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg. 153 PAHs in Water

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	BW-1 1988754
Naphthalene	g/L		0.12	<0.12
Acenaphthylene	g/L		0.11	<0.11
Acenaphthene	g/L		0.10	<0.10
Fluorene	g/L		0.09	<0.09
Phenanthrene	g/L		0.10	<0.10
Anthracene	g/L		0.07	<0.07
Fluoranthene	g/L		0.12	<0.12
Pyrene	g/L		0.12	<0.12
Benzo(a)anthracene	g/L		0.08	<0.08
Chrysene	g/L		0.05	<0.05
Benzo(b)fluoranthene	g/L		0.05	<0.05
Benzo(k)fluoranthene	g/L		0.06	<0.06
Benzo(a)pyrene	g/L		0.01	<0.01
Indeno(1,2,3-cd)pyrene	g/L		0.03	<0.03
Dibenzo(a,h)anthracene	g/L		0.09	<0.09
Benzo(g,h,i)perylene	g/L		0.06	<0.06
2-and 1-methyl Napthalene	g/L		0.20	<0.20
Surrogate	**Unit**	**Acceptable Limits**		
Chrysene-d12	%	60-130		97

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Regulation 153 - Volatile Organic Compounds in Water

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	BW-1 1988754
Dichlorodifluoromethane	g/L		0.20	20
Chloromethane	g/L		0.40	<0.40
Vinyl Chloride	g/L		0.17	<0.17
Bromomethane	g/L		0.20	<0.20
Chloroethane	g/L		0.20	<0.20
Trichlorofluoromethane	g/L		0.40	17
Acetone	g/L		1.0	<1.0
1,1 Dichloroethylene	g/L		0.30	<0.30
Methylene Chloride	g/L		0.30	<0.30
trans- 1,2-dichloroethylene	g/L		0.20	<0.20
Methyl tert-butyl ether	g/L		0.20	<0.20
1,1-Dichloroethane	g/L		0.30	<0.30
Methyl Ethyl Ketone	g/L		1.0	<1.0
cis- 1,2-Dichloroethylene	g/L		0.20	<0.20
Chloroform	g/L		0.20	<0.20
1,2 - Dichloroethane	g/L		0.20	<0.20
1,1,1-Trichloroethane	g/L		0.30	<0.30
Carbon Tetrachloride	g/L		0.20	<0.20
Benzene	g/L		0.20	<0.20
1,2-Dichloropropane	g/L		0.20	<0.20
Trichloroethylene	g/L		0.20	<0.20
Bromodichloromethane	g/L		0.20	<0.20
cis-1,3-Dichloropropene	ug/L		0.20	<0.20
Methyl Isobutyl Ketone	g/L		1.0	<1.0
trans-1,3-Dichloropropene	g/L		0.30	<0.30
1,1,2-Trichloroethane	g/L		0.20	<0.20
Toluene	g/L		0.20	<0.20
2-Hexanone	g/L		0.30	<0.30
Dibromochloromethane	g/L		0.10	<0.10
Ethylene Dibromide	g/L		0.20	<0.20
Tetrachloroethylene	g/L		0.20	<0.20
1,1,1,2-Tetrachloroethane	g/L		0.10	<0.10
Chlorobenzene	g/L		0.10	<0.10

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Regulation 153 - Volatile Organic Compounds in Water

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	BW-1 1988754
Ethylbenzene	g/L		0.10	<0.10
m & p-Xylene	g/L		0.20	<0.20
Bromoform	g/L		0.10	<0.10
Styrene	g/L		0.10	<0.10
1,1,2,2-Tetrachloroethane	g/L		0.10	<0.10
o-Xylene	g/L		0.10	<0.10
1,3-Dichlorobenzene	g/L		0.10	<0.10
1,4-Dichlorobenzene	g/L		0.10	<0.10
1,2-Dichlorobenzene	g/L		0.10	<0.10
1,2,4-Trichlorobenzene	g/L		0.30	<0.30
1,3-Dichloropropene (Cis Trans)	g/L		0.30	<0.30
Xylene Mixture (Total)	g/L		0.20	<0.20
n-Hexane	g/L		0.20	<0.20
Surrogate	**Unit**	**Acceptable Limits**		
Toluene-d8	% Recovery	60-130		100
4-Bromofluorobenzene	% Recovery	70-130		92

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

BURNSIDE - Water Quality Assessment

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	LF-1 1988705	LF-2 1988707	LF-3 1988716	SL-Wet1 1988725	SL-Wet2 1988736	SL-Wet3 1988742	SL-Wet4 1988748
Aluminum	mg/L		0.004	<0.004	0.006	0.004	0.059	0.033	0.054	0.143
Arsenic	mg/L		0.003	<0.003	0.003	0.003	0.007	0.005	0.006	0.011
Barium	mg/L		0.002	0.045	0.041	0.035	0.006	0.007	0.009	0.015
Boron	mg/L		0.010	0.736	0.805	0.773	0.179	0.176	0.162	0.230
Cadmium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		0.05	283	225	169	15.9	20.9	24.4	12.0
Chromium	mg/L		0.003	<0.003	0.006	0.006	0.008	0.006	0.005	0.007
Copper	mg/L		0.003	<0.003	<0.003	<0.003	0.012	0.006	0.011	0.027
Iron	mg/L		0.010	<0.010	0.074	0.020	0.503	1.41	1.28	2.55
Potassium	mg/L		0.05	20.8	30.6	37.5	15.6	14.8	14.7	21.7
Magnesium	mg/L		0.05	24.5	42.1	43.1	8.66	15.9	17.7	9.76
Mercury	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese	mg/L		0.002	0.045	0.216	0.226	0.226	0.412	0.461	0.274
Molybdenum	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L		0.05	82.5	171	204	75.5	111	110	94.2
Nickel	mg/L		0.003	<0.003	0.003	<0.003	0.004	0.003	0.005	0.006
Total Phosphorus	mg/L		0.05	1.57	0.34	0.20	0.98	1.56	1.45	4.54
Lead	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Selenium	mg/L		0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silver	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Strontium	mg/L		0.005	2.54	1.71	1.31	0.142	0.237	0.214	0.111
Thallium	mg/L		0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Titanium	mg/L		0.002	0.008	0.007	0.006	0.003	0.002	0.003	0.005
Uranium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	<0.002	0.004	0.003	0.003	0.006
Zinc	mg/L		0.005	0.007	0.013	0.009	0.007	<0.005	<0.005	0.022
Fluoride	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.50
Chloride	mg/L		0.10	114	267	334	120	204	186	140
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ortho phosphate as P	mg/L		0.10	<0.10	<0.10	<0.10	1.53	1.71	0.55	2.33
Bromide	mg/L		0.05	1.42	2.63	2.58	<0.05	1.16	<0.05	<0.05
Nitrate as N	mg/L		0.05	<0.05	0.81	<0.05	1.00	0.30	0.39	0.40
Sulphate	mg/L		0.10	650	518	469	18.4	37.3	26.6	11.5

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

BURNSIDE - Water Quality Assessment

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	LF-1 1988705	LF-2 1988707	LF-3 1988716	SL-Wet1 1988725	SL-Wet2 1988736	SL-Wet3 1988742	SL-Wet4 1988748
pH	pH Units		NA	7.90	8.03	8.27	7.89	7.82	7.84	8.18
Ammonia as N	mg/L		0.02	<0.02	1.23	0.26	36.5	25.7	18.3	71.9
Total Organic Carbon	mg/L		0.5	36.5	25.8	26.5	28.3	21.0	22.7	61.4
Electrical Conductivity	uS/cm		2	1750	2040	2070	793	1020	957	1030
Total Dissolved Solids	mg/L		20	1440	1520	1450	368	496	484	436
Saturation pH				6.59	6.53	6.70	7.70	7.52	7.43	7.53
% Difference/ Ion Balance			0.1	3.6	3.8	5.6	0.6	4.5	3.6	3.8
Total Hardness (as CaCO3)	mg/L		10	808	735	599	75	118	134	70
Langlier Index				1.31	1.50	1.57	0.19	0.30	0.41	0.65
Carbonate (as CaCO3)	mg/L		5	<5	<5	<5	<5	<5	<5	<5
Bicarbonate (as CaCO3)	mg/L		5	252	322	263	193	186	200	306
Turbidity	NTU		0.5	0.9	3.3	1.6	3.1	4.1	5.2	20.0
Alkalinity (as CaCO3)	mg/L		5	252	322	263	193	186	200	306
Hydroxide (as CaCO3)	mg/L		5	<5	<5	<5	<5	<5	<5	<5
Reactive Silica	mg/L		0.05	15.9	8.84	9.34	12.3	11.4	8.67	14.2
Colour	TCU		5	30	55	49	107	100	131	209

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

Chromium VI & TSS (Water)

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	LF-1 1988705
Chromium VI	mg/L		0.005	<0.005
Total Suspended Solids	mg/L		10	288

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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TEL (905)712-5100
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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 10T434899

PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

Chromium VI, Phenols & TSS (Water)

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	LF-2 1988707	LF-3 1988716
Chromium VI	mg/L		0.005	<0.005	<0.005
Phenols	mg/L		0.001	0.002	0.001
Total Suspended Solids	mg/L		10	21	<10

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 10T434899
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

TSS (Water)

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 22, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	SL-Wet1 1988725	SL-Wet2 1988736	SL-Wet3 1988742	SL-Wet4 1988748
Total Suspended Solids	mg/L		10	44	<10	<10	78

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

R.J. BURNSIDE
ATTN: Stephanie Charity
292 SPEEDVALE AVE., WEST
UNIT #7
GUELPH ON N1H 1C4
Phone: 519-823-4995

Date Received: 14-SEP-10
Report Date: 21-SEP-10 09:07 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L930982
Project P.O. #: NOT SUBMITTED
Job Reference: N-0157460
Legal Site Desc:
C of C Numbers:

Paul Nicolas
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L930982-1 LF-1 Sampled By: SC on 09-SEP-10 @ 11:50 Matrix: WATER							
Bacteriological Tests							
Fecal Coliforms	23		3	MPN/100mL		17-SEP-10	R1470963
Aggregate Organics							
Biochemical Oxygen Demand	27.4		1.0	mg/L	15-SEP-10	20-SEP-10	R1471932
L930982-2 LF-2 Sampled By: SC on 09-SEP-10 @ 12:05 Matrix: WATER							
Bacteriological Tests							
Fecal Coliforms	9		3	MPN/100mL		17-SEP-10	R1470963
Aggregate Organics							
Biochemical Oxygen Demand	6.0		1.0	mg/L	15-SEP-10	20-SEP-10	R1471932
L930982-3 LF-3 Sampled By: SC on 09-SEP-10 @ 13:43 Matrix: WATER							
Bacteriological Tests							
Fecal Coliforms	4		3	MPN/100mL		17-SEP-10	R1470963
Aggregate Organics							
Biochemical Oxygen Demand	2.6		1.0	mg/L	15-SEP-10	20-SEP-10	R1471932
L930982-4 SL-WET-1 Sampled By: SC on 09-SEP-10 @ 14:45 Matrix: WATER							
Bacteriological Tests							
Escherichia Coli	15		3	MPN/100mL		17-SEP-10	R1470963
Fecal Coliforms	15		3	MPN/100mL		17-SEP-10	R1470963
Aggregate Organics							
Biochemical Oxygen Demand	9.0		1.0	mg/L	15-SEP-10	20-SEP-10	R1471932
L930982-5 SL-WET-2 Sampled By: SC on 09-SEP-10 @ 14:25 Matrix: WATER							
Bacteriological Tests							
Escherichia Coli	4		3	MPN/100mL		17-SEP-10	R1470963
Fecal Coliforms	4		3	MPN/100mL		17-SEP-10	R1470963
Aggregate Organics							
Biochemical Oxygen Demand	21.2		6.0	mg/L	15-SEP-10	20-SEP-10	R1471932
L930982-6 SL-WET-3 Sampled By: SC on 09-SEP-10 @ 15:10 Matrix: WATER							
Bacteriological Tests							
Escherichia Coli	9		3	MPN/100mL		17-SEP-10	R1470963
Fecal Coliforms	9		3	MPN/100mL		17-SEP-10	R1470963
Aggregate Organics							
Biochemical Oxygen Demand	5.6		1.0	mg/L	15-SEP-10	20-SEP-10	R1471932
L930982-7 SL-WET-4 Sampled By: SC on 09-SEP-10 @ 15:45 Matrix: WATER							
Bacteriological Tests							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L930982-7 SL-WET-4 Sampled By: SC on 09-SEP-10 @ 15:45 Matrix: WATER							
Bacteriological Tests							
Escherichia Coli	4300		3	MPN/100mL		17-SEP-10	R1470963
Fecal Coliforms	9300		3	MPN/100mL		17-SEP-10	R1470963
Aggregate Organics							
Biochemical Oxygen Demand	20.0		1.0	mg/L	15-SEP-10	20-SEP-10	R1471932

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
EHR	Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BOD-WP	Water	Biochemical Oxygen Demand (BOD)	APHA 5210 B

The sample is incubated for 5 days at 20 degrees Celcius. Comparison of dissolved oxygen content at the beginning and end of incubation provides a measure of biochemical oxygen demand. If carbonaceous BOD is requested, TCMP is added to the sample to chemically inhibit nitrogenous oxygen demand. If soluble BOD is requested, the sample is filtered prior to analysis. Surface waters have a DL of 1 mg/L. Effluents are diluted according to their history and will have a sample DL of 6 mg/L or greater, depending on the dilutions used.

EC-MPN-WP	Water	Escherichia Coli	APHA 9221A-C

The Most Probable Number (MPN) method is based on the Multiple Tube Fermentation technique. The results of examination of replicate tubes and dilutions of a sample are reported after confirmations specific to total coliform, fecal coliform and E. coli are performed. Results are reported in MPN/100 mL for water
and MPN/gram for food and solid samples.

FC-MPN-WP	Water	Fecal Coliform	APHA 9221A-C

The Most Probable Number (MPN) method is based on the Multiple Tube Fermentation technique. The results of examination of replicate tubes and dilutions of a sample are reported after confirmations specific to total coliform, fecal coliform and E. coli are performed. Results are reported in MPN/100 mL for water and MPN/gram for food and solid samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS LABORATORY GROUP - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L930982 Report Date: 21-SEP-10

Client: R.J. BURNSIDE
292 SPEEDVALE AVE., WEST UNIT #7
GUELPH ON N1H 1C4
Contact: Stephanie Charity

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BOD-WP	**Water**							
Batch R1471932								
WG1166992-3 DUP		**L930797-1**						
Biochemical Oxygen Demand		9.2	9.2	J	mg/L	0.0	24	20-SEP-10
WG1166992-4 DUP		**L931066-10**						
Biochemical Oxygen Demand		1.7	1.5	J	mg/L	0.2	4	20-SEP-10
WG1166992-5 DUP		**L931186-1**						
Biochemical Oxygen Demand		28.4	24.8	J	mg/L	3.6	24	20-SEP-10
WG1166992-6 DUP		**L931320-4**						
Biochemical Oxygen Demand		11.4	12.6		mg/L	10	20	20-SEP-10
WG1166992-2 IRM		**61-GG**						
Biochemical Oxygen Demand			86		%		85-115	20-SEP-10
WG1166992-1 MB								
Biochemical Oxygen Demand			<1.0		mg/L		1	20-SEP-10

Quality Control Report

Legend:

Limit	99% Confidence Interval (Laboratory Control Limits)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Bacteriological Tests							
Escherichia Coli							
	4	09-SEP-10 14:45	14-SEP-10 12:13	48	117	hours	EHTR
	5	09-SEP-10 14:25	14-SEP-10 12:13	48	118	hours	EHTR
	6	09-SEP-10 15:10	14-SEP-10 12:13	48	117	hours	EHTR
	7	09-SEP-10 15:45	14-SEP-10 12:13	48	116	hours	EHTR
Fecal Coliform							
	1	09-SEP-10 11:50	14-SEP-10 12:13	48	120	hours	EHTR
	2	09-SEP-10 12:05	14-SEP-10 12:13	48	120	hours	EHTR
	3	09-SEP-10 13:43	14-SEP-10 12:13	48	119	hours	EHTR
	4	09-SEP-10 14:45	14-SEP-10 12:13	48	117	hours	EHTR
	5	09-SEP-10 14:25	14-SEP-10 12:13	48	118	hours	EHTR
	6	09-SEP-10 15:10	14-SEP-10 12:13	48	117	hours	EHTR
	7	09-SEP-10 15:45	14-SEP-10 12:13	48	116	hours	EHTR
Aggregate Organics							
Biochemical Oxygen Demand (BOD)							
	1	09-SEP-10 11:50	15-SEP-10 08:07	48	140	hours	EHTR
	2	09-SEP-10 12:05	15-SEP-10 08:07	48	140	hours	EHTR
	3	09-SEP-10 13:43	15-SEP-10 08:07	48	138	hours	EHTR
	4	09-SEP-10 14:45	15-SEP-10 08:07	48	137	hours	EHTR
	5	09-SEP-10 14:25	15-SEP-10 08:07	48	138	hours	EHTR
	6	09-SEP-10 15:10	15-SEP-10 08:07	48	137	hours	EHTR
	7	09-SEP-10 15:45	15-SEP-10 08:07	48	136	hours	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L930982 were received on 14-SEP-10 08:35.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

R.J. BURNSIDE & ASSOCIATES LTD
ATTN: STEPHANIE CHARITY / JIM WALLS
292 SPEEDVALE AVE., WEST
UNIT #7
GUELPH ON N1H 1C4
Phone: 519-823-4995

Date Received: 13-SEP-10
Report Date: 22-SEP-10 15:38 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L930600
Project P.O. #: NOT SUBMITTED
Job Reference: N-015746
Legal Site Desc:
C of C Numbers:

Paul Nicolas
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L930600-1 ARV-2							
Sampled By: STEPHANIE CHARITY on 10-SEP-10 @ 11:35							
Matrix: WASTE WATER							
Nitrate + Nitrite							
Anions scan (IC)							
Nitrite-N	<0.25		0.25	mg/L		14-SEP-10	R1467253
Nitrate-N	<0.25		0.25	mg/L		14-SEP-10	R1467253
Sulfate	475		2.5	mg/L		14-SEP-10	R1467253
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.35		0.35	mg/L		15-SEP-10	
Miscellaneous Parameters							
Ammonia as N	13.3		0.050	mg/L		21-SEP-10	R1473786
Biochemical Oxygen Demand	<6.0		6.0	mg/L	13-SEP-10	18-SEP-10	R1470801
Conductivity	2630		0.40	umhos/cm		13-SEP-10	R1465201
Fecal Coliforms	38		3	MPN/100mL		16-SEP-10	R1470203
Mercury (Hg)-Total	<0.000050		0.000050	mg/L	17-SEP-10	17-SEP-10	R1473006
Phenols (4AAP)	0.0020		0.0010	mg/L	15-SEP-10	15-SEP-10	R1467205
Total Oil and Grease	<1.0		1.0	mg/L	16-SEP-10	17-SEP-10	R1470248
Total Suspended Solids	8.0		5.0	mg/L		16-SEP-10	R1469793
pH	8.21		0.10	pH units		13-SEP-10	R1465201
Total Metals by ICP-MS							
Aluminum (Al)-Total	0.0095		0.0050	mg/L	14-SEP-10	14-SEP-10	R1466569
Antimony (Sb)-Total	0.00410		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Arsenic (As)-Total	0.00482		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Barium (Ba)-Total	0.0458		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Beryllium (Be)-Total	<0.00020		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Bismuth (Bi)-Total	<0.00020		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Boron (B)-Total	1.34		0.010	mg/L	14-SEP-10	14-SEP-10	R1466569
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	14-SEP-10	14-SEP-10	R1466569
Calcium (Ca)-Total	230		0.10	mg/L	14-SEP-10	14-SEP-10	R1466569
Cesium (Cs)-Total	<0.00010		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Chromium (Cr)-Total	<0.0010		0.0010	mg/L	14-SEP-10	14-SEP-10	R1466569
Cobalt (Co)-Total	0.00051		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Copper (Cu)-Total	0.00149		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Iron (Fe)-Total	0.529		0.020	mg/L	14-SEP-10	14-SEP-10	R1466569
Lead (Pb)-Total	0.000145		0.000090	mg/L	14-SEP-10	14-SEP-10	R1466569
Lithium (Li)-Total	0.0318		0.0020	mg/L	14-SEP-10	14-SEP-10	R1466569
Magnesium (Mg)-Total	49.0		0.010	mg/L	14-SEP-10	14-SEP-10	R1466569
Manganese (Mn)-Total	0.599		0.00030	mg/L	14-SEP-10	14-SEP-10	R1466569
Molybdenum (Mo)-Total	0.00036		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Nickel (Ni)-Total	<0.0020		0.0020	mg/L	14-SEP-10	14-SEP-10	R1466569
Phosphorus (P)-Total	0.56		0.20	mg/L	14-SEP-10	14-SEP-10	R1466569
Potassium (K)-Total	44.0		0.020	mg/L	14-SEP-10	14-SEP-10	R1466569
Rubidium (Rb)-Total	0.0375		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Selenium (Se)-Total	<0.0010		0.0010	mg/L	14-SEP-10	14-SEP-10	R1466569
Silicon (Si)-Total	4.79		0.050	mg/L	14-SEP-10	14-SEP-10	R1466569
Silver (Ag)-Total	<0.00010		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Sodium (Na)-Total	243		0.030	mg/L	14-SEP-10	14-SEP-10	R1466569
Strontium (Sr)-Total	1.66		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Thallium (Tl)-Total	<0.00010		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Thorium (Th)-Total	<0.00010		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Tin (Sn)-Total	0.00022		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Titanium (Ti)-Total	0.00299		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Tungsten (W)-Total	<0.0010		0.0010	mg/L	14-SEP-10	14-SEP-10	R1466569

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L930600-1 ARV-2							
Sampled By: STEPHANIE CHARITY on 10-SEP-10 @ 11:35							
Matrix: WASTE WATER							
Total Metals by ICP-MS							
Uranium (U)-Total	0.00063		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Vanadium (V)-Total	0.00061		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Zinc (Zn)-Total	0.0160		0.0050	mg/L	14-SEP-10	14-SEP-10	R1466569
Zirconium (Zr)-Total	0.00043		0.00040	mg/L	14-SEP-10	14-SEP-10	R1466569
L930600-2 ARV-4							
Sampled By: STEPHANIE CHARITY on 10-SEP-10 @ 11:15							
Matrix: WASTE WATER							
Nitrate + Nitrite							
Anions scan (IC)							
Nitrite-N	0.284		0.050	mg/L		14-SEP-10	R1467253
Nitrate-N	1.23		0.050	mg/L		14-SEP-10	R1467253
Sulfate	6.99		0.50	mg/L		14-SEP-10	R1467253
Nitrate+Nitrite							
Nitrate and Nitrite as N	1.51		0.071	mg/L		15-SEP-10	
Miscellaneous Parameters							
Ammonia as N	28.2		0.050	mg/L		21-SEP-10	R1473786
Biochemical Oxygen Demand	65.0		6.0	mg/L	13-SEP-10	18-SEP-10	R1470801
Conductivity	1020		0.40	umhos/cm		13-SEP-10	R1465201
Fecal Coliforms	2100		3	MPN/100mL		16-SEP-10	R1470203
Mercury (Hg)-Total	<0.000050		0.000050	mg/L	17-SEP-10	17-SEP-10	R1473006
Phenols (4AAP)	<0.01	DLM	0.010	mg/L	15-SEP-10	15-SEP-10	R1467205
Total Oil and Grease	1.3		1.0	mg/L	16-SEP-10	17-SEP-10	R1470248
Total Suspended Solids	169		5.0	mg/L		16-SEP-10	R1469793
pH	8.12		0.10	pH units		13-SEP-10	R1465201
Total Metals by ICP-MS							
Aluminum (Al)-Total	0.325		0.0050	mg/L	14-SEP-10	14-SEP-10	R1466569
Antimony (Sb)-Total	0.00033		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Arsenic (As)-Total	0.0107		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Barium (Ba)-Total	0.0349		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Beryllium (Be)-Total	<0.00020		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Bismuth (Bi)-Total	<0.00020		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Boron (B)-Total	0.254		0.010	mg/L	14-SEP-10	14-SEP-10	R1466569
Cadmium (Cd)-Total	0.000092		0.000010	mg/L	14-SEP-10	14-SEP-10	R1466569
Calcium (Ca)-Total	22.7		0.10	mg/L	14-SEP-10	14-SEP-10	R1466569
Cesium (Cs)-Total	<0.00010		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Chromium (Cr)-Total	0.0018		0.0010	mg/L	14-SEP-10	14-SEP-10	R1466569
Cobalt (Co)-Total	0.00229		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Copper (Cu)-Total	0.0394		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Iron (Fe)-Total	5.90		0.020	mg/L	14-SEP-10	14-SEP-10	R1466569
Lead (Pb)-Total	0.00152		0.000090	mg/L	14-SEP-10	14-SEP-10	R1466569
Lithium (Li)-Total	0.0067		0.0020	mg/L	14-SEP-10	14-SEP-10	R1466569
Magnesium (Mg)-Total	14.4		0.010	mg/L	14-SEP-10	14-SEP-10	R1466569
Manganese (Mn)-Total	0.349		0.00030	mg/L	14-SEP-10	14-SEP-10	R1466569
Molybdenum (Mo)-Total	0.00080		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Nickel (Ni)-Total	0.0088		0.0020	mg/L	14-SEP-10	14-SEP-10	R1466569
Phosphorus (P)-Total	5.81		0.20	mg/L	14-SEP-10	14-SEP-10	R1466569
Potassium (K)-Total	24.7		0.020	mg/L	14-SEP-10	14-SEP-10	R1466569
Rubidium (Rb)-Total	0.0279		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Selenium (Se)-Total	<0.0010		0.0010	mg/L	14-SEP-10	14-SEP-10	R1466569
Silicon (Si)-Total	6.32		0.050	mg/L	14-SEP-10	14-SEP-10	R1466569

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L930600-2 ARV-4							
Sampled By: STEPHANIE CHARITY on 10-SEP-10 @ 11:15							
Matrix: WASTE WATER							
Total Metals by ICP-MS							
Silver (Ag)-Total	0.00025		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Sodium (Na)-Total	116		0.030	mg/L	14-SEP-10	14-SEP-10	R1466569
Strontium (Sr)-Total	0.323		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Thallium (Tl)-Total	<0.00010		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Thorium (Th)-Total	0.00032		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Tin (Sn)-Total	0.00082		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Titanium (Ti)-Total	0.0196		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Tungsten (W)-Total	<0.0010		0.0010	mg/L	14-SEP-10	14-SEP-10	R1466569
Uranium (U)-Total	0.00044		0.00010	mg/L	14-SEP-10	14-SEP-10	R1466569
Vanadium (V)-Total	0.00470		0.00020	mg/L	14-SEP-10	14-SEP-10	R1466569
Zinc (Zn)-Total	0.0241		0.0050	mg/L	14-SEP-10	14-SEP-10	R1466569
Zirconium (Zr)-Total	0.00199		0.00040	mg/L	14-SEP-10	14-SEP-10	R1466569
L930600-3 OLD LAGOON 1							
Sampled By: STEPHANIE CHARITY on 10-SEP-10 @ 14:45							
Matrix: WASTE WATER							
Miscellaneous Parameters							
Biochemical Oxygen Demand	7.2		6.0	mg/L	13-SEP-10	18-SEP-10	R1470801
Fecal Coliforms	1500		3	MPN/100mL		16-SEP-10	R1470183
L930600-4 OLD LAGOON 2							
Sampled By: STEPHANIE CHARITY on 10-SEP-10 @ 14:30							
Matrix: WASTE WATER							
Miscellaneous Parameters							
Biochemical Oxygen Demand	<6.0		6.0	mg/L	13-SEP-10	18-SEP-10	R1470801
Fecal Coliforms	<3		3	MPN/100mL		16-SEP-10	R1470183
L930600-5 SL-1							
Sampled By: STEPHANIE CHARITY on 10-SEP-10 @ 15:00							
Matrix: WASTE WATER							
Miscellaneous Parameters							
Biochemical Oxygen Demand	420		6.0	mg/L	13-SEP-10	18-SEP-10	R1470801
Fecal Coliforms	15000		3	MPN/100mL		16-SEP-10	R1470183

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Numbe	Client ID	Qualifier	Description
L930600-1	ARV-2	EHR	Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested

Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS5-IC-WP	Water	Anions scan (IC)	EPA 300.1 IC
This analysis is carried out using procedures adapted from EPA Method 300.1 "Determination of Inorganic Anions in Drinking Water by Ion Chromatography".			
BOD-WP	Water	Biochemical Oxygen Demand (BOD)	APHA 5210 B
The sample is incubated for 5 days at 20 degrees Celcius. Comparison of dissolved oxygen content at the beginning and end of incubation provides a measure of biochemical oxygen demand. If carbonaceous BOD is requested, TCMP is added to the sample to chemically inhibit nitrogenous oxygen demand. If soluble BOD is requested, the sample is filtered prior to analysis. Surface waters have a DL of 1 mg/L. Effluents are diluted according to their history and will have a sample DL of 6 mg/L or greater, depending on the dilutions used.			
EC-WP	Water	Conductivity	APHA 2510B
Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.			
FC-MPN-WP	Water	Fecal Coliform	APHA 9221A-C
The Most Probable Number (MPN) method is based on the Multiple Tube Fermentation technique. The results of examination of replicate tubes and dilutions of a sample are reported after confirmations specific to total coliform, fecal coliform and E. coli are performed. Results are reported in MPN/100 mL for water and MPN/gram for food and solid samples.			
HG-T-CVAF-WP	Water	Mercury Total	EPA245.7 V2.0
Mercury in filtered and unfiltered waters is oxidized with Bromine monochloride and analyzed by cold-vapour atomic fluorescence spectrometry.			
MET-T-L-MS-WP	Water	Total Metals by ICP-MS	U.S. EPA 200.8-TL
Total Metals by ICP-MS: This analysis is carried out using sample preparation procedures adapted from Standard Methods for the examination of Water and Wastewater Method 3030E and analytical procedures adapted from U.S EPA Method 200.8 for analyis of metals by inductively coupled-mass spectrometery.			
NH3-COL-WP	Water	Ammonia by colour	APHA 4500 NH3 F
Ammonia - Colourimeric using Salicylate-nitroprusside and hypochlorite, in an alkaline phosphate buffer.			
NO2+NO3-CALC-WP	Water	Nitrate+Nitrite	CALCULATION
OGG-IR-WP	Water	Total Oil and Grease	APHA METHOD 5520C
PH-WP	Water	pH	APHA 4500H
pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.			
PHENOLS-4AAP-WT	Water	Phenols (4AAP)	EPA 9066
An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.			
SOLIDS-TOTSUS-WP	Water	Total Suspended Solids	APHA 2540
The residue retained by a prepared 1.5 um Whatman 934-AH glass microfibre filter dried at 105 degrees C.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS LABORATORY GROUP - WINNIPEG, MANITOBA, CANADA
WT	ALS LABORATORY GROUP - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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Certificate of Analysis

AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg. 153 Metals & Inorganics in Soil - Table 1

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	Old Lagoon 1-Soil 1988833	Old Lagoon 2-Soil 1988834	Active Lagoon 1988835
Antimony	g/g	1.0	0.8	1.4	2.8	2.1
Arsenic	g/g	17	1	3	3	1
Barium	g/g	210	2	140	89	56
Beryllium	g/g	1.2	0.5	<0.5	<0.5	<0.5
Boron	g/g		5	10	12	<5
Boron (Hot Water Extractable)	g/g		0.10	2.62	3.96	0.88
Cadmium	g/g	1.0	0.5	1.6	1.1	<0.5
Chromium	g/g	71	2	19	17	14
Cobalt	g/g	21	0.5	3.9	4.4	2.6
Copper	g/g	85	1	273	251	171
Lead	g/g	120	1	45	20	9
Molybdenum	g/g	2.5	0.5	2.8	3.3	1.2
Nickel	g/g	43	1	13	13	9
Selenium	g/g	1.9	0.4	2.5	1.8	3.0
Silver	g/g	0.42	0.2	5.8	4.8	2.7
Thallium	g/g	2.5	0.4	<0.4	<0.4	<0.4
Uranium	ug/g		0.5	1.1	1.6	0.9
Vanadium	g/g	91	1	13	18	13
Zinc	g/g	160	5	533	369	242
Chromium, Hexavalent	g/g	2.5	0.2	<0.2	<0.2	<0.2
Cyanide, Free	g/g	0.12	0.05	<0.05	<0.05	<0.05
Mercury	g/g	0.23	0.01	1.00	0.41	0.31
Electrical Conductivity (2:1)	mS/cm	0.57	0.002	0.703	1.56	0.792
Sodium Adsorption Ratio (2:1)	N/A	2.4	N/A	1.63	1.70	2.38
pH, 2:1 CaCl2 Extraction	pH Units			6.36	6.09	5.51
Chloride (2:1)	g/g	330	2	83	161	94
Nitrate Nitrite	g/g	61	1	<1	<1	<1

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard: Refers to T1(All)

1988833-1988835 EC, SAR, Chloride & Nitrate/Nitrite were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the extract obtained from the 2:1 leaching procedure (2 parts 0.01M CaCl2:1 part soil).

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg. 153 Metals in Soil

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BW-P1-A 1988818	BW-P1-B 1988823	BW-P2-A 1988827	BW-P2-B 1988830	HW-1 1988837	HW-2 1988842	HW-3 1988845
Antimony	g/g	1.0	0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	g/g	17	1	3	1	2	1	2	4	2
Barium	g/g	210	2	26	35	31	31	22	23	21
Beryllium	g/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	g/g		5	<5	<5	<5	<5	<5	<5	<5
Cadmium	g/g	1.0	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	g/g	71	2	11	15	13	12	8	15	9
Cobalt	g/g	21	0.5	2.7	3.9	3.2	3.2	2.4	2.7	2.4
Copper	g/g	85	1	11	10	18	9	7	6	9
Lead	g/g	120	1	4	4	9	5	4	3	3
Molybdenum	g/g	2.5	0.5	0.7	<0.5	0.6	<0.5	<0.5	1.0	0.5
Nickel	g/g	43	1	6	9	8	7	5	7	5
Selenium	g/g	1.9	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	g/g	0.42	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	g/g	2.5	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	ug/g		0.5	1.2	1.4	1.0	1.3	0.9	0.9	1.2
Vanadium	g/g	91	1	14	18	14	16	12	13	14
Zinc	g/g	160	5	25	34	54	20	159	125	31

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard: Refers to T1(All)

Certified By:

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

Phenols in Soil

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BW-P1-A 1988818	BW-P1-B 1988823	BW-P2-A 1988827	BW-P2-B 1988830	HW-1 1988837	HW-2 1988842	HW-3 1988845
Phenols, Total	mg/kg		1	<1	<1	<1	<1	<1	<1	<1

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

(P & T) BTEX - Soil (GC/MS)

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BW-P1-A 1988818	BW-P1-B 1988823	BW-P2-A 1988827	BW-P2-B 1988830	HW-1 1988837	HW-2 1988842	HW-3 1988845
Benzene	g/g	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Toluene	g/g	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethylbenzene	g/g	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
m & p-Xylene	g/g		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
o-Xylene	g/g		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylene Mixture (Total)	g/g	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Surrogate	Unit	Acceptable Limits								
Toluene-d8	% Recovery	60-130		113	106	112	94	100	113	99
4-Bromofluorobenzene	% Recovery	70-130		115	103	109	122	120	104	113

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard: Refers to T1(All)
1988818-1988845 Results are based on the dry weight of the soil.

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg 153 Petroleum Hydrocarbon F1 - F4 in Water (With PAHs)

DATE SAMPLED: Sep 10, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 1988848
C6 - C10 (F1)	g/L		25	<25
C6 - C10 (F1 minus BTEX)	g/L		25	<25
C>10 - C16 (F2)	g/L		100	<100
C>10 - C16 (F2 minus Naphthalene)	g/L		100	<100
C6 - C16 (F1 F2)	g/L		100	<100
C>16 - C34 (F3)	g/L		100	<100
C>16 - C34 (F3 minus PAHs)	g/L		100	<100
C>34 - C50 (F4)	g/L		100	<100
C>16 - C50 (F3 F4)	g/L		100	<100
Gravimetric Heavy Hydrocarbons	g/L		500	NA

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

1988848
The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and nC34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16 - C50 and are only determined if the chromatogram of the C34 - C50 Hydrocarbons indicated that hydrocarbons >C50 are present.
Total C6-C50 results are corrected for BTEX and PAH contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil (PAHs Incl.)

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BW-P1-A 1988818	BW-P1-B 1988823	BW-P2-A 1988827	BW-P2-B 1988830	HW-1 1988837	HW-2 1988842	HW-3 1988845
C6 - C10 (F1)	g/g		5	<5	11	<5	<5	<5	<5	<5
C6 - C10 (F1 minus BTEX)	g/g		5	<5	11	<5	<5	<5	<5	<5
C>10 - C16 (F2)	g/g		10	1200	3400	240	130	<10	<10	<10
C>10 - C16 (F2 minus Naphthalene)	g/g		10	1200	3400	240	130	<10	<10	<10
C>16 - C34 (F3)	g/g		50	430	1800	9100	130	26000	32000	24000
C>16 - C34 (F3 minus PAHs)	g/g		50	430	1800	9100	130	26000	32000	24000
C>34 - C50 (F4)	g/g		50	<50	<50	730	79	4800	6000	4400
Gravimetric Heavy Hydrocarbons	g/g		50	NA	NA	NA	NA	NA	NA	NA
Moisture Content	%		0.1	7.2	8.4	4.2	3.0	7.5	2.2	6.3

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

1988818-1988845 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg. 153 PAHs in Soil

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BW-P1-A 1988818	BW-P1-B 1988823	BW-P2-A 1988827	BW-P2-B 1988830	HW-1 1988837	HW-2 1988842	HW-3 1988845
Naphthalene	g/g		0.03	<0.03	0.04	0.04	<0.03	0.03	<0.03	0.05
Acenaphthylene	g/g		0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	g/g		0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Fluorene	g/g		0.02	0.02	0.15	<0.02	<0.02	<0.02	<0.02	<0.02
Phenanthrene	g/g		0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02
Anthracene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluoranthene	g/g		0.02	<0.02	0.03	<0.02	<0.02	0.02	<0.02	<0.02
Pyrene	g/g		0.02	0.02	0.06	0.03	<0.02	0.04	0.02	0.03
Benzo(a)anthracene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	0.21	0.11	0.14
Chrysene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	0.11	0.07	0.10
Benzo(b)fluoranthene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	0.07	0.05	0.04
Benzo(k)fluoranthene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.02
Benzo(a)pyrene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	0.13	0.09	0.07
Indeno(1,2,3-cd)pyrene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	0.05	0.03	0.03
Dibenz(a,h)anthracene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(g,h,i)perylene	g/g		0.02	<0.02	<0.02	<0.02	<0.02	0.08	0.05	0.04
2-and 1-methyl Naphthalene	g/g		0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05
Surrogate	Unit	Acceptable Limits								
Chrysene-d12	%	60-130		79	89	100	93	89	95	89

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard
1988818-1988845 Results are based on the dry weight of the soil.

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Reg. 153 PAHs in Water

DATE SAMPLED: Sep 10, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 1988848
Naphthalene	g/L		0.12	<0.12
Acenaphthylene	g/L		0.11	<0.11
Acenaphthene	g/L		0.10	<0.10
Fluorene	g/L		0.09	<0.09
Phenanthrene	g/L		0.10	<0.10
Anthracene	g/L		0.07	<0.07
Fluoranthene	g/L		0.12	<0.12
Pyrene	g/L		0.12	<0.12
Benzo(a)anthracene	g/L		0.08	<0.08
Chrysene	g/L		0.05	<0.05
Benzo(b)fluoranthene	g/L		0.05	<0.05
Benzo(k)fluoranthene	g/L		0.06	<0.06
Benzo(a)pyrene	g/L		0.01	<0.01
Indeno(1,2,3-cd)pyrene	g/L		0.03	<0.03
Dibenzo(a,h)anthracene	g/L		0.09	<0.09
Benzo(g,h,i)perylene	g/L		0.06	<0.06
2-and 1-methyl Napthalene	g/L		0.20	<0.20
Surrogate	**Unit**	**Acceptable Limits**		
Chrysene-d12	%	60-130		98

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

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AGAT WORK ORDER: 10T434896
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CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Regulation 153 - Volatile Organic Compounds in Water

DATE SAMPLED: Sep 10, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 1988848
Dichlorodifluoromethane	g/L		0.80	<0.80
Chloromethane	g/L		1.60	<1.60
Vinyl Chloride	g/L		0.68	<0.68
Bromomethane	g/L		0.80	<0.80
Chloroethane	g/L		0.80	<0.80
Trichlorofluoromethane	g/L		1.60	<1.60
Acetone	g/L		4.0	<4.0
1,1 Dichloroethylene	g/L		1.20	<1.20
Methylene Chloride	g/L		1.20	<1.20
trans- 1,2-dichloroethylene	g/L		0.80	<0.80
Methyl tert-butyl ether	g/L		0.80	<0.80
1,1-Dichloroethane	g/L		1.20	<1.20
Methyl Ethyl Ketone	g/L		4.0	<4.0
cis- 1,2-Dichloroethylene	g/L		0.80	<0.80
Chloroform	g/L		0.80	<0.80
1,2 - Dichloroethane	g/L		0.80	<0.80
1,1,1-Trichloroethane	g/L		1.20	<1.20
Carbon Tetrachloride	g/L		0.80	<0.80
Benzene	g/L		0.80	<0.80
1,2-Dichloropropane	g/L		0.80	<0.80
Trichloroethylene	g/L		0.80	<0.80
Bromodichloromethane	g/L		0.80	<0.80
cis-1,3-Dichloropropene	ug/L		0.80	<0.80
Methyl Isobutyl Ketone	g/L		4.0	<4.0
trans-1,3-Dichloropropene	g/L		1.20	<1.20
1,1,2-Trichloroethane	g/L		0.80	<0.80
Toluene	g/L		0.80	<0.80
2-Hexanone	g/L		1.20	<1.20
Dibromochloromethane	g/L		0.40	<0.40
Ethylene Dibromide	g/L		0.80	<0.80
Tetrachloroethylene	g/L		0.80	<0.80
1,1,1,2-Tetrachloroethane	g/L		0.40	<0.40
Chlorobenzene	g/L		0.40	<0.40

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

O. Regulation 153 - Volatile Organic Compounds in Water

DATE SAMPLED: Sep 10, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 1988848
Ethylbenzene	g/L		0.40	<0.40
m & p-Xylene	g/L		0.80	<0.80
Bromoform	g/L		0.40	<0.40
Styrene	g/L		0.40	<0.40
1,1,2,2-Tetrachloroethane	g/L		0.40	<0.40
o-Xylene	g/L		0.40	<0.40
1,3-Dichlorobenzene	g/L		0.40	<0.40
1,4-Dichlorobenzene	g/L		0.40	<0.40
1,2-Dichlorobenzene	g/L		0.40	<0.40
1,2,4-Trichlorobenzene	g/L		1.20	<1.20
1,3-Dichloropropene (Cis Trans)	g/L		1.20	<1.20
Xylene Mixture (Total)	g/L		0.80	<0.80
n-Hexane	g/L		0.80	<0.80
Surrogate	**Unit**	**Acceptable Limits**		
Toluene-d8	% Recovery	60-130		99
4-Bromofluorobenzene	% Recovery	70-130		92

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

1988848 Dilution factor=4
The sample was diluted because the sample was foamy. The reporting detection limit has been corrected for the dilution factor used.

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

PCBs (soil)

DATE SAMPLED: Sep 09, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	BW-P1-A 1988818	BW-P1-B 1988823	BW-P2-A 1988827	BW-P2-B 1988830	HW-1 1988837	HW-2 1988842	HW-3 1988845
PCBs	g/g		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate	Unit	Acceptable Limits								
Decachlorobiphenyl	%	60-130		97	120	80	90	63	82	89

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard
1988818-1988845 Results are based on the dry weight of soil extracted.

Certified By: Jordy Takewaki

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

BURNSIDE - Water Quality Assessment

DATE SAMPLED: Sep 10, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	Old Lagoon 1-Water 1988850	Old Lagoon 2-Water 1989165	SL-1 1989172
Aluminum	mg/L		0.004	0.142	0.234	0.256
Arsenic	mg/L		0.003	0.004	<0.003	<0.003
Barium	mg/L		0.002	0.011	0.007	0.006
Boron	mg/L		0.010	0.108	0.082	0.162
Cadmium	mg/L		0.002	<0.002	<0.002	<0.002
Calcium	mg/L		0.05	19.3	12.5	7.10
Chromium	mg/L		0.003	<0.003	<0.003	<0.003
Copper	mg/L		0.003	0.009	0.009	0.067
Iron	mg/L		0.010	2.15	1.31	0.455
Potassium	mg/L		0.05	12.1	8.48	17.9
Magnesium	mg/L		0.05	7.91	4.99	2.96
Mercury	mg/L		0.0001	<0.0001	<0.0001	<0.0001
Manganese	mg/L		0.002	0.266	0.052	0.047
Molybdenum	mg/L		0.002	<0.002	<0.002	<0.002
Sodium	mg/L		0.05	47.3	29.9	54.3
Nickel	mg/L		0.003	0.004	<0.003	<0.003
Total Phosphorus	mg/L		0.05	1.96	1.93	7.23
Lead	mg/L		0.002	<0.002	<0.002	<0.002
Selenium	mg/L		0.004	<0.004	<0.004	<0.004
Silver	mg/L		0.002	<0.002	<0.002	<0.002
Strontium	mg/L		0.005	0.107	0.057	0.022
Thallium	mg/L		0.006	<0.006	<0.006	<0.006
Titanium	mg/L		0.002	0.003	0.004	0.005
Uranium	mg/L		0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	<0.002
Zinc	mg/L		0.005	0.006	0.013	0.060
Fluoride	mg/L		0.05	0.21	0.15	0.42
Chloride	mg/L		0.10	60.9	38.6	55.8
Nitrite as N	mg/L		0.05	<0.05	0.12	<0.05
Ortho phosphate as P	mg/L		0.10	<0.10	<0.10	<0.10
Bromide	mg/L		0.05	0.19	0.15	<0.05
Nitrate as N	mg/L		0.05	<0.05	0.67	<0.05

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

BURNSIDE - Water Quality Assessment

DATE SAMPLED: Sep 10, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	Old Lagoon 1-Water 1988850	Old Lagoon 2-Water 1989165	SL-1 1989172
Sulphate	mg/L		0.10	11.2	10.3	11.1
pH	pH Units		NA	7.95	7.73	7.90
Ammonia as N	mg/L		0.02	20.9	7.64	49.7
Total Organic Carbon	mg/L		0.5	28.7	23.9	113
Electrical Conductivity	uS/cm		2	523	324	737
Total Dissolved Solids	mg/L		20	294	200	298
Saturation pH				7.72	8.20	7.95
% Difference/ Ion Balance			0.1	2.7	1.1	0.6
Total Hardness (as CaCO3)	mg/L		10	81	52	30
Langlier Index				0.23	-0.47	-0.05
Carbonate (as CaCO3)	mg/L		5	<5	<5	<5
Bicarbonate (as CaCO3)	mg/L		5	161	83	253
Turbidity	NTU		0.5	6.7	4.7	23.0
Alkalinity (as CaCO3)	mg/L		5	161	83	253
Hydroxide (as CaCO3)	mg/L		5	<5	<5	<5
Reactive Silica	mg/L		0.05	9.25	7.02	14.7
Colour	TCU		5	110	86	208

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

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AGAT WORK ORDER: 10T434896
PROJECT NO: N-015746

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

TSS (Water)

DATE SAMPLED: Sep 10, 2010 | DATE RECEIVED: Sep 13, 2010 | DATE REPORTED: Sep 24, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	Old Lagoon 1-Water 1988850	Old Lagoon 2-Water 1989165	SL-1 1989172
Total Suspended Solids	mg/L		10	<10	<10	156

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

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Guideline Violation

AGAT WORK ORDER: 10T434896

PROJECT NO: N-015746

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CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD

ATTENTION TO: Stephanie Charity

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Antimony	1.0	1.4
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Cadmium	1.0	1.6
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Copper	85	273
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Electrical Conductivity (2:1)	0.57	0.703
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Mercury	0.23	1.00
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Molybdenum	2.5	2.8
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Selenium	1.9	2.5
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Silver	0.42	5.8
1988833	Old Lagoon 1-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Zinc	160	533
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Antimony	1.0	2.8
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Cadmium	1.0	1.1
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Copper	85	251
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Electrical Conductivity (2:1)	0.57	1.56
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Mercury	0.23	0.41
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Molybdenum	2.5	3.3
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Silver	0.42	4.8
1988834	Old Lagoon 2-Soil	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Zinc	160	369
1988835	Active Lagoon	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Antimony	1.0	2.1
1988835	Active Lagoon	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Copper	85	171
1988835	Active Lagoon	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Electrical Conductivity (2:1)	0.57	0.792
1988835	Active Lagoon	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Mercury	0.23	0.31
1988835	Active Lagoon	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Selenium	1.9	3.0
1988835	Active Lagoon	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Silver	0.42	2.7
1988835	Active Lagoon	T1(All)	O. Reg. 153 Metals & Inorganics in Soil - Table 1	Zinc	160	242

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Certificate of Analysis

AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

Microbiological Analysis (water)

DATE SAMPLED: Nov 02, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 2104291
Fecal Coliform	CFU/100mL	1	1	TNTC

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard: Refers to SDWA -Schedule 23
2104291 TNTC – Too numerous to count, refers to overgrown colonies.

Certified By: Elizabeth Rolakowska

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AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

Microbiological Analysis (water)

DATE SAMPLED: Nov 02, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-4 2104288
Escherichia coli	CFU/100mL	1	1	14
Total Coliforms	CFU/1mL	1	1	4400
Fecal Coliform	CFU/100mL	1	1	5

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard: Refers to SDWA -Schedule 23

2104288 TC counts refer to a 1 ml sample aliquot diluted prior to filtration a larger aliquot resulted in overgrown colonies. The RDL has been adjusted.

Certified By: Elizabeth Rolakowska

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AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

Particle Size Analysis

DATE SAMPLED: Nov 01, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	ARV-5-1 2104259	ARV-5-2 2104261	ARV-4-1 2104263
Sieve Analysis - 4.75 mm	%		N/A	7.98	0.00	10.42
Sieve Analysis - 2.36 mm	%		N/A	1.85	0.05	3.75
Sieve Analysis - 1.18 mm	%		N/A	2.15	0.10	8.09
Sieve Analysis - 600 microns	%		N/A	3.29	0.19	25.98
Sieve Analysis - 300 microns	%		N/A	7.47	1.47	45.95
Sieve Analysis - 150 microns	%		N/A	9.57	3.16	5.03
Sieve Analysis - 75 microns	%		N/A	14.71	11.28	0.34
Sieve Analysis - Retaining Pan	%		N/A	52.98	83.75	0.44

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By: Tony Nash

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AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

Soil Analysis - Texture

DATE SAMPLED: Nov 01, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	ARV-5-1 2104259	ARV-5-2 2104261
Particle Size Distribution (Sand)	%		1	52	16
Particle Size Distribution (Silt)	%		1	40	68
Particle Size Distribution (Clay)	%		1	8	16
Soil Texture				Sandy Loam	Silt Loam

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

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AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

O. Reg 153 Petroleum Hydrocarbon F1 - F4 in Water (-BTEX)

DATE SAMPLED: Nov 01, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-5 2104265	RDL	ARV-5-2 2104274
C6 - C10 (F1)	g/L		25	<25	50	<50
C6 - C10 (F1 minus BTEX)	g/L		25	<25	50	<50
C>10 - C16 (F2)	g/L		100	<100	100	<100
C6 - C16 (F1 F2)	g/L		100	<100	100	<100
C>16 - C34 (F3)	g/L		100	<100	100	<100
C>34 - C50 (F4)	g/L		100	<100	100	<100
C>16 - C50 (F3 F4)	g/L		100	<100	100	<100
Gravimetric Heavy Hydrocarbons	g/L		500	NA	500	NA

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

2104265-2104274 The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and nC34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16 - C50 and are only determined if the chromatogram of the C34 - C50 Hydrocarbons indicated that hydrocarbons >C50 are present.
Total C6-C50 results are corrected for BTEX and PAH contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Certified By: Jordy Takewaki

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

O. Regulation 153 - Volatile Organic Compounds in Water

DATE SAMPLED: Nov 01, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-5 2104265	RDL	ARV-5-2 2104274
Dichlorodifluoromethane	g/L		0.40	<0.40	2.00	<2.00
Chloromethane	g/L		0.80	<0.80	4.00	<4.00
Vinyl Chloride	g/L		0.34	<0.34	1.70	<1.70
Bromomethane	g/L		0.40	<0.40	2.00	<2.00
Chloroethane	g/L		0.40	<0.40	2.00	<2.00
Trichlorofluoromethane	g/L		0.80	<0.80	4.00	<4.00
Acetone	g/L		2.0	<2.0	10.0	<10.0
1,1 Dichloroethylene	g/L		0.60	<0.60	3.00	<3.00
Methylene Chloride	g/L		0.60	<0.60	3.00	<3.00
trans- 1,2-dichloroethylene	g/L		0.40	<0.40	2.00	<2.00
Methyl tert-butyl ether	g/L		0.40	<0.40	2.00	<2.00
1,1-Dichloroethane	g/L		0.60	<0.60	3.00	<3.00
Methyl Ethyl Ketone	g/L		2.0	<2.0	10.0	<10.0
cis- 1,2-Dichloroethylene	g/L		0.40	<0.40	2.00	<2.00
Chloroform	g/L		0.40	<0.40	2.00	<2.00
1,2 - Dichloroethane	g/L		0.40	<0.40	2.00	<2.00
1,1,1-Trichloroethane	g/L		0.60	<0.60	3.00	<3.00
Carbon Tetrachloride	g/L		0.40	<0.40	2.00	<2.00
Benzene	g/L		0.40	<0.40	2.00	<2.00
1,2-Dichloropropane	g/L		0.40	<0.40	2.00	<2.00
Trichloroethylene	g/L		0.40	<0.40	2.00	<2.00
Bromodichloromethane	g/L		0.40	<0.40	2.00	<2.00
cis-1,3-Dichloropropene	ug/L		0.40	<0.40	2.00	<2.00
Methyl Isobutyl Ketone	g/L		2.0	<2.0	10.0	<10.0
trans-1,3-Dichloropropene	g/L		0.60	<0.60	3.00	<3.00
1,1,2-Trichloroethane	g/L		0.40	<0.40	2.00	<2.00
Toluene	g/L		0.40	<0.40	2.00	<2.00
2-Hexanone	g/L		0.60	<0.60	3.00	<3.00
Dibromochloromethane	g/L		0.20	<0.20	1.00	<1.00
Ethylene Dibromide	g/L		0.40	<0.40	2.00	<2.00
Tetrachloroethylene	g/L		0.40	<0.40	2.00	<2.00
1,1,1,2-Tetrachloroethane	g/L		0.20	<0.20	1.00	<1.00
Chlorobenzene	g/L		0.20	<0.20	1.00	<1.00

Certified By: Jordy Takewaki

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Certificate of Analysis

AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

O. Regulation 153 - Volatile Organic Compounds in Water

DATE SAMPLED: Nov 01, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-5 2104265	RDL	ARV-5-2 2104274
Ethylbenzene	g/L		0.20	<0.20	1.00	<1.00
m & p-Xylene	g/L		0.40	<0.40	2.00	<2.00
Bromoform	g/L		0.20	<0.20	1.00	<1.00
Styrene	g/L		0.20	<0.20	1.00	<1.00
1,1,2,2-Tetrachloroethane	g/L		0.20	<0.20	1.00	<1.00
o-Xylene	g/L		0.20	<0.20	1.00	<1.00
1,3-Dichlorobenzene	g/L		0.20	<0.20	1.00	<1.00
1,4-Dichlorobenzene	g/L		0.20	<0.20	1.00	<1.00
1,2-Dichlorobenzene	g/L		0.20	<0.20	1.00	<1.00
1,2,4-Trichlorobenzene	g/L		0.60	<0.60	3.00	<3.00
1,3-Dichloropropene (Cis Trans)	g/L		0.60	<0.60	3.00	<3.00
Xylene Mixture (Total)	g/L		0.40	<0.40	2.00	<2.00
n-Hexane	g/L		0.40	<0.40	2.00	<2.00
Surrogate	**Unit**	**Acceptable Limits**				
Toluene-d8	% Recovery	60-130		76		74
4-Bromofluorobenzene	% Recovery	70-130		89		85

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

2104265 Dilution factor=2
The sample was diluted becauce it was foamy. The reporting detection limit has been corrected for the dilution factor used.

2104274 Dilution factor=10
The sample was diluted becauce it was foamy. The reporting detection limit has been corrected for the dilution factor used.

Certified By: Jordy Takewaki

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Certificate of Analysis

AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

BOD (Water)

DATE SAMPLED: Nov 02, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-2 2104291
BOD (5)	mg/L		5	34

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

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AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

BOD, EC, pH & TSS (Water)

DATE SAMPLED: Nov 02, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-4 2104288
BOD (5)	mg/L		5	30
Electrical Conductivity	uS/cm		2	2510
pH	pH Units		NA	7.92
Total Suspended Solids	mg/L		10	368

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

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AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

Water Quality Assessment

DATE SAMPLED: Nov 01, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-5 2104265	RDL	ARV-5-2 2104274
Aluminum	mg/L		0.004	3.92	0.040	6.13
Arsenic	mg/L		0.003	0.008	0.003	0.012
Barium	mg/L		0.002	0.073	0.002	0.074
Boron	mg/L		0.010	0.045	0.010	0.769
Cadmium	mg/L		0.002	<0.002	0.002	0.003
Calcium	mg/L		0.05	45.5	0.05	106
Chromium	mg/L		0.003	0.010	0.003	0.111
Copper	mg/L		0.003	0.010	0.003	0.039
Iron	mg/L		0.010	5.85	0.100	131
Potassium	mg/L		0.05	7.66	0.05	57.1
Magnesium	mg/L		0.05	32.7	0.05	290
Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001
Manganese	mg/L		0.002	0.490	0.002	0.831
Molybdenum	mg/L		0.002	<0.002	0.002	0.003
Sodium	mg/L		0.05	160	0.05	1640
Nickel	mg/L		0.003	0.012	0.003	0.049
Total Phosphorus	mg/L		0.05	0.87	0.05	2.42
Lead	mg/L		0.002	0.008	0.002	0.010
Selenium	mg/L		0.004	<0.004	0.004	<0.004
Silver	mg/L		0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.408	0.005	1.50
Thallium	mg/L		0.006	<0.006	0.006	<0.006
Titanium	mg/L		0.002	0.114	0.002	0.132
Uranium	mg/L		0.002	<0.002	0.002	0.004
Vanadium	mg/L		0.002	0.022	0.002	0.056
Zinc	mg/L		0.005	0.068	0.005	0.079
Fluoride	mg/L		0.05	<0.05	0.50	<0.50
Chloride	mg/L		0.10	340	1.00	3110
Nitrite as N	mg/L		0.05	<0.05	0.50	<0.50
Ortho phosphate as P	mg/L		0.10	<0.10	1.00	<1.00
Bromide	mg/L		0.05	1.28	0.50	12.3
Nitrate as N	mg/L		0.05	<0.05	0.50	<0.50
Sulphate	mg/L		0.10	55.9	1.00	636

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 10T449096
PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

Water Quality Assessment

DATE SAMPLED: Nov 01, 2010 | DATE RECEIVED: Nov 03, 2010 | DATE REPORTED: Nov 23, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	ARV-5 2104265	RDL	ARV-5-2 2104274
pH	pH Units		NA	6.61	NA	6.31
Ammonia as N	mg/L		0.02	<0.02	0.02	20.8
Total Organic Carbon	mg/L		0.5	53.6	0.5	240
Electrical Conductivity	uS/cm		2	1200	2	9230
Total Dissolved Solids	mg/L		20	816	20	5930
Saturation pH				7.83		6.66
% Difference/ Ion Balance			0.1	1.7	0.1	<0.1
Total Hardness (as CaCO3)	mg/L		10	248	10	1460
Langlier Index				-1.22		-0.35
Carbonate (as CaCO3)	mg/L		5	<5	5	<5
Bicarbonate (as CaCO3)	mg/L		5	47	5	118
Turbidity	NTU		0.5	369	0.5	239
Alkalinity (as CaCO3)	mg/L		5	47	5	118
Hydroxide (as CaCO3)	mg/L		5	<5	5	<5
Reactive Silica	mg/L		0.05	13.8	0.05	31.8
Colour	TCU		5	113	5	1050

Comments: RDL - Reported Detection Limit G / S - Guideline / Standard

Certified By:

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Guideline Violation

AGAT WORK ORDER: 10T449096

PROJECT NO: NAO157460.0002

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES LTD.

ATTENTION TO: Stephanie Charity

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
2104288	ARV-4	SDWA -Schedule 23	Microbiological Analysis (water)	Escherichia coli	1	14
2104288	ARV-4	SDWA -Schedule 23	Microbiological Analysis (water)	Fecal Coliform	1	5
2104288	ARV-4	SDWA -Schedule 23	Microbiological Analysis (water)	Total Coliforms	1	4400

Lg Red.

AGAT Laboratories

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CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: ☐ Good ☐ Poor (complete "notes")
Arrival Temperature: 2.9°C AGAT WO #: 10T449096
Notes:

Client Information

Company: Nuna Burnside Engineering & Enviro
Contact: Stephanie Charity
Address: 15 Town Line
Orangeville ON
Phone: 519 941-5331 Fax: 519 941 8120
Project: NAO 157460.co2 PO:
AGAT Quotation #:
Please note, if quotation number is not provided, client will be billed full price for analysis.

Invoice To Same as Above? Yes/No (circle)
Company: Nuna Burnside Engineering & Enviro.
Contact: Stephanie Charity
Address: 15 Townline
Orangeville ON L6Z 1N2
Phone: 519 941 5331 Fax: 519 941 8120

Report Information - reports to be sent to:

1. Name: Stephanie Charity
Email: Stephanie.Charity@Njburnside.com
2. Name:
Email:

Regulatory Requirements

☐ Regulation 153 Table ____ (Indicate one) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (check one) ☐ Coarse ☐ Med/Fine
☐ Sewer Use Region ____ (Indicate one) ☐ Sanitary ☐ Storm
☐ Regulation 558
☑ CCME
☐ Other (indicate)
☐ Prov. Water Quality Objectives (PWQO)
☐ Nutrient Management Act (NMA)

Is this a drinking water sample (potable water intended for human consumption)? ☐ Yes ☑ No (If "Yes" please use the Drinking Water Chain of Custody Record)

Report Format
☐ Single Sample per page
☐ Multiple Samples per page
☐ Results by fax

Turnaround Time (TAT) Required*
Regular TAT:
☑ 5 to 7 Working Days
Rush TAT: (please provide prior notification)
Rush Surcharges Apply
☐ 3 to 5 Working Days
☐ 2 Working Days
☐ 1 Working Day
OR
DATE REQUIRED (Rush surcharges may apply):

*TAT is exclusive of weekends and statutory holidays

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments Site/ Sample Information	Metals and Inorganics	Metal Scan (exclud. Hg, B, Cr6)	CCME Fractions 1 to 4	VOCs	PAHs	PCBs	TCLP Metals/Inorganics	TCLP	Storm Sewer Use	Sanitary Sewer Use	Grain Size	Seive Sewer + Hardness	Bacteria + BOD	Bacteria + BOD			LABORATORY USE ONLY LAB SAMPLE ID
ARV-5-1	Nov1/10	2pm	Soil	1 Bag	Grain Size Sample											✓						
ARV-5-2	Nov2/10	3pm	Soil	1 Bag	" " "											✓						
ARV-4-1	Nov1/10	2pm	Soil	1 Bag	" " "											✓						
ARV-5	Nov1/10	1pm	water	set	Surface/seepage	✓		✓	✓													
ARV-5-2	Nov2/10	3pm	water	set	Surface/Seepage	✓		✓	✓													
ARV-4	Nov 2/10	2pm		set															✓			
ARV-2	Nov1/10	3pm		2		(circled)		(circled)	(circled)										✓			
ARV-4	Nov1/10	2pm		2 out of time disgard																		

Samples Relinquished By (print name & sign): Jim Walls Jim Walls
Date/Time: Nov 3/2010 10:00
Samples Received By (print name & sign): B Powell NOV 3/10
Date/Time: 10:15am

Samples Relinquished By (print name & sign):
Date/Time:
Samples Received By (print name & sign):
Date/Time:

Pink Copy – Client
Yellow + Golden Copy - AGAT
White Copy - AGAT

PAGE 1 of 1

NO: 146646

AQUATOX
AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Rd.
RR 3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Daphnia magna

Work Order : 217681
Sample Number : 28312

SAMPLE IDENTIFICATION

Company :	R.J Burnside & Associates Ltd.	Time Collected :	17:30
Location :	Orangeville ON	Date Collected :	2010-09-08
Substance :	ARV Sewage Lagoon	Date Received :	2010-09-10
Sampling Method :	Not given	Date Tested :	2010-09-10
Sampled By :	R.J.	Temp. on arrival :	7.0 °C
Sample Description :	Cloudy, green, earthy odour.		

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna.* Environment Canada EPS 1/RM/14 (Second Edition, December 2000).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm10-17		
Date Tested (yyyy/mm/dd) :	2010-09-13	Historical Mean LC50 :	6.7 g/L
LC50 (95% Confidence Limits) :	6.5 g/L (6.1 - 6.9)	Warning Limits (± 2SD) :	6.1 - 7.4 g/L
Statistical Method :	Probit	Analyst(s) :	LB/SM

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.6 days	Mean Young Per Brood :	30.6
Culture Mortality :	0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm10-17	Organism Loading Rate :	15.0 mL/organism

Date: 2010-09-29
yyyy-mm-dd

Approved by: K Dube
Project Manager

Work Order: 217681
Sample Number: 28312

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	120	None	7.7	3.7	931	20.0	42	0:00

0 hours

Date & Time 2010-09-10 14:30
Technician: LB

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	7.7	3.7	931	20.0	42	120
100B	0	0	7.7	3.7	931	20.0		
100C	0	0	7.7	3.7	931	20.0		
Control A	0	0	8.5	8.6	397	21.0		
Control B	0	0	8.5	8.6	397	21.0		
Control C	0	0	8.5	8.6	397	21.0	99	220

Notes: Indigenous organisms, were attempted to be removed from 100% effluent prior to test initiation.
Dark coloured sample.

24 hours

Date & Time 2010-09-11 14:30
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	1	–	–	–	21.0
100B	0	0	–	–	–	21.0
100C	0	0	–	–	–	21.0
Control A	0	0	–	–	–	21.0
Control B	0	0	–	–	–	21.0
Control C	0	0	–	–	–	21.0

Notes:

48 hours

Date & Time 2010-09-12 14:30
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	8.6	9.6	912	20.0
100B	0	0	8.6	9.6	914	20.0
100C	0	0	8.6	10.0	907	20.0
Control A	0	0	8.5	8.5	395	20.0
Control B	0	0	8.6	8.6	399	20.0
Control C	0	0	8.6	8.5	402	20.0

Notes: >30 live organisms counted. No dead daphnids or carapaces found within sample.

# of control organisms showing stress: 0
Daphnia Batch #: Dm10-17

Number immobile does not include number of mortalities.

– = not measured
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: KEH
Date: 2010-09-29

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TOXICITY TEST REPORT
Rainbow Trout

Work Order : 217681
Sample Number : 28312

SAMPLE IDENTIFICATION

Company :	R.J Burnside & Associates Ltd.	Time Collected :	17:30
Location :	Orangeville ON	Date Collected :	2010-09-08
Substance :	ARV Sewage Lagoon	Date Received :	2010-09-10
Sampling Method :	Not given	Date Tested :	2010-09-10
Sampled By :	R.J.	Temp. on arrival :	7.0°C
Sample Description :	Cloudy, green, earthy odour.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T10-12		
Date Tested (yyyy-mm-dd) :	2010-09-01	Historical Mean LC50 :	4004 mg/L
LC50 (95% Confidence Limits) :	3560 mg/L (3187 - 3961)	Warning Limits (± 2SD) :	3365 - 4766 mg/L
Statistical Method :	Probit	Analyst(s) :	MP/FS/TL

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.91 ± 0.44 g	Mean Fish Fork Length (± 2 SD) :	45.2 ± 7.3 mm
Range of Weights :	0.59 - 1.27 g	Range of Fork Lengths (mm) :	40 - 50 mm
Fish Loading Rate :	0.4 g/L		

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	21
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Total Organisms Per Test Level :	10
Organism Batch :	T10-12		

Date: 2010-09-20
yyyy-mm-dd

Approved by: _____
Project Manager

Work Order: 217681
Sample Number: 28312

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
2:00	**Initial Water Chemistry:**	7.4	2.6	835	16.0	–
	Chemistry after 30min air:	7.4	4.5	826	16.0	49

0 hours

Date & Time 2010-09-10 16:10
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.4	7.3	825	15.5	76
Control	0	0	7.9	9.6	535	15.0	100

Notes:

24 hours

Date & Time 2010-09-11 16:10
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	9	0	7.8	7.2	811	15.5
Control	0	0	–	–	–	15.5

Notes:

48 hours

Date & Time 2010-09-12 16:10
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	7.9	7.8	821	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2010-09-13 16:10
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	–	–	–	15.0

Notes:

96 hours

Date & Time 2010-09-14 16:10
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	8.2	9.4	519	15.0

Notes:

# of control organisms showing stress: 0
Trout Batch #: T10-12

"–" = not measured
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: KFH
Date: 2010-09-16

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TOXICITY TEST REPORT
Daphnia magna

Work Order : 217681
Sample Number : 28313

SAMPLE IDENTIFICATION

Company :	R.J Burnside & Associates Ltd.	Time Collected :	17:45
Location :	Orangeville ON	Date Collected :	2010-09-08
Substance :	ARV Landfill	Date Received :	2010-09-10
Sampling Method :	Not given	Date Tested :	2010-09-10
Sampled By :	R.J.	Temp. on arrival :	7.0 °C
Sample Description :	Cloudy, green, earthy odour.		

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna.* Environment Canada EPS 1/RM/14 (Second Edition, December 2000).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm10-17		
Date Tested (yyyy/mm/dd) :	2010-09-13	Historical Mean LC50 :	6.7 g/L
LC50 (95% Confidence Limits) :	6.5 g/L (6.1 - 6.9)	Warning Limits (± 2SD) :	6.1 - 7.4 g/L
Statistical Method :	Probit	Analyst(s) :	LB/SM

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.6 days	Mean Young Per Brood :	30.6
Culture Mortality :	0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm10-17	Organism Loading Rate :	15.0 mL/organism

Date: 2010-09-27
yyyy-mm-dd

Approved by: K Dube
Project Manager

Work Order: 217681
Sample Number: 28313

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	820	None	7.9	6.2	2471	21.0	72	0:00

0 hours

Date & Time 2010-09-10 14:35
Technician: LB

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	7.9	6.2	2471	21.0	72	820
100B	0	0	7.9	6.2	2471	21.0		
100C	0	0	7.9	6.2	2471	21.0		
Control A	0	0	8.5	8.6	397	21.0		
Control B	0	0	8.5	8.6	397	21.0		
Control C	0	0	8.5	8.6	397	21.0	99	220

Notes: Indigenous organisms, were attempted to be removed from 100% effluent prior to test initiation.
Dark coloured sample.

24 hours

Date & Time 2010-09-11 14:35
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	–	–	–	21.0
100B	0	0	–	–	–	21.0
100C	0	0	–	–	–	21.0
Control A	0	0	–	–	–	21.0
Control B	0	0	–	–	–	21.0
Control C	0	0	–	–	–	21.0

Notes:

48 hours

Date & Time 2010-09-12 14:35
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	8.4	9.7	2218	20.0
100B	0	0	8.4	9.8	2236	20.0
100C	0	0	8.5	9.8	2257	20.0
Control A	0	0	8.4	8.7	399	20.0
Control B	0	0	8.5	8.6	406	20.0
Control C	0	0	8.5	8.6	395	20.0

Notes:

# of control organisms showing stress: 0
Daphnia Batch #: Dm10-17

Number immobile does not include number of mortalities.

– = not measured
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: KEH
Date: 2010-09-23

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TOXICITY TEST REPORT
Rainbow Trout

Work Order : 217681
Sample Number : 28313

SAMPLE IDENTIFICATION

Company :	R.J Burnside & Associates Ltd.	Time Collected :	17:45
Location :	Orangeville ON	Date Collected :	2010-09-08
Substance :	ARV Landfill	Date Received :	2010-09-10
Sampling Method :	Not given	Date Tested :	2010-09-10
Sampled By :	R.J.	Temp. on arrival :	7.0°C
Sample Description :	Cloudy, green, earthy odour.		

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T10-12		
Date Tested (yyyy-mm-dd) :	2010-09-01	Historical Mean LC50 :	4004 mg/L
LC50 (95% Confidence Limits) :	3560 mg/L (3187 - 3961)	Warning Limits (± 2SD) :	3365 - 4766 mg/L
Statistical Method :	Probit	Analyst(s) :	MP/FS/TL

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.72 ± 0.20 g	Mean Fish Fork Length (± 2 SD) :	42.8 ± 5.1 mm
Range of Weights :	0.62 - 0.95 g	Range of Fork Lengths (mm) :	40 - 48 mm
Fish Loading Rate :	0.4 g/L		

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	17
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Total Organisms Per Test Level :	10
Organism Batch :	T10-12		

Date: 2010-09-20
yyyy-mm-dd

Approved by: K Dube
Project Manager

Work Order: 217681
Sample Number: 28313

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
1:30	Initial Water Chemistry:	7.7	5.5	2290	16.0	–
	Chemistry after 30min air:	7.9	6.4	2165	16.0	68

0 hours

Date & Time 2010-09-10 15:40
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.8	7.1	2152	16.0	74
Control	0	0	7.9	9.6	535	15.0	100

Notes:

24 hours

Date & Time 2010-09-11 15:40
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	4	0	–	–	–	15.5
Control	0	0	–	–	–	15.5

Notes:

48 hours

Date & Time 2010-09-12 15:40
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	8	0	8.1	8.4	2055	15.0
Control	0	0	–	–	–	15.0

Notes:

72 hours

Date & Time 2010-09-13 15:40
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	9	1	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes: Remaining test organism in 100% effluent is on side at bottom of test chamber.

96 hours

Date & Time 2010-09-14 15:40
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	8.1	8.2	2036	15.0
Control	0	0	8.3	9.3	544	15.0

Notes:

# of control organisms showing stress: 0
Trout Batch #: T10-12

"–" = not measured
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: KEH
Date: 2010-09-16