APPENDIX 4

CONTWOYTO LAKE
REMEDIATION PROJECT

REMEDIAL ACTION PLAN (RAP)

CONTWOYTO LAKE FORMER WEATHER STATION REMEDIAL ACTION PLAN

Prepared for:

Aboriginal Affairs and Northern Development Canada
Contaminants and Remediation Directorate

Under PWGSC
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EXECUTIVE SUMMARY

The former Contwoyto Lake weather station was a principal radio communication and weather station for the Canadian Government located on a remote island on the lower third of Contwoyto Lake, in the Kitikmeot Region of Nunavut, approximately 50 km southeast of the Lupin Mine and 400 km northeast of Yellowknife. The site was originally founded as a pre-DEW LINE reconnaissance post along one of the winter road routings to the high arctic but was converted to a weather station outpost in 1978 and operated as a manned and then remote weather station until its closure in 1981. The abandoned site is the custodial responsibility of Aboriginal Affairs and Northern Development Canada (AANDC). SENES Consultants (SENES) was retained to develop a Remedial Action Plan (RAP) to address potential environmental and physical risks associated with the site. The RAP, which is presented in this report, was commissioned on behalf of AANDC by Public Works and Government Services Canada (PWGSC) under Supply Arrangement EW699-100053/002/NCS.

The development and operating period for the Contwoyto Lake weather station was between the mid-1950s and the mid-1980s. In 1984, the Kugluktuk (then Coppermine) Hunters and Trappers Association took over responsibility for the site buildings, establishing it as an outpost camp. During its operation as a weather station, various generations of radio communication and weather equipment were housed at the site. At the time operations ceased, infrastructure consisted of a main communications camp building, a generator building, two ham radio sheds, a collapsed radio tower, multiple debris areas and fuel caches, as well as an underground meat locker. A drum-lined emergency airstrip suitable for smaller fixed wing aircraft was also located at the site. The majority of site infrastructure was located on a coarse overburden esker which is the predominant geologic feature in the area. The site was previously accessible via the winter road that is currently used by the Lupin Mine, as well as by aircraft (fixed wing on floats/wheels and helicopter).

In addition to the existing infrastructure related to the former weather station, there is an active Inuit hunting camp (operated by the Kugluktuk Hunters and Trappers Association) and a former Inuit camp that operated when the weather station was in operation. The existing hunting camp is located approximately 300 m west of the weather station on a peninsula that extends from the western shoreline of the island while the former Inuit camp is located along the shoreline on the Inuit Owned Lands (IOL) south of the former weather station and east of the former radio tower location (see Figure 1.1-4).

Environmental liabilities that remain on site include localized soil contamination and small quantities of hazardous materials. Poor housekeeping has also resulted in potential aesthetic concerns. Soil contamination is primarily related to fuel spills into the underlying esker overburden; however, there are also minor pockets of metal contamination related to the disposal

practices on the site when the station was in operation. A small quantity of hazardous materials relates primarily to lead and PCBs in the paint applications used on the two main structures, as well as the residual fuels. Housekeeping issues relate to the empty drums and debris that is present in discrete locations over an area of approximately 5 ha centered on the main station infrastructure. There are also aesthetic issues associated with debris and drums at both the current Inuit hunting camp and the former Inuit camp on the IOL lands.

Community Concerns

Prior to the development of the Contwoyto Lake weather station there was little evidence that the area was used on a permanent basis by the local Aboriginal peoples; however, summer camps may have been used for centuries. The site is surrounded by IOL lands and lies fully within Nunavut and as such is subject to the Nunavut Land Claims Agreement (NLCA) with the Crown. Residents from the Inuit community of Kugluktuk, continue to hunt, trap and gather traditional foods throughout the region. In addition to traditional land use, the area is frequented by non-aboriginal hunters.

Although the site is rarely used by the local Inuit, it is anticipated that local communities will have concerns related to the historical and future potential impacts of the site on the local environment. Based on experiences with similar sites in the region, the restoration of the land to its pre-development condition, the health of the vegetation and wildlife, and the quality of water are priorities for the management of the Contwoyto Lake weather station. A community consultation regarding the current status and potential remediation of the site occurred on January 15th, 2013

Remediation Planning Process

This RAP is based on the results of environmental site investigations and best practices in abandoned site decommissioning. Following the completion of community consultations, the RAP was modified to incorporate traditional knowledge, current use of the area, and community values. The plan takes the environmental status of the site, precedent practice (including those outlined in the Abandoned Military Site Remediation Protocol), regulatory requirements, and site goals into consideration.

Principles relevant to the Contwoyto Lake weather station site from federal policy and guidance documents were combined with the general priorities and principles of local Inuit to provide the site-specific approach for the development of the RAP. The final remediation plan has been developed under the management of AANDC, which has the mandate for management of all northern contaminated sites on Crown Land. As the custodian of the site, AANDC has the overall responsibility to minimize health and safety and environmental risks associated with the

site and to implement a RAP that meets the needs and concerns of AANDC, its Aboriginal partners and all Northerners.

Following implementation of the remediation plan, long-term monitoring and reporting will be carried out as appropriate to provide ongoing assurance that the remediation works continue to perform as intended.

Proponents and Regulators

AANDC is the project proponent for the RAP and is responsible for securing appropriate approvals and resources. The implementation of the plan will be managed by PWGSC. The proposed works may require regulatory authorizations from the Nunavut Water Board, Government of Nunavut, Designated Inuit Organizations and other regulatory agencies.

Proposed Remediation Works

A summary of the main components of the RAP is presented in Table ES-1. These include activities associated with remedial actions to: eliminate physical hazards and aesthetic concerns associated with abandoned equipment and debris; and mitigate existing or potential environmental concerns such as contaminated soils and hazardous materials. The preferred remedial options identified in Table ES-1 has formed the basis of consultations with Inuit communities. Where appropriate, the options will be modified to reflect feedback provided during subsequent consultations.

Table ES-1 Summary of Preliminary Preferred Remedial Options

Site Component	Preliminary Preferred Option
Physical Risks - Buildings	Remove all hazardous building materials, demolish all structures, transfer hazardous materials and remaining residual materials to an appropriately licensed off-site facility.
Hazardous Materials	Transfer all 13.5 m^3 of hazardous material to an appropriately licensed off-site facility. A temporary hazardous material storage area will be required.
Non-Hazardous Waste & Debris	Consolidate the 122.5 m^3 of material. Burn the 12.1 m^3 of untreated wood on site. Transfer the remaining 110.4 m^3 to an appropriately licensed off-site facility. A temporary non-hazardous storage area will be required. Approval from Authorities Having Jurisdiction will be required to burn untreated wood.
Soils Impacted by Metals	Excavate 36.1 m^3 of Tier II metals-impacted soils to clean lines. Transfer soils impacted by metals to an appropriately licensed off-site disposal facility.
Soils Impacted by Petroleum Hydrocarbons	Excavate PHC-impacted soils to clean lines. Treat soil impacted by light fractions on site (estimated 1142.1 m^3) to meet AMSRP.
Drums and drum contents	Consolidate and remove organic liquids (200 L) and unknown liquids (200 L) to an appropriate off-site for disposal facility. Consolidate and treat water and water with trace fuels on-site at the drum wash area. Dispose of crushed drums off-site in an appropriately licensed disposal landfill facility.
Borrow Requirements	It is estimated that under 5,000 m^3 of borrow will be required
Camp	The eastern end of the esker airstrip is a potential location for the temporary camp.

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GLOSSARY OF TERMS

Alkalinity: The aggregate measure of the concentration of hydroxyl, carbonate and bicarbonate ions, and dissolved CO_2. Therefore, it is a general indicator of the acid-buffering capacity of the water body.

Ambient: The natural surrounding (background) conditions in a given area.

Analyte: A compound or element being analyzed.

Analytic detection limit: The limit of measurement of a given parameter, below which variations in concentration are indistinguishable from one another.

Asbestos: A naturally occurring soft fibrous mineral commonly used in fireproofing materials and considered to be highly carcinogenic.

Baseline: See "Environmental baseline".

Bedrock: The solid rock that underlies gravel, soil or other surficial material.

Best Management Practice (BMP): Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.

Biological diversity (biodiversity): The variety of different species, the genetic variability of each species, and the variety of different ecosystems that they form.

Borehole: Hole made with drilling equipment typically to obtain samples.

C**arcinogen:** An agent that has the potential to cause cancer.

Clay: Soil particles that are smaller than silt (less than 0.002 mm in diameter).

Climatology: The study of weather conditions or long periods of time.

Conductivity: A measurement of the electrical conductivity of a water body or sample in order to determine the amount of dissolved material present.

Conservative: As used in the term conservative estimates, this is considered a pessimistic or an overestimate of the level, effect or hazard, as the case may be.

Contaminant migration: The movement of contaminants from one location to another.

Contamination: Elements both radioactive and non-radioactive that are present at levels above those normally found (i.e. above background).

Decommissioning: The act of removing a regulated facility from operation and operational regulation. This usually entails a certain amount of cleanup (decontamination).

Decontamination: The process of removing contaminants from equipment, personnel, buildings or water.

Delineate: To determine the outer limits and size of something (i.e., an ore body).

Discharge: The volume of water passing a given point per unit time, usually expressed as m^3/s.

Drainage basin: The area of land and water bodies therein, draining to a given point, usually a lake or river.

Ecological Risk Assessment: The application of a formal framework, analytical process, or model to estimate the effects of human actions(s) on a natural resource and to interpret the significance of those effects in light of the uncertainties identified in each component of the assessment process. Such analysis includes initial hazard identification, exposure and dose response assessments, and risk characterization.

Ecosystem: Any natural system in which there is an interdependence upon and interaction between living organisms and their physical environment. This interdependence is characterized by the transfer of energy between the organisms themselves and their physical environment in a complex series of cycles.

Element: A substance that is comprised of one and only one distinct kind of atom.

Environment: The sum of all external conditions, influences and forces affecting the development and life of organisms.

Environmental baseline: The data collection characterizing the "natural" environment in its pre-development or pre-impact state. This data is used as a base for determining potential and actual impacts in the defined impact area.

Environmental Impact: A change in environmental conditions resulting from an action or development, which may be negative, positive, or neutral.

Erosion: The wearing down (weathering) and removal of soil, rock fragments and bedrock through the action of rivers, glaciers, sea and wind.

Exposure: The amount of pollutant present in a given environment that represents a potential health threat to living organisms.

Exposure Concentration: The concentration of a chemical or other pollutant representing a health threat in a given environment.

Exposure Pathway: The path from sources of pollutants via, soil, water, or food to man and other species or settings.

Geochemistry: Refers to the chemical analysis of surface and subsurface water, rock alluvium, soil and plants.

Grading: The process of making a surface level or evenly sloped.

Groundwater: Water beneath the earth's surface, accumulating as a result of infiltration and seepage, and serving as a source of springs and wells.

Habitat: The natural home of a plant or animal.

Hazard: Potential for a chemical or other pollutant to cause human illness or injury. Hazard identification of a given substance is an informed judgment based on verifiable toxicity data from animal models or human studies.

Hazard Assessment: Evaluating the effects of a contaminant or determining a margin of safety for an organism by comparing the concentration that causes toxic effects with an estimate of exposure to the organism.

Heavy metals: Any metal with a high atomic weight (usually greater than 100). They are poisonous and tend to persist in living tissue once ingested, e.g. mercury, lead, cadmium and chromium.

Human Health Risk Assessment: The process of quantifying risks and determining the acceptability of those risks to humans.

Hydrogeology: The study of subsurface waters and related geologic aspects of surface water.

Hydrology: The study of the characteristics, occurrence, movement and utilization of water on or below the earth's surface and within its atmosphere.

Inuit land claim: A claim to a specific area of land based on legal concepts of land title and the traditional use and occupancy of that land by Inuit peoples who did not sign treaties, nor were displaced due to war or other means.

Inuit Owned Lands (IOL): Refers to the lands owned by the Inuit under the land claim agreement between Canada and the Nunavut Government.

Loadings: Total mass of contaminants to a water body or to the land surface over a specified time.

Mean: The average value of the data.

Mineral: A naturally occurring inorganic, crystalline solid that has a definite chemical composition and characteristic physical properties.

Mitigation: An action or design intended to reduce the severity or extent of an environmental impact.

Modeling: Using mathematical principles, information is arranged in a computer program to model conditions in the environment and to predict the outcome of certain operations.

Monitoring: Sampling, measurement, and/or inspection methodology.

Outcrop: The part of a rock formation that appears at the surface of the earth, uncovered by water or overburden.

Overburden: Unconsolidated soil and rock material overlying bedrock.

Particulate: Consisting of particles.

Pathway: The physical course a chemical or pollutant takes from its source to the exposed organism.

PCB's: A group of manufactured chemicals including 209 different, but closely related, compounds made up of carbon, hydrogen, and chlorine. If released to the environment, they persist for long periods of time and can biomagnify in the food web. They are an organic toxicant suspected of causing cancer, endocrine disruption, and other adverse impacts on organisms.

Permeability: Describes the ability of subsurface features to transport water.

pH: A number expressing the degree of alkalinity or acidity of a substance according to the hydrogen ion concentration. A substance is said to be “neutral” if its pH is 7, acidic if less than 7 and alkaline if greater than 7.

Precipitation: The deposition of atmospheric moisture as rain, sleet, snow, hail, frost or dew.

Pyrite: A common yellow mineral with a brilliant metallic lustre often crystallizing into cubes. It is an important sulphur ore and is often associated with gold and copper.

Receptor: A human or ecological entity exposed to a contaminant released to the environment.

Reclamation: Restoration of a site to a beneficial use, which may be for purposes other than the original use.

Remediation: The improvement of a contaminated site to prevent, minimize or mitigate damage to human health or the environment. Remediation involves the development and application of a planned approach that removes, destroys, contains or otherwise reduces the availability of contaminants to receptors of concern.

Risk: A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

Risk Assessment: Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.

Risk Characterization: The last phase of the risk assessment process that estimates the potential for adverse health or ecological effects to occur from exposure to a stressor and evaluates the uncertainty involved.

Sediment: Loose, solid particles resulting from the breakdown of rocks, chemical precipitation or from organisms.

Taiga: The northern forest of coniferous trees that lies just south of the arctic tundra.

Till: An unsorted heterogeneous mixture of rock debris carried and deposited directly by a glacier, with very little subsequent reworking by melt water.

Topographic map: A map showing elevations by means of contour lines (i.e. lines joining points of equal elevation).

Traditional knowledge: Refers to the ancient understanding of philosophy, events and things passed on orally through generations by aboriginal people.

Traditional land use: Refers to land use by aboriginal people that reflect the historic activities of their people prior to European settlement (i.e. hunting, fishing, gathering).

Traditional lifestyle: Refers to the lifestyle of aboriginal people prior to European settlement.

Uncertainty: A quantitative expression of error.

VOCs: Volatile Organic Compounds.

Watershed: A drainage area or basin into which all surface water from a particular area collects and is transported.

Winter Road: A seasonal road passable only during the winter when the ground, muskegs and lakes it passes over are frozen.

UNITS AND ABBREVIATIONS

g/m^3	grams per cubic meter	m^3/y	cubic meters per year
L	litre	μg/g	microgram per gram
m	meter	μg/L	microgram per litre
m^2	square meter	dw	dry weight
m^3	cubic meter	ww	wet weight

ACM	Asbestos Containing Material
ALARA	As Low As Reasonably Achievable
AANDC	Aboriginal Affairs and Northern Development Canada
AMSRP	Abandoned Military Site Remediation Protocol
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CCME	Canadian Council of Ministers of the Environment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ERE	Ecological Risk Evaluation
ESA	Environmental Site Assessment
FCSAP	Federal Contaminated Sites Action Plan
HQ	Hazard Quotient
ISQG	Interim Soil Quality Guideline
LEL	Lowest Effect Level
MDL	Method Detection Limit
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl Compound
PEL	Probable Effect Level
PHC	Petroleum Hydrocarbon
PQRA	Preliminary Quantitative Risk Assessment
RAP	Remedial Action Plan
SARA	Species At Risk Act
SEL	Severe Effect Level

CHEMICAL SYMBOLS

Aluminum	Al
Antimony	Sb
Arsenic	As
Barium	Ba
Beryllium	Be
Bismuth	Bi
Cadmium	Cd
Calcium	Ca
Chlorine	Cl
Chromium	Cr
Cobalt	Co
Copper	Cu
Iron	Fe
Lead	Pb
Magnesium	Mg
Manganese	Mn
Mercury	Hg
Molybdenum	Mo
Nickel	Ni
Phosphorous	P
Potassium	K
Selenium	Se
Silver	Ag
Sodium	Na
Strontium	Sr
Sulphate	SO_4
Thallium	Tl
Tin	Sn
Titanium	Ti
Uranium	U
Vanadium	V
Zinc	Zn
Zirconium	Zr

1.0 INTRODUCTION

1.1 OVERVIEW OF THE PROJECT

Aboriginal Affairs and Northern Development Canada (AANDC) has the responsibility to manage a number of contaminated sites that are no longer maintained by the original occupant. AANDC's portfolio of contaminated sites in the north originates from private sector mining, oil and gas activities and government military activity dating back over half a century, many years before the environmental impacts of such activities were adequately understood. The abandoned Contwoyto Lake weather station (WS) is one of these sites.

The Contwoyto Lake WS was a remote weather station that operated intermittently between the mid-1950s and the mid-1980s. During its operation, the station consisted of four buildings, all of which still exist but are in various states of disrepair/collapse. Much of the abandoned station equipment that was not salvaged remains along with an assortment of debris distributed throughout the small site. Other potential concerns include localized soil contamination, small quantities of hazardous materials and site aesthetics. In addition to the weather station, there is an active Inuit hunting camp located on the peninsula near the station. Remnants of a former Inuit Camp that existed when the WS was in operation are also located on the Inuit Owned Lands (IOL) south of the station. Minor amounts of debris and fuel drums are associated with these two locations.

This Remedial Action Plan (RAP) was developed to address human health, ecological and environmental concerns associated with the abandoned Contwoyto Lake WS. It is intended to be a supporting document to assist with regulatory and funding decisions and to provide the basis for the development of tender documents and technical designs for the implementation of remediation.

The RAP is based on the results of environmental site investigations and best practices in abandoned site decommissioning. Following the completion of initial community consultations, the RAP was modified to incorporate traditional knowledge, current use of the area, and community concerns. The Plan takes into account the environmental status of the site, precedent practice (including those outlined in the Abandoned Military Site Remediation Protocol), regulatory requirements, and goals for site closure. Following remediation, it is expected that appropriate long-term monitoring and reporting will be carried out to provide ongoing assurance that the remediation works perform as intended.

1.1.1 Location and Access

The abandoned Contwoyto Lake WS is located in Nunavut (NU) and is situated on the western limit of an unnamed remote island on the lower third of Contwoyto Lake (North 65.48501, West 110.37634). The 37 ha site is located fully within NU and is surrounded on two sides (south and east) by IOL lands and Contwoyto Lake on the balance. The nearest potentially affected community to the Contwoyto Lake WS is Kugluktuk which is located 330 km northwest of the site. Yellowknife is approximately 400 km to the southwest.

Summer access to the site is currently by fixed-wing aircraft on floats or helicopter with boat access from the Lupin Mine possible. During winter, the ice road to the Lupin Mine passes within a few hundred metres of the former weather station. If the winter road to the Lupin Mine is not active, a dedicated ice road could be constructed from the Ekati turn off which is approximately 130 km to the southwest of the site. Maps depicting the location of the Contwoyto Lake WS are provided in Figures 1.1-1 to 1.1-3.

1.1.2 History of the Weather Station

The Contwoyto Lake WS was originally a small camp built and operated by Pacific Western Airlines (PWA) during the Distant Early Warning (DEW) Line Site construction c. 1956. PWA built the existing buildings which included the Quonset living quarters, power house, beacon building and airstrip and installed the communications equipment that existed at the site. In 1978, Transport Canada acquired the site to establish a telecommunications and navigational aid station. By 1980, Transport Canada was looking into abandoning the site, for the more economical option of establishing a non-directional beacon (NDB) air navigation aid at the nearby Echo Bay Mines - Lupin Site. In 1984, the Coppermine Hunters and Trappers Organization (HTO) took over responsibility for the site buildings and established it as an outpost camp (WESA, 2011).

Figure 1.1-4 presents the existing infrastructure at the Contwoyto Lake WS. As shown, the site consisted of the main camp structure, a generator building and two ham radio sheds along with a radio tower approximately 250 m south of the main facility structures. There are two camp areas in addition to the weather station related infrastructure. An active hunting camp is being operated on the peninsula area due west of the former weather station while an abandoned camp is located approximately 800 m south-southwest of the former station.

For perspective on the magnitude of potential concerns at the site, all historical records and site evidence indicate that the Contwoyto Lake WS was a small scale operation and did not house significant quantities of fuel and did not have a large compliment of staff, thus minimizing the domestic debris generated. Similarly, the Inuit camps (active and past) are small in footprint and

would not accommodate a large number of individuals thus generating a limited amount of debris. Potential impacts to the environment should be viewed within the context of the scale of the historic operation.

1.1.3 Community Concern

The Inuit people have expressed concerns regarding abandoned sites on their traditional lands. Although the Contwoyto Lake WS is small relative to other regional developments (e.g., the Lupin mine, Jericho mine and the like), there remains a general concern associated with historic activities on their lands. The potential contamination of water and soils, as well as impacts to fish, wildlife and vegetation, are commonly cited as the top priorities for attention. Physical hazards such as collapsing and/or unsound buildings, residual drums and debris have also been identified as concerns with respect to human and wildlife health.

1.2 DESIGNATED RESPONSIBILITIES

AANDC is the project proponent for the remediation of the Contwoyto Lake WS. It is AANDC's responsibility to develop the RAP, obtain appropriate approvals, secure resources, and ensure the plan is implemented in a manner consistent with the remediation of all AANDC contaminated sites in Nunavut. Following remediation, AANDC is responsible for conducting any long-term monitoring necessary to confirm that the environment and human-health are being protected.

Public Works and Government Services Canada (PWGSC) provides support to AANDC throughout the planning and implementation phases of the remediation project. Environment Canada (EC), the federal Department of Fisheries and Oceans (DFO) and Health Canada (HC) also assist AANDC through the provision of environmental science expertise required for the selection of appropriate remedial measures.

1.2.1 Approach to Preparation of the Remedial Action Plan

1.2.1.1 Overview

Abandoned and/or contaminated sites are defined as those properties where previous owners cannot be identified or held responsible to address existing environmental contamination. The Contwoyto Lake WS is one of several hundred abandoned sites under the management of AANDC. The department works within a broader management system for all northern contaminated sites. This being the case, AANDC must follow several guiding documents while developing the RAP for the Contwoyto Lake WS. The following federal policies or guidance

documents provide a broad context as to how AANDC approaches remediation of contaminated sites in Northern Canada:

- A Federal Approach to Contaminated Sites (CSMWG 2000);
- Northern Affairs Program Contaminated Sites Management Policy (AANDC 2002a);
- Abandoned Military Site Remediation Protocol (AANDC 2009); and,
- Policy on Management of Real Property (Treasury Board 2006).

The overall responsibility of AANDC is to minimize health and safety and environmental risks associated with the site by implementing a RAP that meets the needs and concerns of all Inuit groups and Northerners in accordance with AANDC policy and Treasury Board Guidelines.

1.2.1.2 Regulatory

Currently, AANDC has no land use permits or water licenses associated with the Contwoyto Lake WS. Depending on the approach proposed by the contractor selected to perform the remediation, the proposed works may require regulatory authorizations from the Nunavut Water Board, Government of Nunavut, Designated Inuit Organizations and other regulatory agencies. Once the remediation of the site is complete, long-term monitoring suitable for the site conditions and remedial options will occur as identified through the Federal Approach to Contaminated Sites (CSMWG 2000).

1.2.1.3 General Principles

The development of the Contwoyto Lake WS RAP was based on the principles of relevant federal policy and guidance documents. These guiding principles are listed in the following sections and will be influenced by future consultations with members of local Inuit communities.

1.2.1.4 Federal Policies

The following principles were adopted for the Contwoyto Lake WS RAP from federal policy and guidance documents referenced above. Specifically:

- Meet the overall AANDC objective to contribute to a safer, healthier, sustainable environment for Aboriginal peoples and northern residents by striving to preserve and enhance the ecological integrity of the environment (AANDC 2002a);
- Take immediate and reasonable action to protect the environment and the health and safety of persons (Treasury Board 2006);
- Meet federal and AANDC policy requirements and legal obligations regarding the management of contaminated sites (AANDC 2002a);

- Ensure sound environmental stewardship of federal real property by avoiding contamination and by managing contaminated sites in a consistent and systematic manner that recognizes the principle of risk management and results in the best value for the Canadian taxpayer (Treasury Board 2006);
- Provide a scientifically valid, risk management based framework for setting priorities, planning, implementing and reporting on the management of contaminated sites (AANDC 2002a);
- Develop a RAP that is sufficiently flexible to allow adjustments as the remediation progresses, including the flexibility to adapt to new and improved technologies and methodologies (AANDC 2002b); and
- Adopt solutions tailored to the northern environment and peoples wherever possible (AANDC 2006a – management framework).

1.2.1.5 Partnerships with Aboriginals

The following principles regarding partnerships with Aboriginals were adopted from the policy and guidance documents referenced above specifically for the Contwoyto Lake WS RAP:

- Promote Inuit and northern participation and partnership (AANDC 2002a; AANDC 2006b);
- Promote respect and sharing of knowledge, experience and resources in partnerships/teamwork with clients and partners;
- Promote the social and economic benefits that may accrue to Aboriginal and northern communities (AANDC 2002a);
- Plan, where appropriate, the scale and pace of remediation/risk management in keeping with northern and Inuit capacity to be involved (AANDC 2002a); and
- Incorporate economic opportunities, to the extent possible, for northern and Inuit communities in the management and remediation of the site (AANDC 2002a).

In keeping with the above policies, community representatives from the Inuit community of Kugluktuk participated in consultations regarding this RAP for the Contwoyto Lake Remediation Project. A community meeting was held on January 15th, 2013. The community consultation meeting minutes are attached as Appendix A

1.2.1.6 Principles from the Nunavut Land Claim Agreement

As indicated previously, the Contwoyto Lake WS falls within the management area as defined by the Nunavut Land Claim Agreement (NLCA). The following principles, adopted from the NLCA, have been applied to the RAP for the Contwoyto Lake WS:

- To protect and conserve the wildlife and environment of the settlement area for present and future generations;
- To directly involve communities and designated Inuit organizations in land use and planning; and,
- To encourage self-sufficiency of the Inuit and to enhance their ability to participate fully in all aspects of the economy specifically by protecting and promoting the existing and future social, cultural and economic well-being of the Inuit people.

1.2.1.7 Site Objectives

The following site objectives for the remediation of the Contwoyto Lake WS were developed in accordance with applicable Federal Policies, the principles of the NLCA, remediation best practices and the remediation protocols outlined in the Abandoned Military Site Remediation Protocol.

- Minimize human health and safety risks at the Contwoyto Lake WS;
- Protect fish, wildlife and vegetation;
- Protect the water quality of Contwoyto Lake;
- Minimize environmental impacts during remediation;
- Minimize long-term care and maintenance;
- Return the site to its original condition where possible; and,
- Be cost-effective.

1.2.1.8 Remediation Planning Team

The technical team responsible for the development of the RAP included representatives from the following groups:

- AANDC;
- PWGSC; and
- SENES Consultants (SENES).

1.2.2 Community Involvement and Consultation

1.2.2.1 Guiding Principles to Community Involvement and Consultation

As discussed above, the Northern Affairs Program Contaminated Sites Management Policy specifies that "AANDC will promote Aboriginal and northerner participation and partnership in the identification, assessment, decision-making and remediation/risk management processes relating to contaminated sites" (AANDC 2002a). The guidelines indicate that every effort

should be made to incorporate local knowledge on many different levels by, for example, creating working groups and interviewing elders and other age groups of the local people (AANDC 2006b).

In addition to the federal policies and guidelines, a major objective of the Northern Contaminated Sites Program is to provide Inuit people with meaningful opportunities to participate in decision making concerning the use, management and conservation of land, water and resources. This objective is addressed in NU's environmental management framework, as described in the Nunavut Water and Surface Rights Tribunal Act (NWSRTA 2002). The overall consultation approach under the NWSRTA includes:

- Providing the party to be consulted with:
  - notice of the matter in sufficient form and detail to allow the party to prepare its views on the matter;
  - a reasonable period for the party to prepare those views; and
  - an opportunity to present those views to the party having the power or duty to consult.
- The party with the duty to consult must:
  - consider, fully and impartially, any views so presented.

1.2.2.2 Contwoyto Lake WS Community Involvement and Consultations

A community involvement and consultation process for the development of the Contwoyto Lake WS RAP was undertaken to ensure that the priorities and insights of Inuit stakeholders were included in the decision-making process. To this end, a public presentation was held on January 15th, 2013 (a record of the meeting is presented in Appendix A). During this meeting, an overview of the site conditions and assessment findings were presented, conceptual remedial strategies were discussed and a preferred remedial approach was selected. Further, it was agreed that:

1) AANDC was to move ahead with the preparation of a RAP for the site based on the preferred remedial approach;
2) Participants in the meeting would inform their respective communities of the preferred remedial approach and would notify AANDC if any issues were raised;

No additional community meeting is anticipated until the remediation contract has been awarded.

1.2.2.3 Future Community Involvement and Consultation

Any significant deviations from the preferred approaches described in this plan will be presented to community members for their consideration. In addition to participating in the planning process, Inuit involvement during the remediation phase of the project will be encouraged

through the use of an "Aboriginal Opportunity Considerations" (AOC) provision in the remediation contract. All contractors bidding on the remediation project will be required to submit an AOC plan describing their commitment to Inuit employment and subcontracting. The commitments of the successful bidder will be enforced through contractual obligations.

1.2.2.4 Evaluation of Remedial Options

The overall approach to evaluating remedial options for the site was as follows:

1. The site was divided into various aspects and issues as outlined in the Abandoned Military Site Remediation Protocol (AANDC 2009).
2. For each aspect and issue, remedial options were developed by SENES with input from AANDC and PWGSC (refer to Chapter 6).
3. All remedial options were evaluated to determine the extent to which they met the remedial objectives for the site. Preferred remedial approaches were selected based on the evaluation. This document describes the evaluation process and presents the preferred remedial approaches.
4. In situations where the revised approach differs from the original consultation between the community and AANDC, discussion will be required to come to a resolution.

1.3 OVERVIEW OF AVAILABLE INFORMATION

Information on environmental conditions and historic activities at the Contwoyto Lake WS has been obtained through a number of environmental site assessment (ESA) and monitoring programs including:

- Integrated Phase I and Phase II Environmental Site Assessment, WK117- Contwoyto Lake Weather Station, Nunavut – WESA Inc. (WESA), 2011.
- Phase III Environmental Site Assessment for the Contwoyto Lake Remediation Program, Former Weather Station, NU – SENES Consultants (SENES), 2013.

The Phase III ESA prepared by SENES (2013) represents the most recent and comprehensive evaluation of the site. In general, the Phase III ESA includes and expands upon all aspects of the previous assessment works. For this reason, the site descriptions, analytical information and conclusions presented in the Phase III ESA formed the basis of the site-specific information presented in this RAP.

1.4 STRUCTURE OF REMEDIAL ACTION PLAN

In addition to this introductory chapter, the following information is provided in this report:

- Chapter 2 provides information on the current land use and the history of the site including former operations and past closure activities;
- Chapter 3 provides physical descriptions of the site;
- Chapter 4 provides a description of the environmental setting in which the site is located;
- Chapter 5 summarizes potential environmental concerns at the site based on previous Environmental Site Assessments.
- Chapter 6 presents the RAP including the potential and preferred remedial options for each major component;
- Chapter 7 comments on the remediation schedule;
- Chapter 8 provides a discussion of post-remediation monitoring activities; and
- Chapter 9 provides a list of cited references.

2.0 LAND USE AND HISTORY OF SITE AND SURROUNDING AREA

2.1 HISTORICAL LAND USES

2.1.1 Historic Aboriginal Land Use

While there is currently no documented information regarding historic land use specific to the Contwoyto Lake WS, an overview of traditional land use in the general region is summarized below.

As noted previously, the region surrounding the Contwoyto Lake WS lies within the traditional land use area of the Inuit. It also borders the traditional land use areas of the Tli Cho and Akaitcho peoples. Historically, land users would at times stay resident in a given area for several months, depending on the season and access to traditional food. However, the extent to which a small island such as the location of the Contwoyto Lake WS would have been used is unknown.

Of particular importance to traditional land use, Contwoyto Lake falls within the range of the Bathurst caribou herd, including areas that are used for calving. Historically, Aboriginal groups travelled through the region to harvest caribou. In addition to hunting for large animals such as caribou, the surrounding lands are understood to have been used by Aboriginal people for trapping, small game and fishing. A number of plant species that are part of the traditional diet are also present in the area including blueberries, cranberries, and cloudberries. This was verified during the community meeting.

Previous environmental site assessments and archaeological reviews of the Contwoyto Lake WS area have not identified the presence of any traditional burial grounds at or in the vicinity of the site. While no traditional burial grounds have been documented, applicable regulatory authorizations (e.g. Nunavut Water Board) will provide protection should any traditional burial grounds be found in the course of remedial activities.

2.1.2 Historic Development

The history of the Contwoyto Lake WS is presented in Section 1.1.2 and as such not repeated herein.

2.2 CURRENT LAND USES

The nearest communities to the Contwoyto Lake WS are Bathurst Inlet and Kugluktuk which are respectively located 185 km north-northeast and 330 km northwest of the site. Yellowknife is approximately 400 km southwest (see Figure 1.1-1). From discussions with the wildlife monitor hired from the community of Kugluktuk for the Phase III ESA it was stated that few from that

Inuit community currently use this area for traditional pursuits such as hunting, fishing, trapping, collection of plants and firewood. However, the hunters and trappers did work with other northerners to trophy hunt and fish in the area of the site.

The remoteness of the site limits its current use by Aboriginal groups; however, an Inuit Camp did exist for a period during the time the weather station operated. It is believed that this Inuit Camp had been abandoned prior to the mothballing of the weather station.

2.3 ARCHAEOLOGICAL HERITAGE

Under the terms of the Phase III ESA SENES retained the services of a professional Archaeologist to review the site and records to establish the archaeological heritage of the site. The results of the Archaeological Report (Golder 2012) did not identify any archaeologically significant findings.

2.4 SITE ACCESS

The primary mode of access during the operational phase for the weather station was via float plane with wheeled aircraft a possibility with the short runway present on site. In addition, winter roads were regularly constructed through the area and are assumed to have been used to mobilize supplies and equipment to the site. A winter road is still used to access the Lupin Mine and typically passes within several hundred metres of the Contwoyto Lake WS.

3.0 DESCRIPTION OF THE SITE FEATURES

3.1 SITE OVERVIEW

The Contwoyto Lake WS consists of two general areas: 1) the former weather station and related infrastructure; and 2) an Inuit hunting cabin on the peninsula west of the former weather station. In addition to these site features, there are the remnants of a former Inuit Camp located south of the weather station property on IOL lands. Figures 3.1-1 and 3.1-2 identify the locations of each of these areas. General descriptions of the areas are provided in Sections 3.1.1, 3.1.2 and 3.1.3.

3.1.1 Former Weather Station Property

As indicated previously, the Contwoyto Lake WS is an "abandoned" weather station. To date, limited effort has been directed towards the remediation or "closure" of the former weather station and associated infrastructure. Much of the abandoned and relic facility equipment and assorted debris remains distributed throughout the small site. The primary site features include:

1) Main Camp Building (Structure 02) – The structure is comprised of a series of wood framed structures added to the original Quonset style structure. The windows are removed and the building is open to the environment. The walls and roof are in reasonable condition, however, are showing signs of deterioration. The structure did house a furnace and generator with a fuel oil tank. Residual debris related to the operation of the station remains within the structure.

2) Generator Building (Structure 03) – The structure is in a state of disrepair and partially collapsed with no windows and only one door remaining. The structure housed three above ground fuel tanks (each approximately 2,500 L) and at least one generator (removed). Limited amounts of equipment and parts remain within the footprint of the structure.

3) Ham Radio Sheds (Structures 04 and 05) – These two wood framed sheds are in reasonable shape with all equipment having been removed.

4) Airstrip – East of the site is a 300 m long airstrip delineated by 20 fuel drums (most of which are empty) located on top of an esker that transects the site. Minimal amounts of scrap metal have been dumped into the standing water bodies adjacent the north side of the airstrip.

5) Drum Caches 03 and 04 – There are two main fuel caches associated with the former weather station and both are located due east of the generator building. Fuel Cache 03 was reported to contain 47 drums, of which 14 had some form of liquid content, while 45 drums were reported in Fuel Cache 04 with 30 having some form of liquid content.

6) Debris Area 01 and 02 – In addition to existing infrastructure, there are two main areas where related debris has been distributed across the site. Debris Area 01 is located due west of Structure 02 on top of the esker material and is comprised mainly of empty drums, scrap metal related to skidoos, former radio antenna, and domestic waste. Debris Waste has been deposited in three main areas of the site. Debris Area 02 runs along the southern limit of the former station and extends down off the esker based overburden into the marshy low lands south of the site. The debris within this area is similar to that in Debris Area 01; however, quantities are greater and the debris contains more domestic waste, multiple propane cylinders as well as a small burn pit.

7) Equipment and Debris – Miscellaneous equipment (e.g., skidoos parts, radio antenna, radio tower sections), scrap metal (e.g., grounding wire, steel pipes and rails) drums and four above-ground storage tanks are distributed throughout the site beyond the two debris areas noted above.

Figure 3.1-3 provides a plan view of the major features present at the former weather station, Figure 3.1-4 a plan view of the airstrip and Figure 3.1-5 an overview of the radio tower portion of the site. Selected photographs of the features are presented in Plates 3.1-1 to 3.1-14.

Plate 3.1-1 Structure 02 (Camp Building) at Camp Looking West

Plate 3.1-2 Structure 02 (Camp Building) at Camp Looking South

Plate 3.1-3 Structure 03 (Generator Building) at Camp Looking South

Plate 3.1-4 Structure 03 (Generator Building) at Camp Looking North

Plate 3.1-5 Structure 04 (Ham Building) at Camp Looking East

Plate 3.1-6 Structure 05 (Ham Building) at Camp Looking West

Plate 3.1-7 Airstrip Looking East

Plate 3.1-8 Airstrip Looking West

Plate 3.1-9 Drum Cache 03 Looking East

Plate 3.1-10 Drum Cache 04 Looking South

Plate 3.1-11 Debris Area 01 at Camp Looking North

Plate 3.1-12 Debris Area 02 at Camp Overview

Plate 3.1-13 Radio Tower Sections Looking North

Plate 3.1-14 Radio Tower Area Looking East

3.1.2 Existing Inuit Hunting Camp

On the peninsula, due west of the former weather station, there exists a small wood frame with a tarped roof. Surrounding this structure are multiple drums of fuel, empty drums full of domestic and camp debris, wood frames used for drying fish and/or meat and remnants of two fire pits. The active drum cache (Drum Cache 01) contains five drums of unopened fuel while the inactive drum cache (Drum Cache 02) has 13 drums of which four were reported to contain water. Figure 3.1-6 provides a plan view of the major features present at the campsite. Selected photographs of the features are presented in Plates 3.1-15 to 3.1-20.

3.1.3 Former Inuit Camp

The former Inuit Camp is located along the southern shoreline of the island and due south of the former weather station. Little remains of the former camp other than some domestic debris (e.g. cans, tins, small pieces of plastic and some drums).

Figure 3.1-5 provides a plan view of the major features present at the campsite. Selected photographs of the features are presented in Plates 3.1-21 and 3.1-22.

Plate 3.1-15 Existing Inuit Hunting Camp Shed and Surround Looking North

Plate 3.1-16 Existing Inuit Hunting Camp Shed and Surround Looking South

Plate 3.1-17 Existing Inuit Hunting Camp Drum Cache 01 Looking South

Plate 3.1-18 Existing Inuit Hunting Camp Drum Cache 02 Looking East

Plate 3.1-19 Existing Inuit Hunting Camp Debris Looking North

Plate 3.1-20 Existing Inuit Hunting Camp Debris Looking North

Plate 3.1-21 Aerial Overview of Former Inuit Camp

Plate 3.1-22 Aerial Overview of Former Inuit Camp

4.0 DESCRIPTION OF THE NATURAL ENVIRONMENT

4.1 PHYSICAL SETTING

The study area is located on an island within the lower third of Contwoyto Lake in the Nunavut Territory. The island stratigraphy is divided between an esker deposit of sands and gravels with variable amounts of cobbles and boulders on the high lands and the low-lying marsh lands with occasional characteristic rocky outcrops, abundant fresh water and taiga ecology. The site is underlain by continuous permafrost. The vegetation in the area of the site is low lying shrubs, grass and bushes with patches of berry bearing vegetation.

Elevations range from 445 m above sea level (asl) along the shoreline of Contwoyto Lake and rise gradually to 450 m asl within the limits of the camp. The topography rises again to 455 m asl along the airstrip. The low relief portions of the site north and south of the esker deposit range from 446 m to 447 m with isolated bedrock outcrops as high as 455 m asl present south of the site near the former Inuit Camp. The topography of the site is shown in Figure 3.1-1.

4.2 CLIMATE

4.2.1 Temperature

Temperatures in the Contwoyto Lake area are summarized as follows (based on Environment Canada – Canadian Climate Normals 1961-1990):

- Average daily highs ranging from 14.9 ˚C (July) to -27.9˚C (January);
- Average daily lows ranging from 5.2 ˚C (August) to -35.1˚C (January); and
- Extreme temperature records of -53.9 ˚C to 27.2 ˚C.

Due to the exposed nature of the site, extreme cold temperatures are exacerbated by wind chill. Contwoyto Lake itself is anticipated to partially moderate temperature fluctuations, particularly during the relatively brief open water season (July to August/September).

4.2.2 Precipitation

With total annual precipitation of 246.6 mm, the Contowyto Lake area is technically classified as a desert. Approximately 55% of precipitation falls during the four months when average daily temperatures exceed 0˚C (i.e., June to September). Nonetheless, precipitation in the form of snow can occur at any time throughout the year.

4.3 AIR QUALITY

Although site-specific measurements are not available for the Contwoyto Lake WS, air sampling at other northern abandoned mine sites has found excellent air quality well below the Ambient Air Quality Standard (AAQS) for the Northwest Territories, Nunavut, and other jurisdictions. The concentrations of conventional pollutants (i.e. total suspended particulate - TSP, sulphur dioxide - SO_2, nitrogen oxides - NO_x) at the Contwoyto Lake WS Site are expected to be similar, as there are no significant sources of these pollutants in the local study area. Furthermore, the site is small with a limited footprint of historically disturbed area, has been inactive for many years, and contains only limited features that are potentially subject to wind disturbance/erosion.

4.4 HYDROLOGY

Contwoyto Lake is the dominant hydrologic feature in this area of Nunavut, with a surface area of 1,034 km^2. The lake is the primary outflow of the Burnside River, which eventually drains into Bathurst Inlet and then the Arctic Ocean. The hydrologic conditions at the weather station are governed by the coarse esker material on the highlands and the permafrost underlying the entire site. The small surface water bodies inland from Contwoyto Lake are shallow and interconnected through low-lying marshlands, all of which ultimately discharge to Contwoyto Lake (see Plate 4.4-1). From the topography of the site the surface water drainage on site would be towards the low-lying areas of the site to the north and south of the esker with the water migrating towards Contwoyto Lake.

The Department of Fisheries and Oceans (DFO) reports that Contwoyto Lake supports populations of the following fish species: lake trout, Arctic char, round whitefish, lake cisco, Arctic grayling and burbot (DFO 1986). Observations at the weather station indicate that the small inland waters are devoid of aquatic life.

Plate 4.4-1 Photographs of the Lowlying Areas Around the Site

4.5 GEOLOGY

4.5.1 Regional Bedrock Geology

Bedrock in the area is granite monzonite syenite (INAC, 2009). Depth to bedrock is expected to be more than 10 m below the existing site elevations. During the Phase III investigation bedrock outcrops were observed south of the site in the vicinity of the former Inuit Camp. No bedrock outcrops were observed at the former weather station site itself.

4.5.2 Regional Surficial Soils

A review of the Natural Resources Canada (Geological Survey of Canada) Surficial Geology of Contwoyto Lake (Map 76E south half, 1995) indicates that surface geology conditions in the vicinity of the site consist of esker sediments 1 m to 40 m thick of sand, silt and gravel flanked to the north and south by of organic deposits of peat and muck up to 2 metres thick. The eastern portion of the island is indicated as a till blanket 2 m to 10 m thick.

4.5.3 Local Scale Geology

Based on the site-specific information from test pits and boreholes, the site geology is described according to the following stratigraphic units:

Surficial Topsoil - The surficial topsoil consists of sand, gravel with organic rich peat material typical for this region located in the low lying areas. Within the limits of the esker, the surficial soils are exclusively coarse grained materials. In the low lying areas, this horizon comprises a thin veneer of dark brown to black topsoil containing some organic debris (e.g. wood and root debris). The topsoil horizon is loose, and ranges from moist to wet.

Native Soils – The native soils within the limits of the on-site esker are a mix of sands and gravels with cobbles and boulders in evidence from visual observations along the shoreline. The basement of the native soils were not defined during the course of the environmental site assessment work in 2011 or 2012; however, permafrost was encountered across the site at depths ranging from 0.5 to 1.2 m below grade.

In the low lying areas, the topsoil is underlain by a mix of finer grained silts and sands with some cobble and gravel present. Permafrost was encountered in locations where site conditions allowed for deeper overburden sampling. The basement of the native soils within this area of the site was not encountered during the recent site assessment work.

Bedrock – No bedrock was encountered within the limits of the site property.

4.6 HYDROGEOLOGY

It is presumed that the permafrost at the bottom of the active layer acts as a barrier below the groundwater table, and the movement of groundwater and infiltrating surface water at this site would be expected to follow the local contours of any permafrost (and/or bedrock in areas of shallow overburden) toward low-lying areas. Drainage paths are generally determined by local topography, which drains toward Contwoyto Lake.

4.7 TERRESTRIAL WILDLIFE

While information on wildlife occurring specifically at the Contwoyto Lake WS is not available, the region surrounding the site is known to support a diversity of terrestrial species. Animals seasonally present in the area are known to include barren-ground caribou and other mammals such as black bears and wolf. Hundreds of bird species have been observed throughout the region including waterfowl, shorebirds as well as predatory birds.

From direct observation a Golden Eagle, Gulls and Geese are known to frequent the site.

4.7.1 Species at Risk in Canada

Species at risk assessments are conducted by the Committee on the Status of Endangered Species in Canada (COSEWIC) who provide recommendations on the levels of protection needed to allow the recovery of declining species. Candidate species are listed under specific classifications depending on their numbers and the health of the population as follows:

Extinct:	a species no longer exists.
Extirpated:	a species no longer exists in the wild in Canada, but occurs elsewhere.
Endangered:	a species faces imminent extirpation or extinction.
Threatened:	a species likely to become endangered if limiting factors are not reversed.
Special Concern:	a species that may be particularly sensitive to human activities or natural events.

Species protected under the *Species at Risk Act* (SARA) are listed on Schedule 1 of SARA. SARA also includes endangered and threatened species on Schedule 2 and species of concern on Schedule 3 that are under review for inclusion on Schedule 1.

From our review of the Natural Resources Canada Ecozone maps, the former weather station on Contwoyto Lake is located within the Southern Arctic Ecozone. From the Government of Northwest Territories (GNWT) Environmental and Natural Resources literature (no equivalent

yet established in Nunavut) the status of the NWT Species at Risk Index for mammals and birds within this Ecozone are as noted in Table 4.8-1 below:

Table 4.8-1 Terrestrial Species at Risk Potentially Occurring within the Contwoyto Lake Area

Terrestrial Species at Risk potentially within project area [1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility [2]
Eskimo Curlew [3]	Endangered	Schedule 1	EC
Peregrine Falcon (*anatum-tundrius* complex [4])	Special Concern	Schedule 1 (*anatum*) Schedule 3 (*tundrius)*	Government of NWT/NU
Grizzly	Special Concern	Schedule 1 (*anatum*) Schedule 3 (*tundrius)*	Government of NWT/NU
Wolverine	Special Concern	Pending	Government of NWT/NU
Ivory Gull	Endangered	Schedule 1	Government of NWT/NU
Northern Mountain Caribou	Special Concern	Schedule 1	Government of NWT/NU
Red Knot	Threatened	No schedule	Government of NWT/NU
Olive-sided Flycatcher	Threatened	No schedule	Government of NWT/NU

[1] The Department of Fisheries and Oceans has responsibility for aquatic species.

[2] Environment Canada has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the *Migratory Birds Convention Act* (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Territorial Government. Thus, for species within their responsibility, the Territorial Government is best suited to provide detailed advice and information on potential adverse effects, mitigation measures, and monitoring.

[3] There have been no reliable sightings of Eskimo Curlew since 1998 and the National Recovery Team for this species has determined that recovery is not feasible at this time.

[4] The *anatum* subspecies of Peregrine Falcon is listed on Schedule 1 of SARA as threatened. The *anatum* and *tundrius* subspecies of Peregrine Falcon were reassessed by COSEWIC in 2007 and combined into one subpopulation complex. This subpopulation complex was listed by COSEWIC as Special Concern.

5.0 OVERVIEW OF ENVIRONMENTAL SITE ASSESSMENT RESULTS

5.1 INTRODUCTION

As indicated in Section 1.3, information on environmental conditions and historic activities at the Contwoyto Lake WS has been obtained through a number of environmental site assessment (ESA) and monitoring programs including:

- Integrated Phase I and Phase II Environmental Site Assessment, WK117- Contwoyto Lake Weather Station, Nunavut – WESA Inc. (WESA), 2011.
- Phase III Environmental Site Assessment for the Contwoyto Lake Remediation Program, Former Weather Station, NU – SENES Consultants (SENES), March 2013, revised October 2013.

The Phase III ESA conducted by SENES (SENES, 2013) represents the most recent and comprehensive evaluation of the site. For this reason, the characterization of environmental conditions described by SENES formed the basis of decision-making for the Remedial Action Plan (refer to Chapter 6). The following sections therefore provide an overview of the findings reached by SENES in their Phase III ESA report (SENES, 2013). Where appropriate, information collected from the previous WESA Phase I/II ESA is also presented.

Chemical data obtained during the various site investigations has been compared to guidelines and standards for each environmental media. These numerical limits have been used to determine if impacts have occurred at the site. It should be noted, however, that the definition of impact does not necessarily imply that there will be significant risks to human health and the environment. Natural attenuation mechanisms such as biodegradation and adsorption, exposure pathways, the frequency and distances to potential receptors must be considered to determine specific risks and potential impacts.

5.2 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

During the Phase III ESA the Contwoyto Lake site was divided into five areas and then sub-divided into Areas of Environmental Concern (AECs) depending on their setting, historical use and potential for contamination. The different areas were as follows:

- AEC 1: Peninsular Pond Area
- AEC 2: Camp Area
- AEC 3: Radio Tower Area
- AEC 4: Airstrip Area

- AEC 5: Former Inuit Camp Area [part of Inuit Owned Land (IOL) Area]

The AECs associated with each of the Areas are summarized in Table 5.2-1 along with associated Contaminants of Concern (COC). The AECs for the site are identified in Figure 5.2-1. With more detailed information on the respective AECs provided on Figures 5.2-2 to Figure 5.2-6 which includes all current and historical test pits, surface water and sediment sampling locations are also shown in the figures. Photos of the various Areas were presented in Chapter 3.

Table 5.2-1 Summary of Areas of Environmental Concern

Area of Environmental Concern (AEC)	Sub-Area	Contaminants of Concern (COC)
AEC 1 Peninsula Pond	Structure 01/Stain 1	PHCs
	Burn Pit 1	Metals, PHCs
	Burn Pit 2	Metals
	Drum Cache 01	Residual Fuels
	Drum Cache 02	Physical Hazards, Residual Fuels
AEC 2 Camp Area	Structure 02	PHCs, Residual Fuels and lead in paint Physical Hazard
	Structure 03	PHCs, Metals, Residual Fuels and lead in paint Physical Hazard
	Structure 04 and 05	Physical Hazard
	Drum Cache 03	Residual Fuels
	Drum Cache 04	Physical Hazards, Residual Fuels
	Debris Area 01	PHCs Physical Hazard
	Debris Area 02	PHCs, Metals, Residual Fuels Physical Hazard
	Stain 2	PHCs
	Misc. Drums and Debris	Residual Fuels Physical Hazard
AEC 3 Radio Tower Area	Radio Tower Section	Metals in paint application
	Radio Tower Base	Physical Hazard
	Misc. Debris Dumps and drums	Physical Hazard
AEC 4 Airstrip Area	Drums in Airstrip	Residual Fuels Physical Hazard

Area of Environmental Concern (AEC)	Sub-Area	Contaminants of Concern (COC)
AEC 5 Former Inuit Camp	Former Camp	Physical Hazards

5.3 SOIL IMPACTS AND DISTRIBUTIONS

5.3.1 Metals

5.3.1.1 AEC 1 Peninsula Area

During the course of the Phase II ESA, four soil samples were collected from this AEC and submitted for metals analysis. The results report one location within Burn Pit 1 with metal parameter concentrations above the applicable standard. The failing parameters were barium, boron (hot water extractable), copper, lead, tin and zinc. This is consistent with the camp waste that was burned within the pit. The locations of the samples and exceedances relative to applicable criteria are noted in Figure 5.3-1.

During the course of the Phase III ESA, seven soil samples (including two blind duplicates) were submitted for metals testing. All parameter results were below the applicable Environmental Quality Guidelines (EQG).

The estimated volume of metal impacts at one discrete location of this AEC is summarized below in Table 5.3-1.

Table 5.3-1 AEC 1 Metals Impacted Soils

Impact	Metals			Co-contaminant (Volume)
Name (Area)	**Volume of Impact(1)**	**Volume of Impact(2)**	**Contaminants of Concern**	
Soil Impact 02 (Burn Pit 01)	0.1 m^3	0.1 m^3	Barium, boron, copper, lead, tin, zinc	Benzene[3] (0.1 m^3)
Metals Impacted Soils Total AEC 1	**0.1 m^3**	**0.1m^3**	**Barium, boron, copper, lead, tin, zinc**	Benzene (0.1 m^3)

(1) Metals data compared to Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for an agricultural land use.
(2) Metals data compared to AMSRP DEW Line Cleanup Criteria (DCC) for Soil.
(3) BTEX data compared to CCME CEQGs coarse grained soil texture, agricultural land use.

5.3.1.2 AEC 2 Camp Area

During the course of the Phase II ESA, a total of twenty-five soil samples were submitted from the AEC for metals and inorganic parameter analysis. The results of the analytical work identified six samples with at least one parameter above the applicable EQG. Elevated concentrations of boron (hot water extractable), lead, copper, cadmium and zinc were encountered around Structure 03, antimony, arsenic, lead, tin and zinc were reported at discrete

locations with Debris Area 02, and zinc was reported at Drum Cache 04. The locations of the samples and exceedances relative to applicable criteria are noted in Figure 5.3-2.

During the course of the Phase III ESA, nineteen soil samples (including a blind duplicate) were submitted for metals testing from this AEC. The results for all but one soil sample reported parameter results below the applicable EQG. A surface soil sample from DA02 GR-1 reported elevated concentrations of copper, lead and tin. The locations of the samples and exceedances relative to applicable criteria are noted in Figure 5.3-2.

The estimated volumes of metal impacts at five discrete locations within AEC 2 are summarized below in Table 5.3-2.

Table 5.3-2 AEC 2 Metals Impacted Soils

Impact	Metals			Co-contaminant (Volume)[3]
Name (Area)	**Volume of Impact[1]**	**Volume of Impact[2]**	**Contaminants of Concern**	
Soil Impact 03 (Structure 03)	15 m^3	13 m^3	Boron, cadmium, copper, lead, zinc	PHC F1, F2, F3 (15 m^3)
Soil Impact 06 (Debris Area 02)	20 m^3	20 m^3	Copper, cadmium, chromium, lead, tin, zinc	PHC F1, F2, F3, F4 (20 m^3)
Soil Impact 07 (Debris Area 02)	3 m^3	3 m^3	Antimony, arsenic, lead, tin, zinc	PHC F2, F3 (3 m^3)
Soil Impact 08 (Debris Area 02)	8 m^3	0 m^3	Tin, zinc	PHC F2, F3 (8 m^3)
Soil Impact 09 (Drum Cache 04)	0.1 m^3	0 m^3	Zinc	n/a
Metals Impacted Soils Total AEC 2	**46.1 m^3**	**36 m^3**	**Antimony, arsenic, boron, cadmium, chromium, copper lead, tin, zinc**	PHC F1, F2, F3, F4 (46 m^3)

(1) Metals data compared to Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for an agricultural land use.
(2) Metals data compared to AMSRP DEW Line Cleanup Criteria (DCC) for Soil.
(3) PHC F1 to F4 data compared to Tier 1 CCME 2008 coarse grained soil texture, agricultural land use.

5.3.1.3 AEC 3 Radio Tower Area

No soil sampling was completed within this AEC during the Phase II ESA program.

During the course of the Phase III ESA, four shallow surface soil samples were recovered from the thin veneer of fine grained soils. The reported parameter concentrations were all below the EQG set for this assessment. The location of the respective sample points are presented on Figure 5.3-3.

5.3.1.4 AEC 4 Airstrip Area

No soil sampling was completed within this AEC during the Phase II ESA program.

During the course of the Phase III ESA, three shallow surface and three deeper soil samples were recovered from the granular esker overburden. The reported parameter concentrations were all below the EQG set for this assessment. The location of the respective sample points are presented on Figure 5.3-4.

5.3.1.5 AEC 5 Former Inuit Camp Area

No soil samples were recovered from the Former Inuit Camp Area and, as such, metal parameter testing was not completed within this AEC.

5.3.2 Petroleum Hydrocarbons

5.3.2.1 AEC 1 Peninsula Area

During the course of the Phase II ESA four soil samples were collected from this AEC and submitted for BTEX (Benzene, Toluene, Ethylbenzene, Xylene) and PHC analysis. The results report one location within Burn Pit 1 with an elevated concentration of benzene and one location (Stain 01) where the PHC F3 fraction reported a concentration above the EQG. This is consistent with the camp waste that was burned within the pit and the fuel management practices at the active hunting camp. The locations of the samples and exceedances relative to applicable criteria are noted in Figure 5.3-5.

During the course of the Phase III ESA, nineteen soil samples (including two blind duplicates) were submitted for BTEX/PHC testing. All parameter results were below the applicable EQG.

The estimated volumes of BTEX/PHC impacted soil at the two discrete locations of this AEC are summarized below in Table 5.3-3.

Table 5.3-3 AEC 1 BTEX/PHC Impacted Soils

Impact	PHCs			Co-contaminant (Volume)[4]
Name (Area)	**Volume of Impact[1,2]**	**Volume of Impact[3]**	**Contaminants of Concern**	
Soil Impact 01 (Stain 01)	0.1 m^3	0 m^3	PHC F3	n/a
Soil Impact 02 (Burn Pit 01)	0.1 m^3	0.1 m^3	Benzene	metals (0.1 m^3)
PHC/BTEX Impacted Soils Total AEC 1	**0.2 m^3**	**0.1 m^3**	**PHC F3, benzene**	metals (0.1 m^3)

(1) PHC F1 to F4 data compared to Tier 1 CCME 2008 coarse grained soil texture, agricultural land use.
(2) BTEX data compared to CCME CEQGs coarse grained soil texture, agricultural land use.
(3) PHC data compared to AMSRP Remedial Objectives for Hydrocarbon Contaminated Soil.
(4) Metals data compared to Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for an agricultural land use.

5.3.2.2 AEC 2 Camp Area

During the course of the Phase II ESA, a total of twenty-eight soil samples were submitted from the AEC for BTEX/PHC parameter analysis. The results of the analytical work identified eighteen samples with at least one parameter above the EQG. Elevated concentrations of F1, F2 and F3, as well as toluene and xylene were encountered around Structure 02; F1, F2 and F3 were encountered around Structure 03, Stain 03 and within Debris Area 01; and F2 and F3 were encountered at two discrete locations in Debris Area 02. The locations of the samples and exceedances relative to applicable criteria are noted in Figure 5.3-6.

During the course of the Phase III ESA, seventy soil samples (including six blind duplicates) were submitted for BTEX/PHC testing from this AEC. The results identified fifteen samples with at least one PHC fraction concentration above the EQG. No elevated BTEX parameter concentrations were reported. In general, the elevated parameter concentrations are from the same areas previously identified in the Phase II ESA. The locations of the samples and exceedances relative to applicable criteria are noted in Figure 5.3-2.

The estimated volumes of BTEX/PHC impacted soil at the seven discrete locations of this AEC are summarized below in Table 5.3-4.

Table 5.3-4 AEC 2 BTEX/PHC Impacted Soils

Impact	PHCs			Co-contaminant (Volume)[4]
Name (Area)	**Volume of Impact[1,2]**	**Volume of Impact[3]**	**Contaminants of Concern**	
Soil Impact 03 (Structure 03)	800 m^3	800 m^3	PHC F1, F2, F3	Boron, cadmium, copper, lead, zinc (15 m^3)
Soil Impact 04 (Structure 02)	250 m^3	250 m^3	PHC F1, F2, F3; toluene, xylene (total)	n/a
Soil Impact Area 05 (Debris Area 01)	1 m^3	1 m^3	PHC F1, F2, F3	n/a
Soil Impacted Area 06 (Debris Area 02)	35 m^3	35 m^3	PHC F1, F2, F3, F4	Copper, cadmium, chromium, lead, tin, zinc (20 m^3)
Soil Impact Area 07 (Debris Area 02)	3 m^3	3 m^3	PHC F2, F3	Antimony, arsenic, lead, tin, zinc (3 m^3)
Soil Impacted Area 08 (Debris Area 02)	8 m^3	8 m^3	PHC F2, F3	Tin, zinc (8 m^3)
Soil Impacted Area 10 (Stain 02)	45 m^3	45 m^3	PHC F3, benzene	n/a
PHC/BTEX Impacted Soils Total AEC 2	**1142 m^3**	**1142 m^3**	**PHC F1, F2, F3, F4; benzene, toluene, xylene (total)**	metals (46 m^3)

(1) PHC F1 to F4 data compared to Tier 1 CCME 2008 coarse grained soil texture, agricultural land use.
(2) BTEX data compared to CCME CEQGs coarse grained soil texture, agricultural land use.
(3) PHC data compared to AMSRP Remedial Objectives for Hydrocarbon Contaminated Soil.
(4) Metals data compared to Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for an agricultural land use.

5.3.2.3 AEC 3 Radio Tower Area

No soil sampling was completed within this AEC during the Phase II ESA program.

During the course of the Phase III ESA, four shallow surface soil samples were recovered from the thin veneer of fine grained soils. The reported parameter concentrations were all below the EQG set for this assessment. The location of the respective sample points are presented on Figure 5.3-7.

5.3.2.4 AEC 4 Airstrip Area

No soil sampling was completed within this AEC during the Phase II ESA program.

During the course of the Phase III ESA, three shallow surface and three deeper soil samples were recovered from the granular esker overburden and submitted for BTEX/PHC analysis. The reported parameter concentrations were all below the EQG set for this assessment. The location of the respective sample points are presented on Figure 5.3-8.

5.3.2.5 AEC 5 Former Inuit Camp Area

No soil samples were recovered from the Former Inuit Camp Area and, as such, BTEX/PHC parameter testing was not completed within this AEC.

5.3.3 Polychlorinated Biphenyls

During the course of the Phase II ESA program, a total of eighteen soil samples (including two blind duplicates) were submitted for polychlorinated biphenyls (PCBs) analysis from AECs 1 and 2. No supplemental PCB testing was completed as part of the Phase III ESA program. The results of the PCB analysis showed that all parameters were not-detected and therefore, PCBs in soil are not a contaminant of concern and no further action is required.

5.4 SURFACE WATER IMPACTS AND DISTRIBUTIONS

5.4.1 Sampling Overview

During the course of the Phase II ESA program, a total of four surface water samples were collected (including a blind duplicate and a background sample) from different water bodies in close proximity to the former weather station. The surface water sampling locations were generally consistent with sediment sampling and are shown in Figure 5.4-1.

In order to better understand the water quality in the area of the former weather station and to confirm identified concerns with pond water adjacent the existing hunting camp, the Phase III ESA program involved the collection of twelve surface water samples (including a blind duplicate and background sample) for analysis of total and dissolved metals as well as petroleum hydrocarbons.. The surface water sample locations are shown in Figure 5.4-1.

5.4.2 Surface Water Impacts and Distributions

5.4.2.1 Metals

The majority of analytical results for surface water samples identified elevated metal concentrations relative to the Canadian Council of Ministers of the Environment (CCME) Freshwater Aquatic Life (FAL) guidelines. The following table summarizes the parameters that were reported at concentrations above the CCME FAL.

Table 5.4-1 Surface Water Exceedences

Sample	Parameter						
	Aluminum	**Cadmium**	**Cobalt**	**Copper**	**Phosphorous**	**Iron**	**Zinc**
Background							
CL-11-SW	x	x	x	x		x	
CL-12-SW	x						x
AEC 1							
CL-1-SW		x			x	x	
CL-2-SW		x			x	x	
AEC 2							
CL-4-SW	x	x	x	x		x	
CL-104-SW	x	x	x	x	x	x	
CL-5-SW							
CL-6-SW	x	x					
CL-7-SW	x				x		
AEC 3							
CL-8-SW	x	x			x		
AEC 4							
CL-9-SW							
CL-10-SW	x						

(1) An `X` denotes an exceedance in comparison to the CCME FAL.

In general, the elevated parameter results were similar to, or below, concentrations measured from the in-land background sample (CL-11-SW) procured approximately 1 km east of Debris Area 02. This suggests that the surface water in the low lying areas of the site is naturally

elevated in metals, in particular aluminum, cadmium, cobalt, copper and iron. Results from the Contwoyto Lake background sample (CL-12-SW collected 0.8 km north of the site) also suggest that aluminum concentrations are naturally elevated.

The results of the surface water analytical program have shown that the operation of the weather station has not contaminated the local surface water regime. The removal of debris from the site, including rusting scrap metal and broken batteries, will further reduce any potential for surface water contamination as a result of residual debris at the site.

5.4.2.2 BTEX/PHCs

The results of the surface water analysis for BTEX and PHC parameters did not identify any concentrations above the EQG for this program. There are no BTEX/PHC concerns in the surface water around the former weather station or the existing hunting camp.

5.5 SEDIMENT IMPACTS AND DISTRIBUTIONS

5.5.1 Sampling Overview

As part of the Phase III ESA program, SENES collected eight surface (0-15 cm) sediment samples to assist with the identification and delineation of potential metal and petroleum hydrocarbon impacts in the waters around the former Contwoyto Lake weather station and the existing hunting camp on the Peninsula where an elevated mercury result was reported in the Phase II ESA program. The Phase III ESA sediment sampling program included the collection of a background sediment sample from an inland water body and Contwoyto Lake as the depositional environments are different at these locations. The locations of sediment sample stations are shown in Figure 5.5-1.

5.5.2 Sediment Impacts and Distributions

5.5.2.1 Metals

Based on the analytical results of the Phase III ESA, exceedances of applicable CCME Interim Sediment Quality Guidelines (ISQG) were as follows in Table 5.5-1, presented on the following page.

Table 5.5-1 Sediment Exceedences

Sample	Parameter			
	Arsenic	**Copper**	**Nickel**	**PHC F3**
Background				
CL-11-SD	x	x	x	x
CL-12-SD				
AEC 1				
CL-1-SD	x			
CL-2-SD				
CL-3-SD	x			
AEC 2				
CL-4-SD	x	x	x	
CL-104-SD	x	x	x	x
CL-5-SD				
CL-6-SD				
CL-7-SD				
AEC 3				
CL-8-SD				
AEC 4				
CL-9-SD				
CL-10-SD				

(1) An `X` denotes an exceedance in comparison to the CCME ISQG.

The elevated parameter results at sample locations CL-1-SD, CL-3-SD and CL-4-SD are consistent with the inland background sediment values reported in sample CL-11-SD and, as such, the operation of the former weather station and the on-going operation of the hunting camp does not appear to have impacted the local sediment.

5.5.2.2 Petroleum Hydrocarbons

Eight of the sediment samples collected during the Phase III ESA were analyzed for petroleum hydrocarbons. None of the samples from the Peninsula (CL-1 to -3- SD) and Contwoyto Lake (CL-6, -7 and -12- SD) reported detectable concentrations of BTEX or PHC parameters. Similarly, all results from three inland samples procured from the north side of the airstrip (CL-5, -9 and -10-SD) were below detection limits for BTEX and PHC. Two inland sediment

samples (CL-104 and -11- SD) from marshy areas on the south side of the side of the island reported an F3 concentration above the EQG for the program. All other petroleum hydrocarbon parameter results were below the EQG for the respective parameters. The elevated F3 results are consistent with samples that contain high levels of organic material and are not believed to be indicative of fuel oils or other petroleum hydrocarbons having been spilled in the area.

On the basis of the analytical results, there are not petroleum hydrocarbon issues with the sediment in the area of the former weather station or the existing hunting camp.

5.6 DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

5.6.1 Asbestos-Containing Materials

Between the Phase II and III ESA, a total of twelve samples were submitted for analysis of Asbestos Containing Material (ACM). Two of the samples were identified as having asbestos; however, during the course of the sampling program the entire piece of ACM was collected. As such, there are no longer any asbestos concerns at the site.

5.6.2 Lead-Amended Paint

During the course of the Phase II and III ESA programs, a total of eleven paint samples (including one blind duplicate) were collected for lead in paint analysis. The results of the analytical work identified eight of the samples from within Structures 02 and 03 with paint applications high in lead.

The total estimated volume of materials with lead-amended paint is 5.2 m^3. The location of confirmed lead-amended paint is presented on Figure 5.6-1.

5.6.3 PCB-Amended Paint

During the course of the Phase II and III ESA programs, a total of eleven samples (including one blind duplicate) were collected for PCB in paint analysis. The results of the analytical work identified four of the samples from within Structure 02 with paint applications high in PCBs.

The total estimated volume of materials with PCB-amended paint, broken down by location within this AEC, is 5.8 m^3. The location of confirmed PCB-amended paint is presented on Figure 5.6-1.

Table 5.6-1 Volume of Materials with PCB-Amended Paint (PAP)

Location	Volume of Materials With PAP > 50 ppm (m^3)
Structure 02 – Room 1 Entrance	0.43
Structure 02 - Interior Room 1	3.05
Structure 02 - Quonset East Room	1.47
Structure 02 – Room 4	0.85
Total	**5.8**

5.6.4 Residual Fuels

During the course of the Phase III ESA program, a total of 279 drums were identified within the five AECs inspected. A total of 99 drums contained some form of liquid product. The results of the investigative work reported the following:

Table 5.6-2 Drum and Drum Contents Overview

Detail	Quantity
No. of drums on-site[1]	279 drums
No. of drums with liquid contents	99 drums
Volume of liquid contents	2,100 litres

(1) Includes 8 drums within the IOL Camp Area

- 10 drums contained petroleum hydrocarbon based product – 200 L;
- 88 drums contained water or oily water – 1700 L; and
- One drum contained an unknown product – 200 L

Comparison of the laboratory results to the standards set out in the Abandoned Military Site Remediation Protocol (AMSRP) indicates that the majority of the liquid within the drums could be managed on site (i.e., through incineration) however more recent practice is to ship residual liquids off-site for disposal. As a minimum two drums with a total of 82 L of product will need to be shipped off-site for disposal as per the AMSRP.

5.7 WASTE AND DEBRIS

Equipment, debris and non-combustible building materials are scattered throughout the former weather station site, the existing hunting camp and former Inuit camp areas. The debris around the former weather station consists mostly of scrap metal, drums, above ground tanks, antenna sections and domestic waste (e.g., tin cans). The debris around the existing hunting camp and the former Inuit camp is primarily domestic waste with some drums. Representative

photographs are presented in Chapter 3 while Figure 5.7-1 shows the spatial distribution of waste and debris. The total volume of wastes and scattered debris around the Contwoyto Lake WS was estimated by SENES (2013) to be 122.5 m^3 according to the distribution by AEC as shown below in Table 5.7-1.

Table 5.7-1 Volume of Non-Hazardous Waste by AEC

Description	Volume (m^3)
AEC 1 – Peninsula Area	
AEC 1 drums	3.4(1)
AEC 1 debris	0.6(2)
AEC 1 Total	**4.0**
AEC 2 – Camp Area	
Structure 02	13.9
Structure 03	25.3
Structure 04	4.9
Structure 05	4.9
AEC 2 drums	28.6(1)
AEC 2 debris	32.3
AEC 2 Total	**109.9**
AEC 3 – Radio Tower Area	
AEC 3 drums	1.4(1)
AEC 3 debris	0.2
AEC 3 Total	**1.6**
AEC 4 – Airstrip Area	
AEC 4 drums	2.8(1)
AEC 4 debris	2.6
AEC 4 Total	**5.4**
AEC 5 – Former Inuit Camp Area	
AEC 5 drums	1.1(1)
AEC 5 debris	0.5
AEC 5 Total	**1.6**
Non-hazardous Waste Total	**122.5 m^3**

(1) Assumes a 30% reduction of drum volumes by crushing.
(2) Does not include Structure 01. Structure 01 to remain.

The hazardous debris scattered throughout the former weather station site included items such as old batteries, old propane cylinders, and old fridges and freezers. The total volume of hazardous wastes around Contwoyto Lake WS was estimated by SENES (2013) to be 13.5 m^3 according to the distribution by AEC as presented in Table 5.7-2.

Table 5.7-2 Volume of Hazardous Debris by AEC

AEC	Volume (m^3)
AEC 1 – Peninsula Area	0.01
AEC 2 – Camp Area	11.4
AEC 3 – Radio Tower Area	1.9
AEC 4 – Airstrip Area	0.2
AEC 5 – Former Inuit Camp Area	0
Total	**13.5 m^3**

Note that 5.2 m^3 of wood in the Camp Area and 1.9 m^3 of metal in the Radio Tower Area, which contain lead amended paint applications, are considered non-hazardous if disposed of in an engineered landfill under 0.5 m of clean fill.

5.8 PHYSICAL HAZARDS

There are a number of physical hazards in different areas of the Contwoyto Lake WS site. They include scattered metal objects and waste dumps as well as the partially collapsed structures.

5.9 SUMMARY OF SITE CONDITIONS

5.9.1 Chemical Characterization

Soils

Soils have been impacted by metals and petroleum hydrocarbons, primarily in the main camp area. Metal impacts were typically encountered in the shallow soils (0.0 – 0.15 m below grade) and included the burn pit on the peninsula as well as various locations within the Debris Areas which were basically the Camp Dumps. Petroleum hydrocarbon impacts were associated with the above ground storage tanks within Structure 02 and Structure 03, as well as minor areas associated with drums and the peninsula burn pit. The petroleum hydrocarbon impacts beneath the structures are encountered in the shallow soils within the esker (0.0 – 1.2 m below grade), whereas the petroleum hydrocarbons at the drums and burn pit are encountered in the shallow soils within the peat (0.0 – 0.3 m below grade).

The total volume of metal impacted soils identified on the site is in the order of 50 m^3 which the majority of is co-contaminated with PHCs. The total volume of PHC impacted soils identified on the site is in the order of 1150 m^3. Table 5.9-1 and 5.9-2 summarize the soil impacts.

Table 5.9-1 Volume of Soil Impacts

Area	CCME(1)		AMSRP(2)	
	Volume		Volume	
	PHC-impacted soils	Metals-impacted soils	Type B PHC-impacted soils	Tier II Metals-impacted soils
AEC 1	0.2 m^3	0.1 m^3	0.1 m^3	0.1 m^3
AEC 2	1142 m^3	46.1 m^3	1142 m^3	36 m^3
AEC 3	0 m^3	0 m^3	0 m^3	0 m^3
AEC 4	0 m^3	0 m^3	0 m^3	0 m^3
AEC 5	0 m^3	0 m^3	0 m^3	0 m^3
Total	**1142.2 m^3**	**46.2 m^3**	**1142.1 m^3**	**36.1 m^3**

(1) PHC data compared to 2008 Tier 1 coarse grained F1 to F4 for an agricultural land use. Metals data compared to Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for an agricultural land use.

(2) PHC data compared to AMSRP Remedial Objectives for Hydrocarbon Contaminated Soil. Metals data compared to AMSRP DEW Line Cleanup Criteria (DCC) for Soil.

Table 5.9-2 Volume of Impacts based on AMSRP

Soil Impact	Volume	
	Type B PHC-impact	Co-contaminant Metals
AEC 1		
Soil Impact 01	0 m^3	0 m^3
Soil Impact 02	0.1 m^3	0.1 m^3
AEC 2		
Soil Impact 03	800 m^3	13 m^3
Soil Impact 04	250 m^3	0 m^3
Soil Impact 05	1 m^3	0 m^3
Soil Impact 06	35 m^3	20 m^3
Soil Impact 07	3 m^3	3 m^3
Soil Impact 08	8 m^3	0 m^3
Soil Impact 09	0 m^3	0 m^3
Soil Impact 10	45 m^3	0 m^3
Total	**1142.1 m^3**	**36.1 m^3**

Water Quality

Surface water impacts were not identified in Contwoyto Lake. Surface water from the pond in the vicinity of Debris Area 02 and the pond northeast of the camp did contain elevated concentrations of metals; however the background concentrations of those metals were also elevated. In these cases, the surface water was collected immediately adjacent to visible surface debris. Once surface debris is collected, natural attenuation of any localized surface water impacts is expected.

Sediment Quality

Somewhat random metal concentrations have been detected in sediments slightly exceeding the low level ISQGs. Based on the types of site activities and distribution of metal concentrations, it is considered unlikely that elevated metal concentrations are attributable to activities at the site. One sediment sample, collected within the peninsula pond (WESA 20111) contained elevated levels of mercury. This result was not reproduced during the Phase III (SENES 2013). The most recent investigation suggests that mercury contaminated sediments are not a concern.

Designated Substances

Small quantities of asbestos-containing material (< 0.1 m^3 already removed during sampling), wood applied with lead-amended paint (5.2 m^3) and PCB-amended paint (5.8 m^3) have been identified on site.

5.9.2 Physical Characterization

The Contwoyto Lake WS contains the typical hazards and issues associated with other northern DEW-Line era radar sites including surface debris, remnants of buildings, abandoned equipment, debris and scrap. A summary of these hazards is provided below.

- *Buildings and Infrastructure* – The radio tower and buildings have not been in use since the 1980s. Currently, the structures are in a state of disrepair with sections of roof already collapsed on two of the structures. The structures included sleeping quarters, radio buildings, a generator building, and a camp building. There is scattered debris within the structures and some of the building contents are scattered around the debris areas. The radio tower has been dismantled and its remains are adjacent to its former location. The volume of waste that will be generated from the site buildings and infrastructure is noted below.

- *Equipment, Waste and Debris* - Miscellaneous equipment, waste and debris is distributed throughout the main camp areas. In total, the volume of waste material (the majority of which is metal) is estimated to be in the order of 125 m^3 and includes the non-hazardous waste from the sites buildings and infrastructure. This volume includes the former above-ground fuel storage tanks, drums and scattered debris across the site centred around the main camp area.

Table 5.9-3 Volume of Waste and Debris

AEC	Site Feature	Item	Volume (m^3)			
			Wood[1]	Metal[2]	Concrete	Total
1	Drums[2]	24 drums	0	3.4	0	3.4
	Debris	Waste debris from hunting camp and other misc. wood, metal and plastic waste (0.2 m^3)	0.3	0.05	0	0.6
	Structure 01	Plywood and stud framed structure no paint.	Structure 01 to remain[3]			
	Total					**4.0**
2	Drums[2]	204 drums	0	28.6	0	28.6
	Structure 02	Wood frame structure with tarpaper roofing material and paint wood (15.2 m x 12.5 m x 3.4 m). Multiple interior walls Minor concrete foundations for generator and AST pads Miscellaneous debris inside the structure (Tar paper = 1.3 m^3, and flooring = 0.3 m^3)	6.7	5	0.6	13.9
	Structure 03	Wood frame structure with asphalt roofing material and some paint (8.8 m x 5.0 m x 2.2 m) Concrete strip foundation for AST pad. AST inside (2 x 2,500 L) and AST outside the structure (1 x 2,500 L) Miscellaneous debris inside the structure (Tar paper = 0.1 m^3)	2.1	10	13.1	25.3
	Structure 04	Wood frame structure with asphalt roofing (0.1 m^3), flooring (0.05 m^3) and insulation (3.6 m^3)	0.9	0.2	0	4.9
	Structure 05	Wood frame structure with asphalt roofing (0.1 m^3), flooring (0.05 m^3) and insulation (3.6 m^3)	0.9	0.2	0	4.9
	Debris	Camp area covered with a mix of wood, metal and plastic parts (1 m^3) including skidoos, appliances and radio tower components, tanks	1	30	0.3	32.3
	Total					**109.9**

Table 5.9-3 Volume of Waste and Debris (Cont'd)

AEC	Site Feature	Item	Volume (m^3)			
			Wood[1]	**Metal[2]**	**Concrete**	**Total**
3	Drums[2]	10 Drums	0	1.4	0	1.4
	Radio Tower[4]	Metal tower broken down into 10 sections approximately 3.6 m long. Miscellaneous anchor cable and galvanized metal parts in buckets with the tower components.	0	0[4]	0.01	0.01
	Misc. debris	Miscellaneous tin cans and other scrap metal along shoreline and around base of former tower, approx. 50 x 50 m of grounding wire	0.05	0.15	0	0.2
	Total					**1.6**
4	Drums[2]	20 Drums	0	2.8	0	2.8
	Misc. debris	Metal debris, electronic component racking and pieces of scrap-metal, old tub and miscellaneous plastic (0.5 m^3)	0.1	2	0	2.6
	Total					**5.4**
5	Drums[2]	8 Drums	0	1.1	0	1.1
	Misc. debris	Tin can dumps, wood, plastic (0.04 m^3)	0.01	0.4	0	0.5
	Total					**1.6**
Grand Total (includes 11.1 m^3 of misc. materials)			**12.1**	**85.3**	**14.0**	**122.5 m^3**

1. Assumes all wood volume is burnable 2. Assumes a 30% reduction of drum volumes by crushing.

3. Structure 01 consists of 0.7 m^3 of wood, operated by the Kugluktuk Hunters and Trappers Association

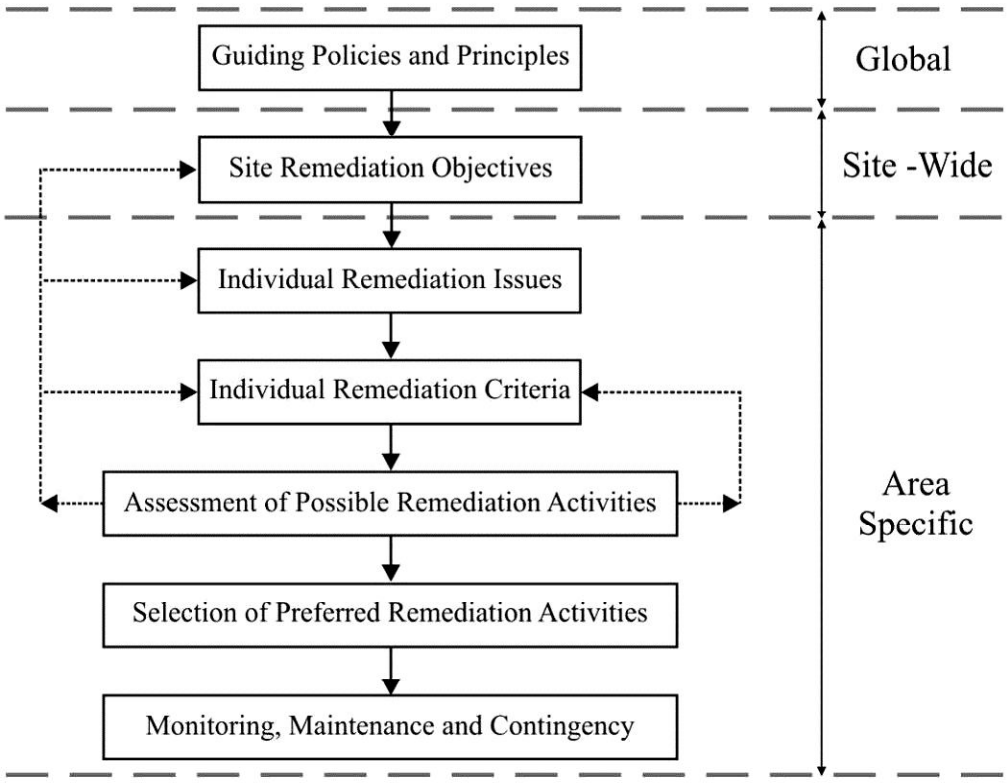
4. Radio Tower painted metal material included within hazardous total. Material is considered non-hazardous when disposed in an engineered landfill under 0.5 m of clean fill.

6.0 PROPOSED REMEDIAL ACTIONS

6.1 PROCESS FOR SELECTION OF REMEDIAL ACTIVITIES

The general AANDC approach to remediation is illustrated in Figure 6.1-1 below. The specific process components carried out for the development of the Remediation Action Plan (RAP) for the Contwoyto Lake WS are presented in the following discussion.

Figure 6.1-1 AANDC's Approach to Selection of Remedial Activities



6.1.1 Generic Process Approach and Considerations

The site consists of a number of features that have similar remedial issues. In order to enable the development of a coherent RAP, these features were grouped into like components that share similar characteristics and remedial issues. For each of these components, *remedial issues and concerns* were identified based on input from field studies. Input received during future consultations will also inform this process. Potential *remedial options* were identified that can be used to address the outstanding remedial issues.

Possible and preferred remedial options for each component of the Contwoyto Lake WS are discussed in the following sections of this report. These remedial options have been assessed with respect to their ability to fulfill the overall framework and site-specific remedial objectives. A preliminary preferred option was then selected for each remedial component. Collectively, these preferred options represent the proposed RAP that will form the basis of future community consultations.

6.1.2 Typical Remedial Objectives and Considerations

In general, the objective for any site remediation strategy is to assure:

- The protection of human health;
- Minimization of environmental impacts; and,
- To the extent possible, restoration of the land to pre-development conditions or a suitable alternative land use.

The following technical reclamation guidance was considered appropriate for the remediation of the site.

Physical Stability and Health and Safety

- Minimize physical risk associated with collapsing and partially collapsing structures; and
- Minimize physical risks associated with other physical hazards (e.g., waste and debris).

Environmental Effects

- Meet receiving water quality criteria in Contwoyto Lake;
- Keep environmental effects as low as reasonably achievable (ALARA); and,
- Manage any contaminated soils based on good practice.

Land Use

- Allow for future land uses that are typical of the area.

6.1.3 Listing of Remedial Components and Features at the Contwoyto Lake WS

Based on Environmental Site Assessments conducted to date, components of the Contwoyto Lake WS requiring remediation or risk management are as follows:

- Physical hazards and aesthetic concerns
    - Waste dumps and debris

  - Partially Collapsed Structures

- Soils impacted by metals

- Soils impacted by petroleum hydrocarbons

- On-site management issues
  - Drums containing fuel
  - Empty drums
  - Building materials with lead and/or PCB-amended paint
  - Used/burned batteries

6.1.4 Review of Remedial Issues and Options

The remedial options considered for each component listed in the previous section vary. However, in most cases, the following generic options were considered for each component:

Leave As Is - The "no action" option is typically included for all components and may be adopted where:

- Components are stable and do not represent a physical or ecological hazard;
- The area has been, or is being, naturally reclaimed through natural processes (e.g., re-vegetation); and,
- The component has historic or archaeological value.

Consolidation and On-Site Disposal – For materials requiring disposal/containment, this option would involve the consolidation of potential contaminant sources and disposal in an engineered facility to be constructed at the site.

Consolidation, Transport and Off-Site Disposal – For materials requiring disposal/containment, this option would involve the consolidation of potential contaminant sources and off-site disposal in an appropriately licensed facility.

On-site Treatment – Technologies exist to treat some forms of contamination. For sites similar to the Contwoyto Lake WS, on-site treatment options typically focus on soils contaminated by petroleum hydrocarbons. The treatment methods can involve biological processes (e.g., bioremediation) or may rely exclusively on volatilization.

6.2 REMEDIAL OPTIONS ANALYSIS

SENES undertook a screening level options analysis to assist with the selection of the preferred remedial approaches. The screening was based on the extent to which each option was deemed to meet the remediation objectives for the site. The following sections present the analysis of remedial options for the various site components.

6.2.1 Physical Hazards

Mitigating physical hazards has been identified as a high priority for the Contwoyto Lake WS. The most significant physical hazards are the two collapsing structures which are addressed in this section. Management options for other physical hazards, including metal debris and drums, are evaluated in subsequent sections.

The options reviewed to manage the existing structures (except the existing Inuit cabin in AEC 1 which is owned by the Kugluktuk Hunting and Trapping Association) were:

i. Demolition and on-site disposal of waste;
ii. Demolition and off-site disposal of waste; and
iii. Care and maintenance of the buildings and other site infrastructure

i) Demolition and On-site Disposal of Waste

Under this approach, all the hazardous materials would initially be removed from the respective structures pending off-site disposal and the structures would be demolished. The demolition waste would be burned to reduce volume and then placed into an engineered on-site landfill to be located within the limits of the existing airstrip. This option would remove the physical hazards but would not provide the program stakeholders with a "walk away" solution since long-term monitoring and maintenance of the engineered landfill would be required. However, an on-site engineered landfill can effectively manage the associated risks.

ii) Demolition and Off-site Disposal of Waste

Under this approach, all the hazardous materials would initially be removed from the respective structures pending off-site disposal and the structures would be demolished. The demolition waste would be consolidated for off-site disposal at an appropriately licensed off-site facility. This option would provide a "walk away" solution since no landfill would be on site that would require long-term monitoring and maintenance. However, this option may be cost prohibitive given the volume of material requiring relocation.

iii) Care and Maintenance

The third option would be to board up the existing structures and sign them warning of the issues associated with the structures. This option would not remove the physical hazards, nor would it provide the program stakeholders with a "walk away" solution since long term monitoring and maintenance is required.

6.2.2 Waste and Debris

The waste and debris present at the Contwoyto Lake WS was described in Section 5.7. The debris consists mostly of metals such as drums, skidoo parts, radio equipment, wires and miscellaneous domestic debris. In relative terms, the volume and mass of these materials represents a significant component of the project works and planning logistics. Options for the management of the debris include:

i. Consolidate and transfer the material to an appropriately licensed off-site waste management facility for disposal; and
ii. On-site disposal in an engineered landfill.

This evaluation of options considered only materials deemed to be non-hazardous. Options for the management of known hazardous materials are described in subsequent sections.

i) Consolidate and transfer to licensed waste management facility for disposal

Although disposal in the Yellowknife landfill is not an option, other landfills in northern Alberta have received industrial metal wastes in the past. It has been assumed that such facilities would be willing to receive the relatively small quantity of waste present at the Contwoyto Lake WS. This would be the ultimate "walk-away" solution; however, the option may be cost prohibitive given the volume of material requiring relocation.

ii) Consolidate and dispose in an on-site engineered landfill

An on-site engineered landfill would require engineering designs andadditional construction equipment. While this option is technically feasible, it may meet with resistance from the local stakeholders, has challenges associated with location, and would require long-term monitoring. The challenge of an on-site landfill at this site is locating all remedial components of the work on the limited space of the airstrip esker. These components include a borrow material source, temporary storage areas, a PHC treatment area, a drum wash area, and a temporary camp. Given the quantities of waste involved and location of the site, construction of a landfill is likely to be more cost effective than off-site disposal. However, the construction of an engineered

landfill at the site would not meet the general objective of removing waste streams whenever possible and would not represent the preferred "walk away" solution.

6.2.3 Soils Impacted by Metals

The total volume of metal impacted soils on-site is estimated to be 46.2 m^3 (46.1 m^3 of which is co-contaminated with PHCs) based on CCME guidelines. Based on the AMSRP, there is 36.1 m^3 of DCC Tier II soil (36.1 m^3 is co-contaminated with PHCs). Three remedial options have been considered, as noted below:

i. Leave as is in current locations
ii. Dispose in an on-site engineered facility
iii. Transfer to an appropriately licensed off-site facility

i) Leave as is in current locations

The metal impacted soils represent a potential source of metal contamination. Additional environmental sampling and risk assessments could be conducted to determine if the risks are in fact significant. If not, leaving the metal impacted soils on-site may be justified. However, this would be inconsistent with the general objective of removing all waste streams from the site whenever feasible/appropriate. Due to the relatively small quantity of this impacted material, a number of options are available to effectively manage/eliminate the associated risks. On this basis, the "leave as is" scenario is not considered appropriate.

ii) Dispose in an on-site engineered facility

This would involve the consolidation of the metal impacted soils and disposal in an on-site engineered Tier II landfill. Although an on-site engineered Tier II landfill can effectively remove the human and ecological pathways, leaving the material on site is inconsistent with the general objective of removing all waste streams from the site whenever feasible/appropriate. An engineered Tier II landfill would require long-term monitoring and may meet with opposition from interested parties.

iii) Transfer to an appropriately licensed off-site facility

Based on a review of analytical data from the metals analysis, the municipal landfill in Yellowknife indicated that the facility would not be able to dispose of the soil in the landfill. Disposal of the metals-impacted soil at another appropriate off-site location, such as Swan Hills, Alberta will therefore be required. Transferring material to an appropriately licensed off-site facility would be the ultimate "walk-away" solution.

6.2.4 Soils Impacted by Petroleum Hydrocarbons

The volume of soil impacted by petroleum hydrocarbons is estimated to be 1142.2 m^3 (of which 46.1 m^3 is co-contaminated with metals) based on CCME or 1142.1 m^3 (of which 36.1 m^3 is co-contaminated with metals) based on the AMSRP. The volume of soil impacted by petroleum hydrocarbons may increase if hydrocarbon impacts extend deeper into the permafrost than currently anticipated (based on assessment work completed to date). . The management of this environmental concern can be mitigated by removal, treatment, risk management or some combination of these alternatives. For the purposes of this RAP we have considered the following:

i. Leave as is in current locations
ii. On-site treatment
iii. Transfer to an appropriately licensed off-site disposal facility

i) Leave as is in current locations

The soils contaminated with petroleum hydrocarbons represent a theoretical source of potential impacts to humans and ecology. Due to the isolated location of the relatively small areas of impacted soil, a number of other remedial options can effectively manage/eliminate the associated risks. On this basis, the "leave as is" scenario is not considered appropriate.

ii) On-site treament

The proposed work plan would be to excavate all the PHC impacted soils to clean lines and place the impacted soils into the contaminated material treatment area (CTA). This on-site treatment option is technically feasible and is a commonly accepted approach used at other northern contaminated sites within Nunavut.

Once the treatment process has been completed and the soils have been confirmed to meet AMSRP, through confirmatory soil sampling and analysis, the remediated soil can be regraded in place. The PHC soil treatment could result in a program that could extend over multiple seasons if not successful in processing the impacted soil during the initial clean-up season. This is a commonly accepted approach at other northern contaminated sites within Nunavut.

A conceptual remedial plan which shows the potential location of the contaminated soil treatment area, preferred borrow location, and other temporary remedial works is presented as Figure 6.2-1.

.

iii) Transfer to an appropriately licensed off-site facility

This option would involve placing the PHC impacted soils in bags/containers for transportation and off-site management to an appropriately licensed disposal facility (e.g., Swan Hills in Alberta). This would be the ultimate "walk-away" solution; however, the option would be cost prohibitive given the volume of material requiring relocation.

6.2.5 Residual Liquids in Drums

The amount of residual fuel and water remaining in drums is significant enough that management of this waste stream will require considerable effort on the part of the remediation contractor. Potential management options for the material include:

i. Transfer to a recycling plant for disposal
ii. Incinerate the fuels and treat the oily water on-site
iii. Incinerate the fuels and transfer oily water off-site
iv. Transfer fuels to an appropriate waste management facility and treat the oily water on-site

This option does not consider the new unopened drums of fuel in Drum Cache 01 at the Existing Hunting Camp within AEC 1 to be part of this remediation work.

i) Transfer to a Recycling Facility

The fuel products and oily water remaining in various drums could be consolidated or placed into "over-packs" and transferred to an appropriately licensed waste management facility ((e.g., Swan Hills in Alberta).

ii) Incinerate Fuels and Treat Oily Water On-site

The fuel products could be incinerated on-site with oily water being consolidated and treated on-site using an oil/water separator and granular activated carbon filter systems. All filtered water would be tested prior to discharge to the environment.

Any drums remaining on-site would require cleaning prior to crushing and disposal in accordance with the conditions outlined in the AMSRP protocols.

iii) Incinerate Fuels and Transfer Oily Water Off-site

The fuel products could be incinerated on-site with oily water being consolidated and consolidated or placed into "over-packs" and transferred to an appropriately licensed waste management facility.

iv) Transfer fuels to an appropriate waste management facility and treat the oily water on-site

The oily water could be consolidated and treated on-site using an oil/water separator and granular activated carbon filter systems. All filtered water would be tested prior to discharge to the environment

The fuel products remaining in various drums could be consolidated or placed into "over-packs" and transferred to an appropriate waste management facility (e.g., Swan Hills in Alberta).

Any drums remaining on-site would require cleaning prior to crushing and disposal in accordance with the conditions outlined in the AMSRP protocols.

6.2.6 Lead-Amended Paint, PCB-Amended Paint, and Batteries

Relatively small amounts of lead-amended paint, PCB-amended paint, batteries and battery remains have been identified at the site. For the purposes of remedial planning, the small amount of material has been grouped into a common category for hazardous materials. Potential management options include:

i. Leave as is in current locations
ii. Transfer to an appropriately licensed off-site facility

i) Leave as is in current locations

Based on the small quantity and nature of the materials involved, it is unlikely that the materials would result in adverse impacts. Regardless, leaving the material on site in its current locations is inconsistent with standard best management practices.

iii) Transfer to another appropriately licensed off-site facility

This option would involve the consolidation of the separate hazardous material types in "overpack" drums or crating with appropriate labelling for shipping to and disposal at an appropriately licensed off-site disposal facility (e.g., Swan Hills in Alberta).

6.3 PREFERRED REMEDIAL OPTIONS

Based on the information presented in Section 6.2, AANDC (with assistance from PWGSC and SENES) has developed a preliminary list of preferred remedial options for the site components. Collectively, the preferred options represent the proposed remedial strategy for the site. The

proposed remedial strategy, which is summarized on the following page in Table 6.3-1, will form the basis of consultations with interested parties, particularly Inuit communities. Figure 6.2-1 presents the conceptual remedial plan which shows the preliminary preferred locations of the temporary remedial works which includes the hazardous/non-hazardous storage area, drum wash area, and camp area. The conceptual plan also shows the preliminary preferred location for the borrow source area.

Table 6.3-1 Proposed Remedial Strategy

Site Component	Preliminary Preferred Option
Physical Risks - Buildings	Remove all hazardous building materials, demolish all structures, transfer hazardous and remaining residual materials to an appropriately licensed off-site disposal facility.
Hazardous Materials	Transfer 13.5 m^3 of hazardous waste to an appropriately licensed off-site disposal facility. A temporary hazardous material storage area will be required.
Non-Hazardous Waste & Debris	Consolidate the 122.5 m^3 of material. Burn the 12.1 m^3 of untreated wood on site. Transfer the remaining 110.4 m^3 to an appropriately licensed off-site facility. A temporary non-hazardous storage area will be required. Approval from Authorities Having Jurisdiction will be required to burn untreated wood.
Soils Impacted by Metals	Excavate 36.1 m^3 of Tier II metals-impacted soils to clean lines. Transfer soils impacted by metals to an appropriately licensed off-site disposal facility.
Soils Impacted by Petroleum Hydrocarbons	Excavate PHC-impacted soils to clean lines. Treat soil impacted by light fractions on site (estimated 1142.1 m^3) to meet AMSRP.
Drums and drum contents	Consolidate and remove organic liquids (200 L) and unknown liquids (200 L) off-site to an appropriately licensed disposal facility. Consolidate and treat water and water with trace fuels on-site at the drum wash area. Dispose of crushed drums off-site with the balance of the non-hazardous waste to an appropriately licensed disposal facility.
Borrow Requirements	It is estimated that under 5,000 m^3 of borrow will be required
Camp	The eastern end of the esker airstrip is a potential location for the temporary camp.

On the basis of the information gathered during the Community Meeting the proposed remedial options, as presented in Table 6.3-1, are deemed to be acceptable to both AANDC and the local community.

7.0 REMEDIATION SCHEDULE

The following general project activities and milestones are anticipated for the design and implementation of the RAP:

- April 2014 - Mobilize to site.
- June to October 2014 & 2015 – Remedial activities.
- March 2016 – Demobilize from the site.

The schedule may change depending on procurement approach, contract award, and regulatory approval.

8.0 MONITORING

Monitoring, maintenance and contingency plans are necessary to: 1) monitor for possible impacts and quality control while the remedial work is underway (*remediation monitoring*); 2) to ensure health and safety of workers during remediation (*health and safety monitoring*); 3) monitor the effectiveness of the work that was done after its completion *(performance monitoring*); 4) ensure that any required maintenance work is done to keep the remedial work up to specifications (*maintenance*); and 5) make sure that backup plans are ready in case something unexpected takes place (*contingency plan*).

The remedial actions outlined in Chapter 6 will require a commitment to monitoring, both during the implementation phase of the project, and after the remediation is complete. In keeping with AANDC's policy guidance on the management of contaminated sites, a 'Reclamation Completion Report' will be completed following the remediation of the site, which will confirm that actual remedial works completed at the Contwoyto Lake WS are consistent with the RAP and remedial specifications.

Monitoring during implementation will include water quality monitoring in the environment around the site. The potential impact of the remediation work on wildlife will also be monitored. A designated health and safety officer will be on-site at all times during the implementation, with the primary role of monitoring the health and safety of site workers.

9.0 REFERENCES

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10.0 LIMITATIONS

SENES Consultants undertook the work referred to in this report for Public Works and Government Services Canada (PWGSC) on behalf of Aboriginal Affairs and Northern Development Canada (AANDC). It is intended for the sole, and exclusive use of AANDC, its affiliated departments, agencies, companies and partners and their respective insurers, agents, employees and advisors.

Any use, reliance on or decision made by any person other than INAC based on this report is the sole responsibility of such other person. AANDC and SENES Consultants make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken based on this report or the work referred to in this report.

The conclusions and recommendations made in this report reflect SENES Consultants judgment based on the previous environmental reporting and on information available at the time of the preparation of this report. SENES Consultants make no representation or warranty to anyone with regard to data or information from others and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken.

This report has been prepared for specific application to this site and it is based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in the Phase III Environmental Assessment report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, portions of the site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described may exist within the site, substances addressed by the investigation may exist in areas of the site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken.

If site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations in this report may be necessary.

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APPENDIX A

COMMUNITY CONSULTATION MINUTES

DATE:	Jan 15th, 2013
TIME:	1900 – 20:30
LOCATION:	Kugluktuk Community Hall
REPRESENTATIVES:	Charles Gravelle (SENES), Janice Lee (PWGSC), Erika Solski (AANDC)
ATTENDANCE:	~60 (including children)
NOTES:	The majority of the attendees were young adults and children. Many were interested as to how the site would be preserved. Many people that attended the consultation, had parents and/or grandparents that lived or were born at Contwoyto Lake during the time of the weather station activities. See below for specific details.

Summary of the Contwoyto Lake Weather Station Draft Remedial Action Plan Community Consultation in Kugluktuk

Approximately 60 people attended the Contwoyto Lake Draft Remedial Action Plan Presentation in Kugluktuk on Jan. 15th, 2013. The community consultation began around 7:15PM and continued until about 8:30PM.

During the question and comment period the following people/concerns were identified; (They are listed in no particular order).

Group # 1

John Ivarluk
Dorris Nancy Ivarluk (John's Daughter)

John is a resident of Kugluktuk who lived near the site when he was in his early 20's. He was raised in the area of the Contwoyto Lake station but not at the area identified as the Inuit Camp (AEC 5). He was there when the weather station first opened up. He recalled that in the early 1960's four men would rotate working at the weather station 2 weeks in and 2 weeks out. When the local Inuit nearby needed supplies (e.g. flour, tea and sugar), they would go to the weather station and order supplies from Yellowknife through the men that worked there, in exchange for furs. They would often make trades of skins for groceries with the men at the weather station.

John pointed out that traditionally people used to live in the site location identified as AEC #5 in the RAP. John named a Ms. May Algona, that used to live near the weather station and there were houses within the area identified as AEC #5. He noted that after they (the Inuit) moved back to Kugluktuk the people had burned the houses down. Note that remnants of burnt houses were not observed in the area identified as AEC #5 during the 2012 site visit.

John asked about how the landfill would be constructed and how the debris on site would be managed. It was explained that the waste would be consolidated and placed into the excavation that would be required to clean up the hydrocarbon (oil) impacted materials. He asked if the permafrost would come up into the landfill and it was stated that it was possible. He then asked if there was a risk of the debris jacking up out of the ground. It was explained the landfill would be constructed in a manner whereby the debris would be buried below the active layer of permafrost and therefore the likelihood of that happening was remote. The permafrost below the active layer would be melted temporarily and sufficient borrow material would be placed over top of the buried debris. This would effectively seal in the debris once the permafrost re-established itself and therefore mitigate the potential for material to resurface.

John has been back to the Contwoyto area frequently over the years. He identified that there were some empty drums and propane tanks along the shoreline of Contwoyto Lake near Lupin. He also identified more drums around Fingers Lake. John said there is an old trailer of his near Fingers Lake that he would like back. John stated that he had not been to the weather station area to camp since leaving the area to move to Kugluktuk.

Group # 2

Bobby Algona (Born in 1956) phone: 867-982-4636

Bobby was born in 1956 with the hunters from Contwoyto area. He called himself “One of the originals from the Contwoyto Lake Area.” He grew up with the hunters that frequented the area during the 40s and 50s. He was born in Edmonton because his mom was having problems during childbirth; his family was near Bathurst Inlet at the time. However, his family was in the Contwoyto area before the weather station was constructed. A local hunter later came across the Contwoyto Lake Weather Station as he was hunting and this established a new relationship for Bobby’s family. From that point on they would often travel to the weather station to trade for supplies. The Contwoyto Weather Station alleviated the need to travel farther to the Bathurst Inlet

Hudson's Bay trading company. However, the Weather station did not have ammunition, so the family still had to make the journey to the Bathurst Inlet area to trade for ammunition.

They would travel to Bathurst Inlet by dog team, wearing traditional clothing such as caribou clothing and the parents would wear some seal skin that they had obtained in the Bathurst Area. Caribou clothing was the only thing kids had to wear, even caribou coveralls with a button in the back for easy bathroom breaks. Bobby was 2 or 3 years old at when he was originally at Contwoyto. In 2001 he took his whole family and went to Contwoyto for about 9 months. He has brought his family annually to the Contwoyto lake area for many years. He began this tradition of camping in the area in 1979 after he started his own family. They would go to Contwoyto during the spring time until the end of fall (roughly March-September). They also sometimes stayed at the nearby Pellet Lake area which is 40 miles from the Former Contwoyto Weather Station. He also commented that there was very good fishing in the area.

The hunters would follow the caribou herd in the early years and this is what originally brought them inland to Contwoyto. Many different people lived around there and interacted. The Dene people were also in the area. Bobby said that the Inuit were all over Alaska and Russia. Inuit from many different coastal areas would frequent the Contwoyto area.

Henry Algona – Bobby's Dad
May Algona – Bobby's Mom

Bobby also said that the airplane monument in Yellowknife (WardAir Bristol Freighter 170 MK 31) was an airplane that he unloaded in the spring fuel hall at Contwoyto.

Bobby had many stories and would be interested in sharing some of these stories at future community consultations. He unfortunately was out for a smoke when we addressed the audience for questions and comments and would have liked to share a story or two. He would like to be notified ahead of the next community consultation so that he can be present and tell a few stories of some times at and around the Contwoyto Lake Weather Station.

Mary Algona (Bobby's Wife)

Mary also lived in the Contwoyto Area (Pellet Lake Area). Mostly from 1979 – 2001. The weather station was still operating when she was in the area. Mary remembers PWA

before TC took over. She recalls that TC took over around the same time as the Lupin mine was opening.

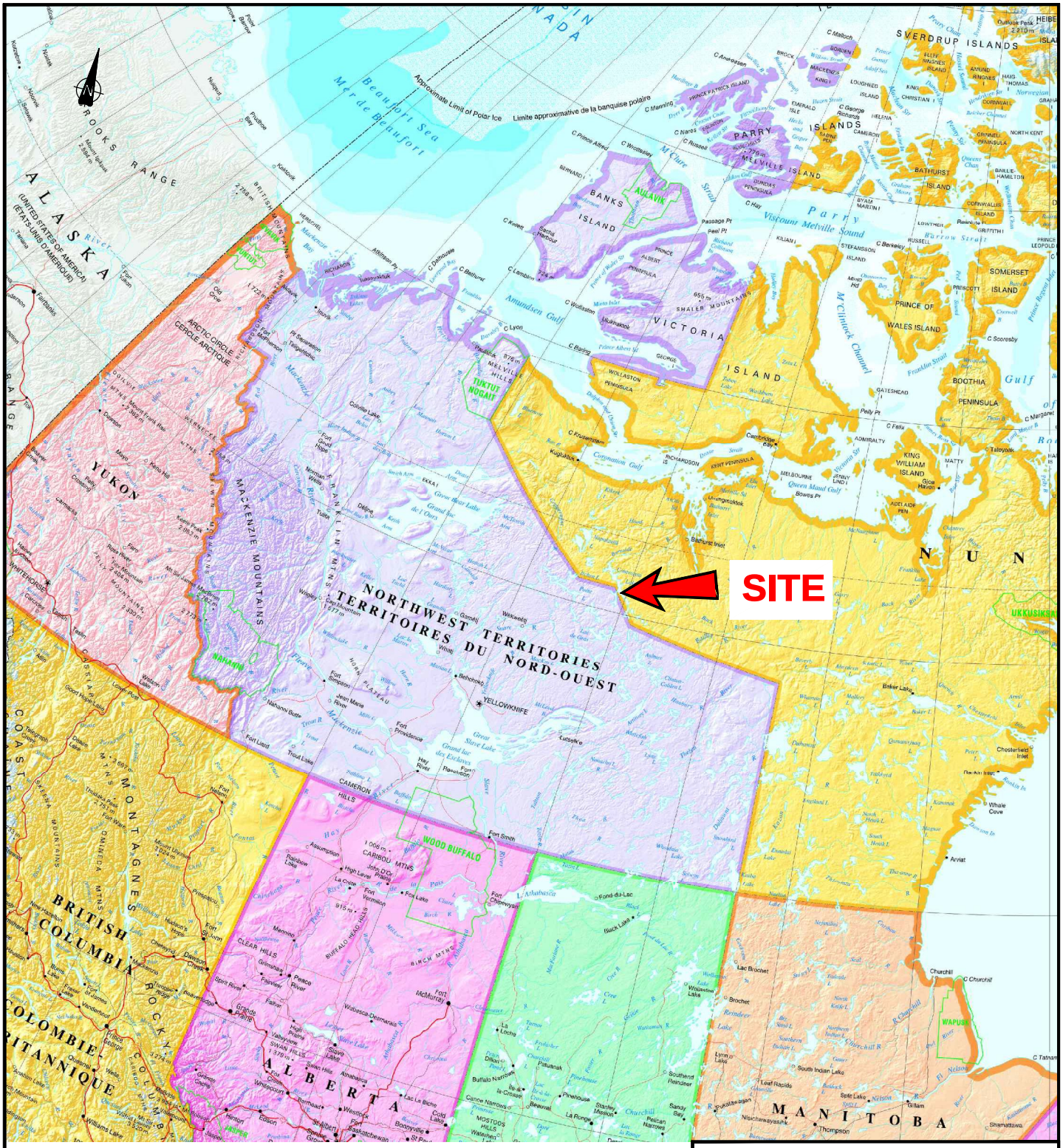
Group # 3)

Bobby Hikhaitok (born in 1958)
Bobby was born in 1958 in the Coppermine area. His family also visited Contwoyto.

FOLLOW UP ACTIONS:	Bobby Algona would like to be contacted before the next community meeting to share publicly some stories of the weather station times at Contwoyto.
MEDIA INQUIRIES:	None

APPENDIX B

FIGURES



DECOMMISSIONING CONSULTING SERVICES LIMITED

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN

CONTWOYTO LAKE, NUNAVUT

KEY PLAN

Drawn By:	P.A.F.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	N.T.S	Drawing No:	FIGURE 1.1-1

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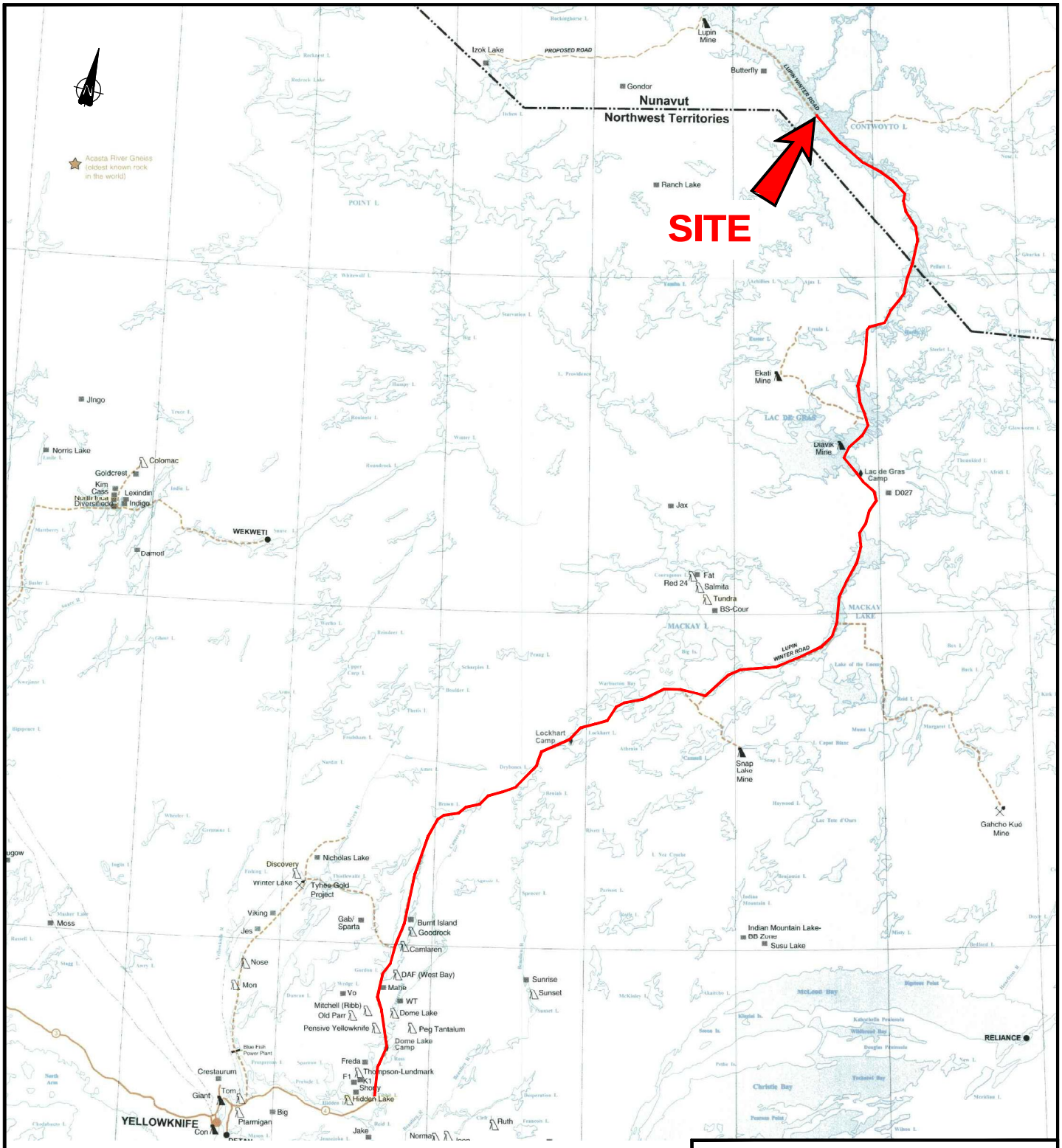

EXISTING WINTER ROAD ROUTE

DECOMMISSIONING CONSULTING SERVICES LIMITED

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION
VICINITY PLAN

Drawn By:	P.A.F.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	N.T.S	Drawing No:	FIGURE 1-1-2

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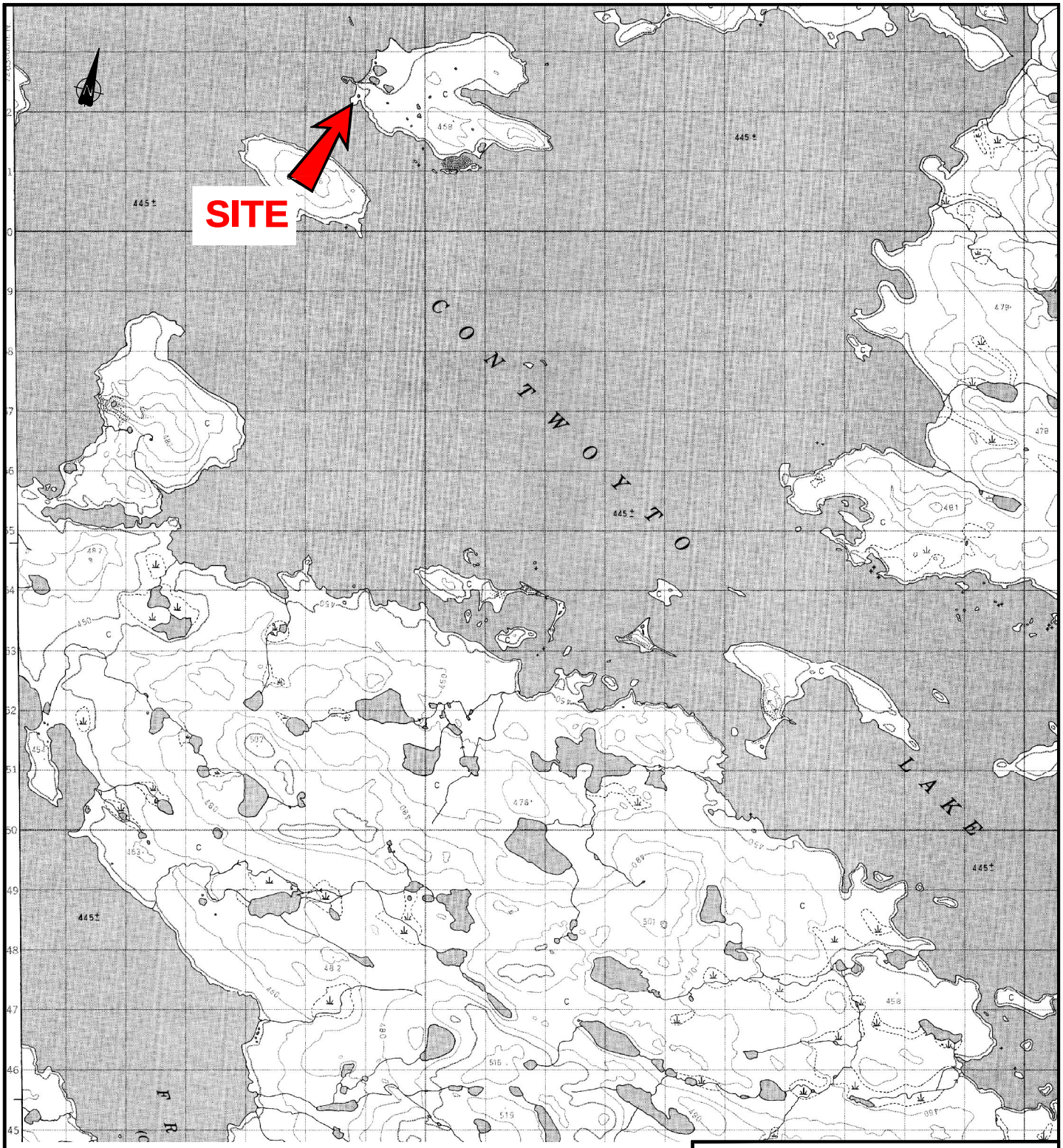

DECOMMISSIONING CONSULTING SERVICES LIMITED

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

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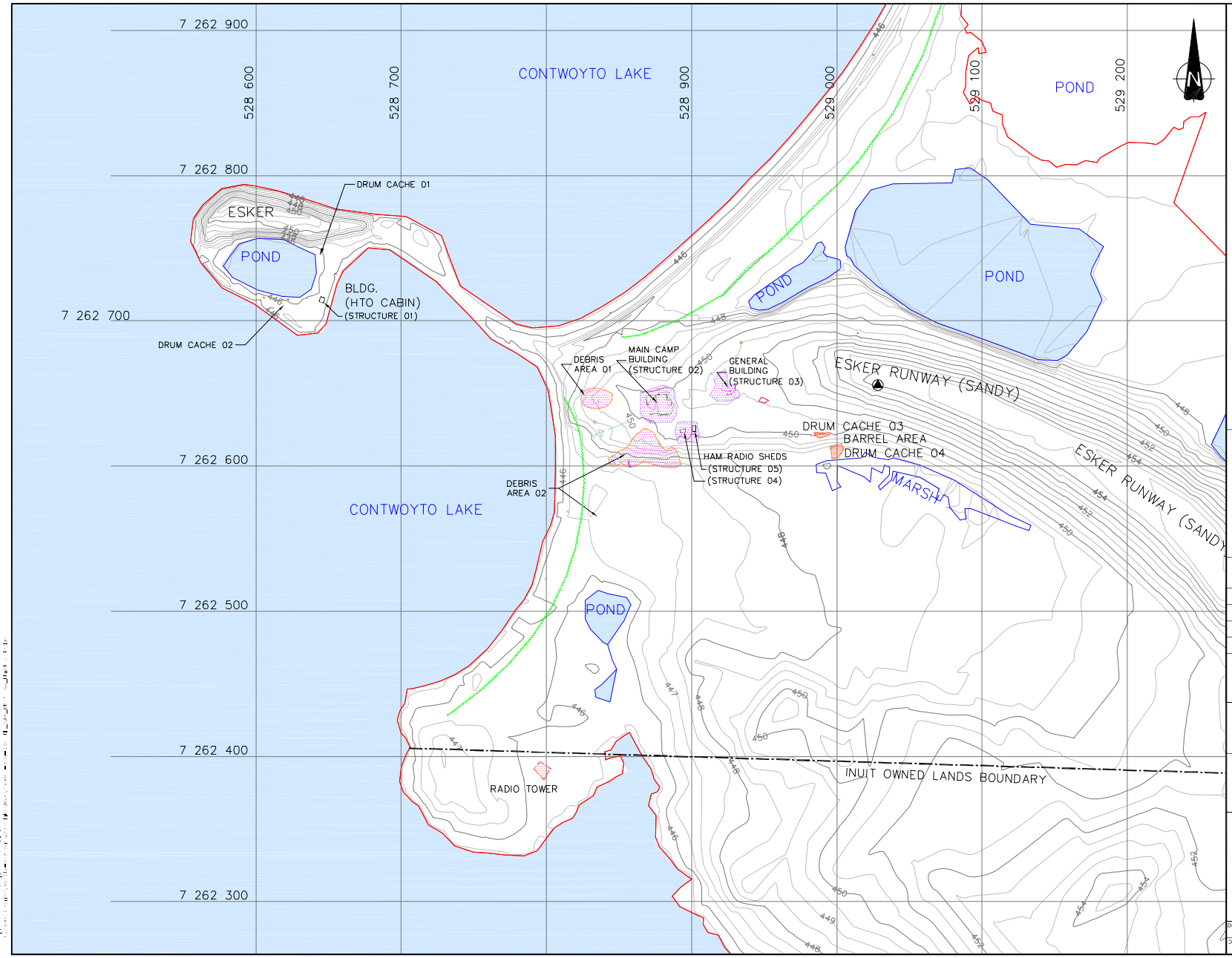


LEGEND:

- BUILDING
- VEGETATION LINE
- LIMIT OF SURVEY
- AREAS OF CONCENTRATED WASTE/DEBRIS AREA

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD. DATED AUGUST 2012

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

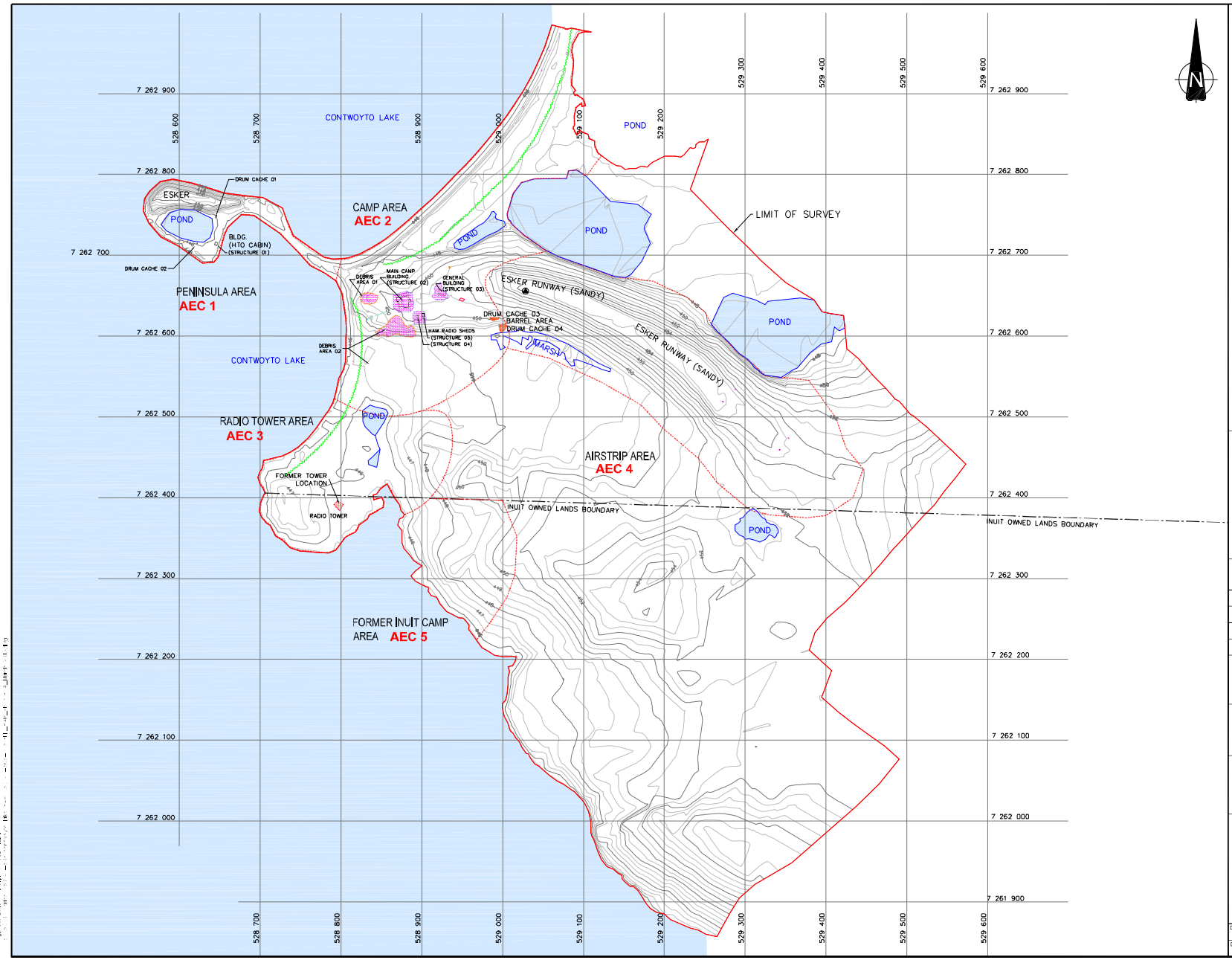
REMEDIATION ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

INFRASTRUCTURE SITE PLAN

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:2500±		FIGURE 1-1-4



LEGEND:

- BUILDING
- INUIT OWNED LANDS BOUNDARY
- VEGETATION LINE
- AREA OF ENVIRONMENTAL CONCERN (AEC) BOUNDARY LINE
- AREAS OF CONCENTRATED WASTE/DEBRIS AREA

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC. CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

SITE OVERVIEW

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:4500±		FIGURE 3-1-1

LEGEND:

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

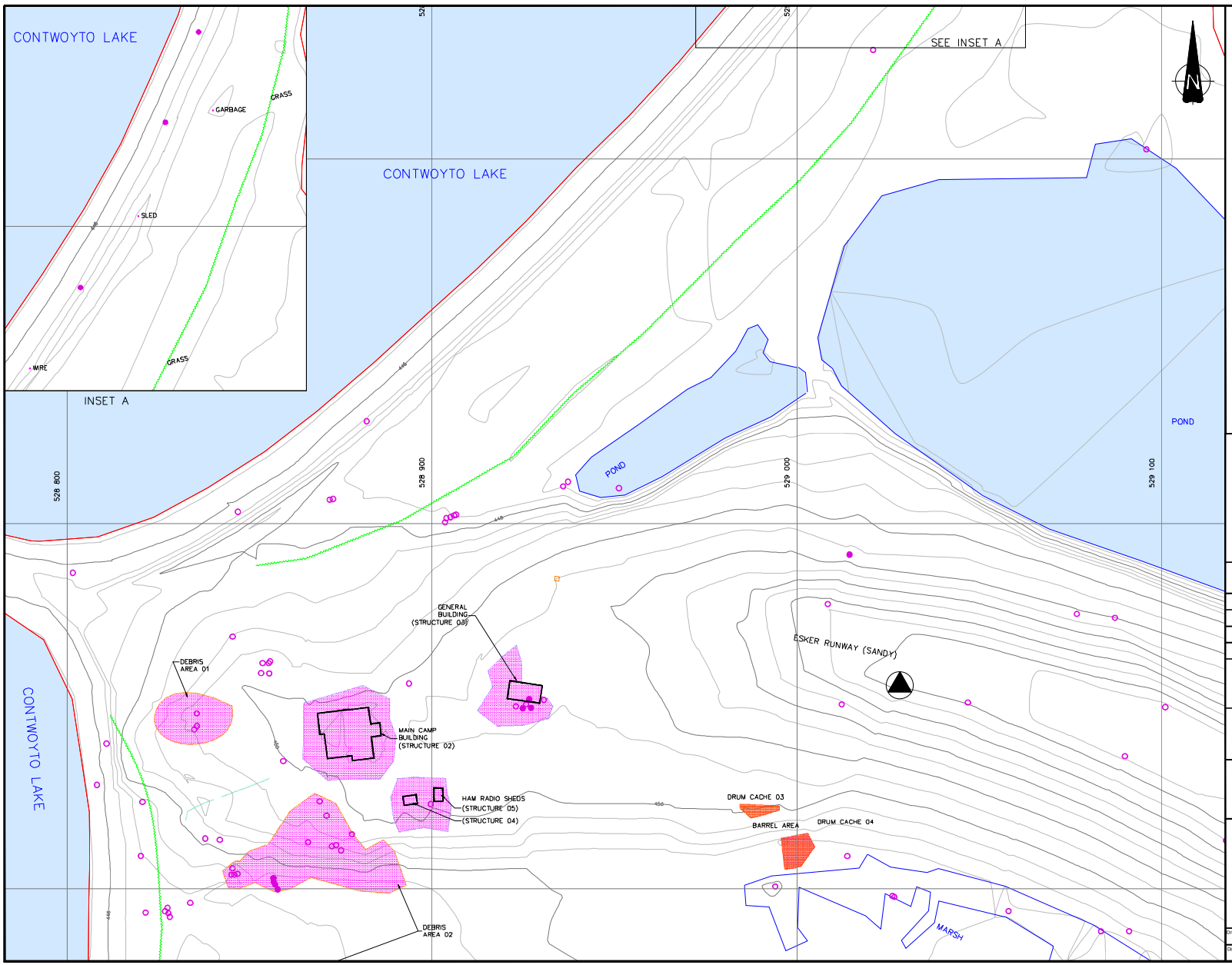
REMEDIAL ACTIONPLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AERIAL PHOTOGRAPH (2012)

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	NOT TO SCALE		FIGURE 3-1-2



LEGEND:

- BUILDING
- AREAS OF CONCENTRATED WASTE/DEBRIS AREA
- BARREL
- VEGETATION LINE
- LIMIT OF SURVEY

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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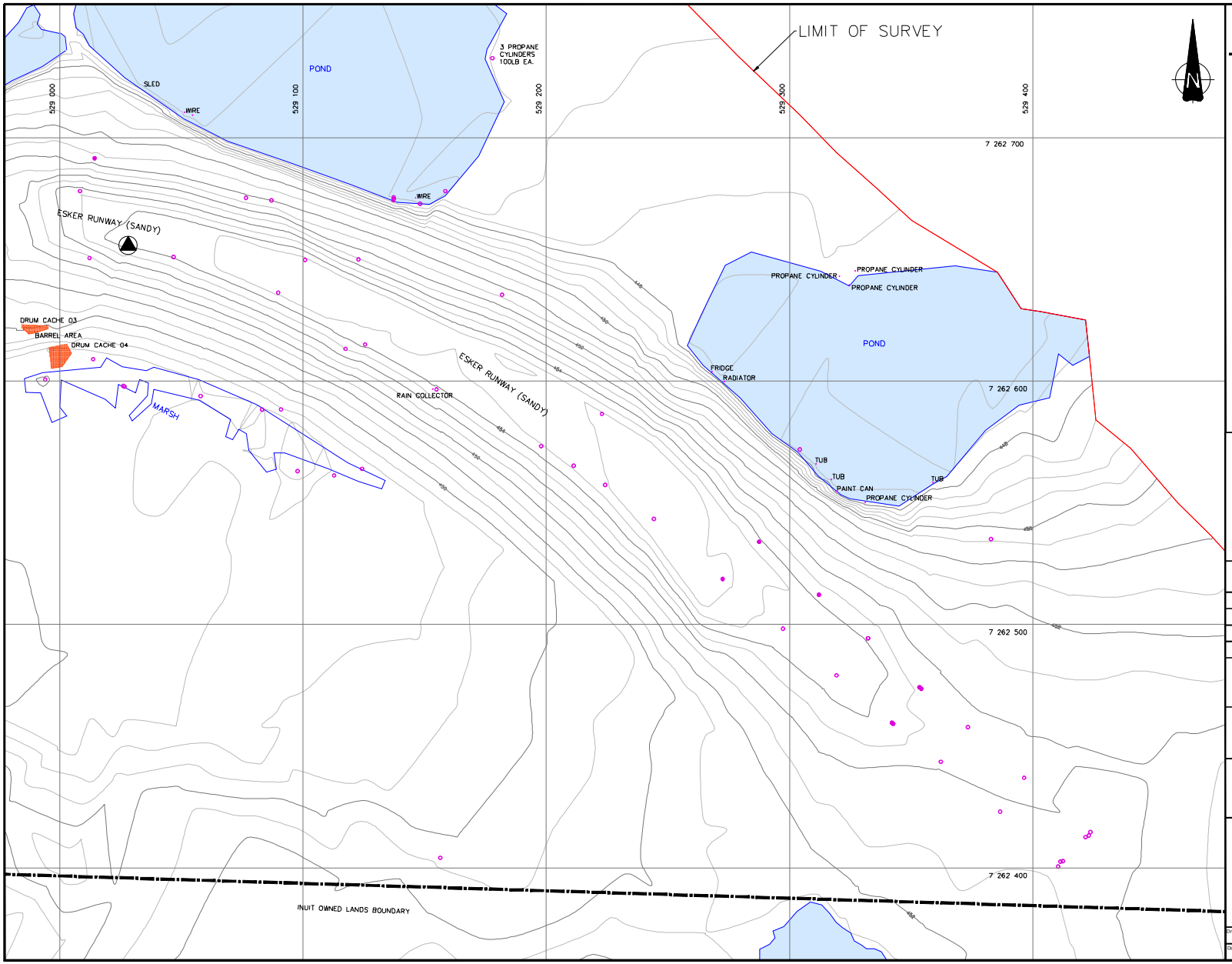
REMEDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

SCHEMATIC OF FORMER WEATHER STATION PROPERTY

Drawn By:	Approved By:	Project No:
J.B.S.	C.F.G.	350047-508
Date: MARCH 2013	Scale: 1:1000±	FIGURE 3-1-3



LEGEND:

- INUIT OWNED LANDS BOUNDARY
- DEBRIS AREA
- BARREL

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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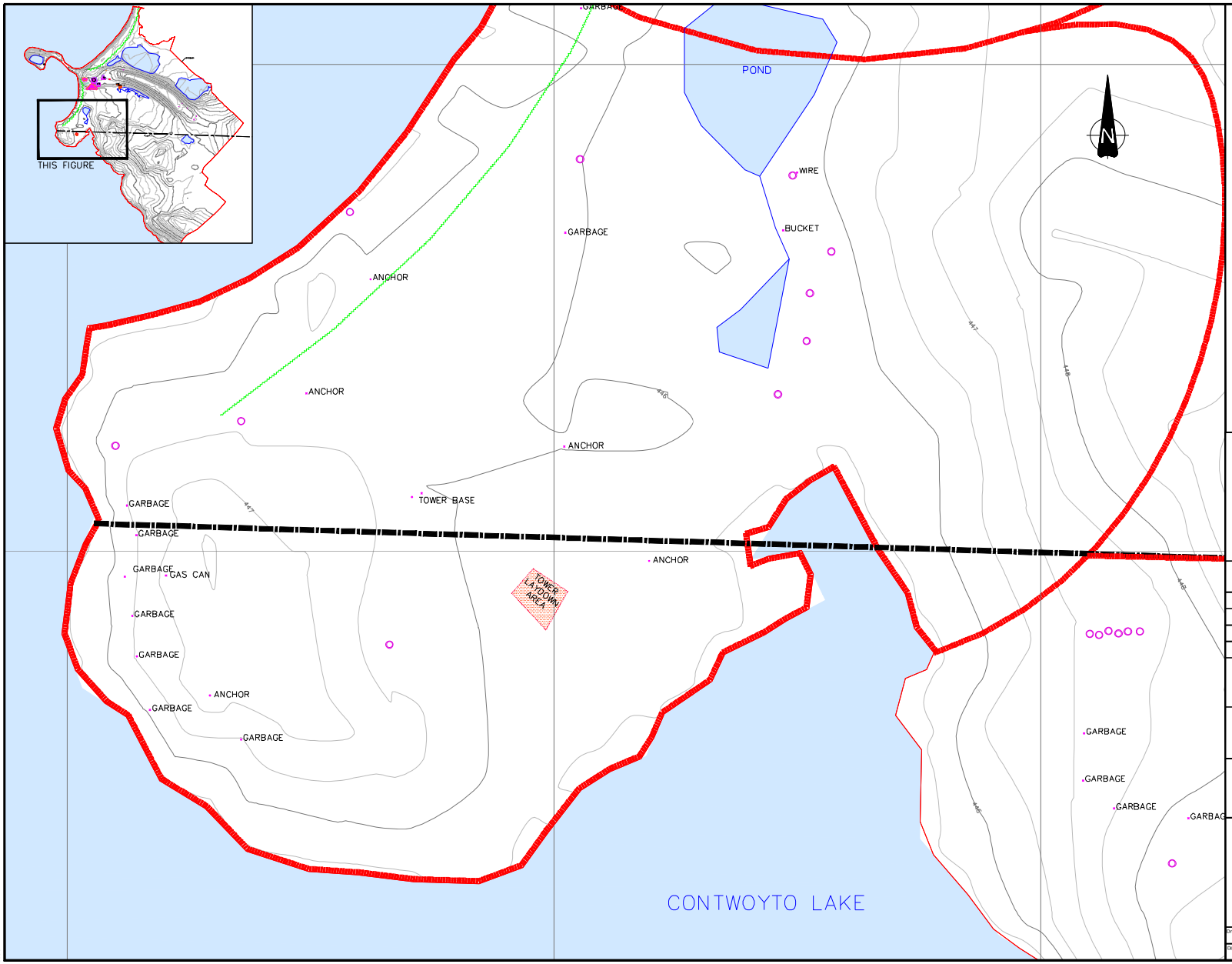
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

SCHEMATIC OF AIRSTRIP AREA

Drawn By:	O.K.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:1500±		FIGURE 3-1-4



LEGEND:

- INUIT OWNED LANDS BOUNDARY
- DEBRIS AREA
- BARREL
- AREA OF ENVIRONMENTAL CONCERN (AEC) BOUNDARY LINE
- LIMIT OF SURVEY

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

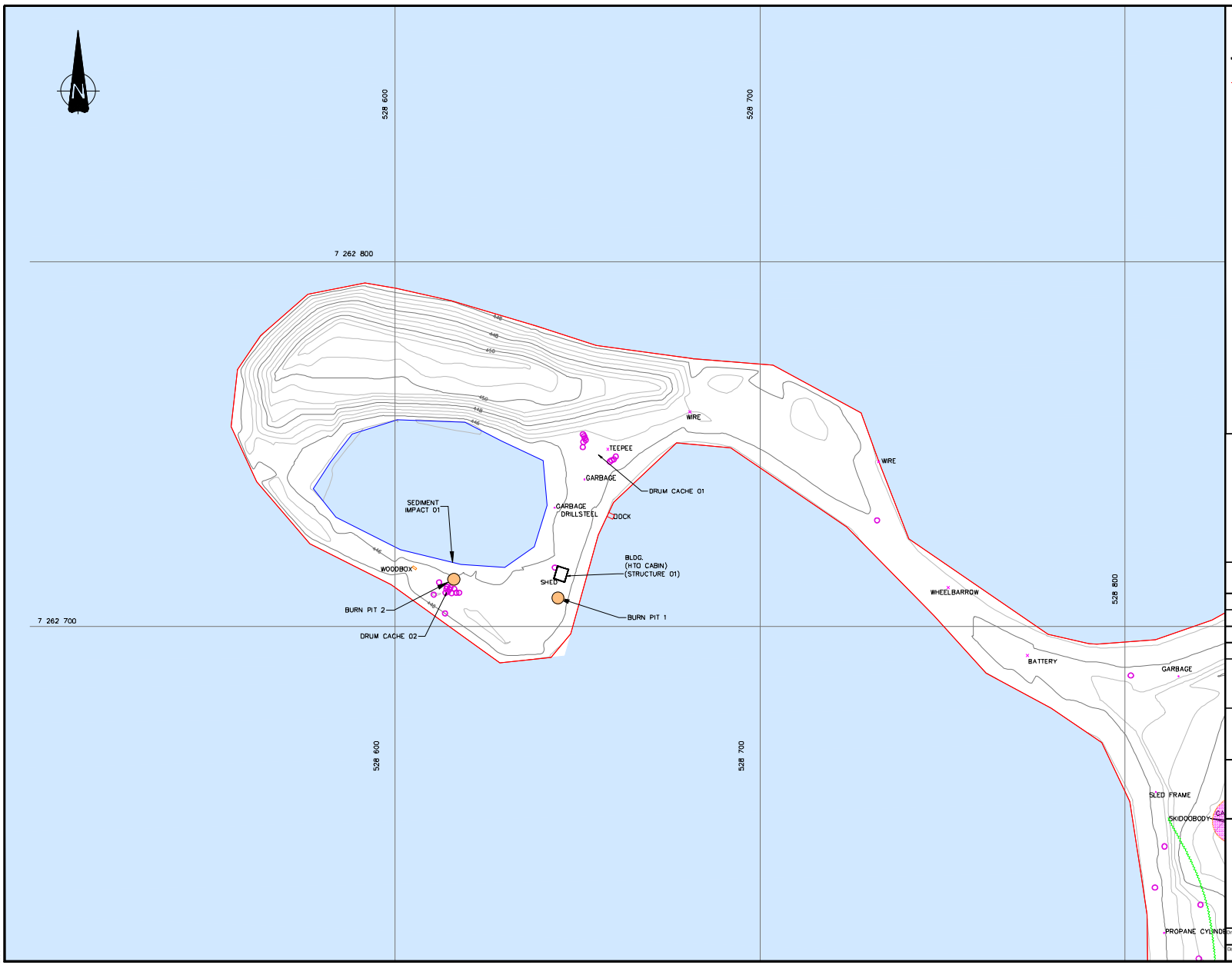
REMDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

SCHEMATIC OF FORMER RADIO TOWER AND INUIT CAMP

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:750±		FIGURE 3-1-5



LEGEND:

- INUIT OWNED LANDS BOUNDARY
- LIMIT OF SURVEY
- BUILDING
- BARREL

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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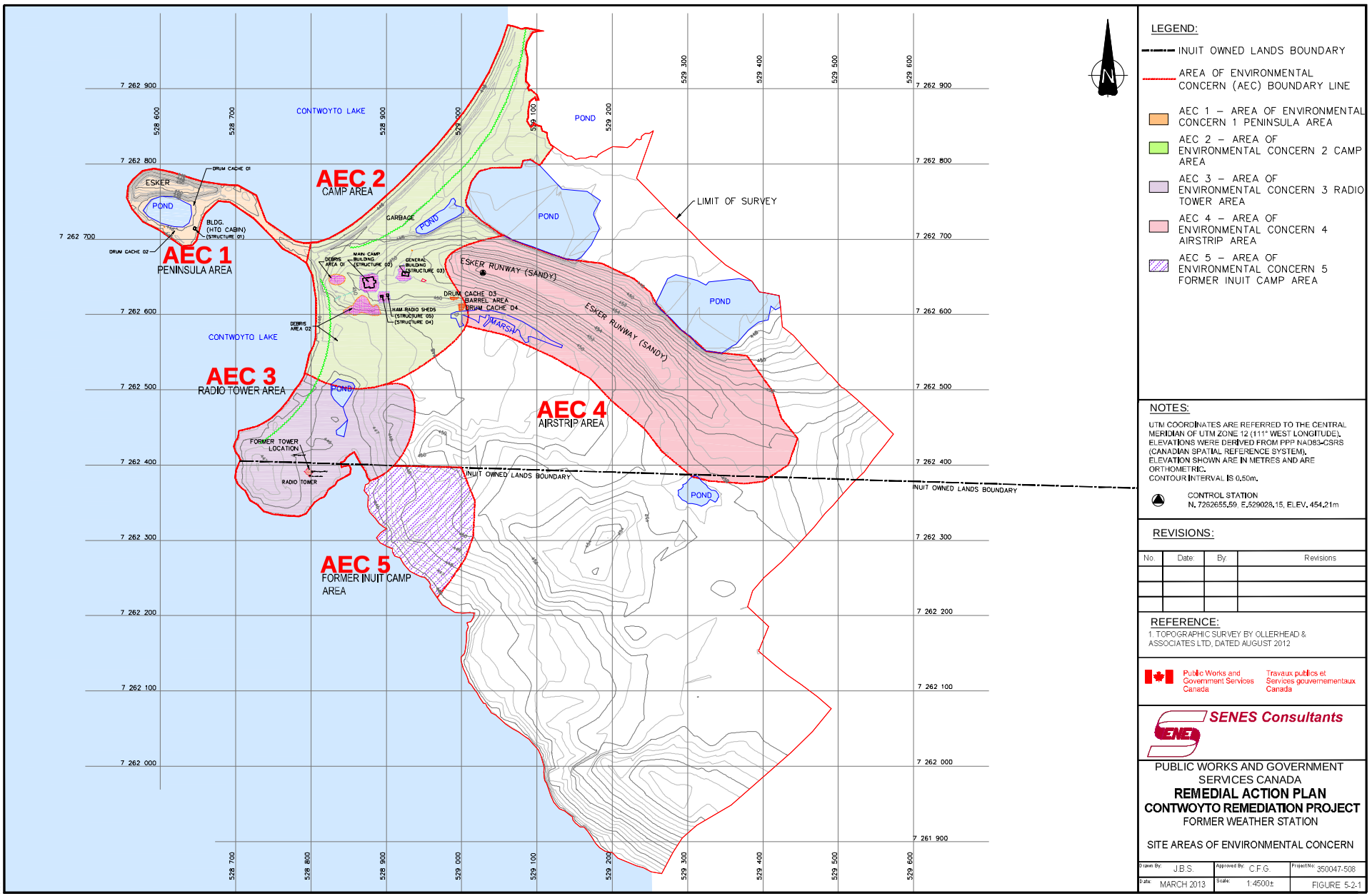
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

SCHEMATIC OF PENINSULA AREA

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:1000±		FIGURE 3-1-6



LEGEND:

- INUIT OWNED LANDS BOUNDARY
- AREA OF ENVIRONMENTAL CONCERN (AEC) BOUNDARY LINE
- AEC 1 – AREA OF ENVIRONMENTAL CONCERN 1 PENINSULA AREA
- AEC 2 – AREA OF ENVIRONMENTAL CONCERN 2 CAMP AREA
- AEC 3 – AREA OF ENVIRONMENTAL CONCERN 3 RADIO TOWER AREA
- AEC 4 – AREA OF ENVIRONMENTAL CONCERN 4 AIRSTRIP AREA
- AEC 5 – AREA OF ENVIRONMENTAL CONCERN 5 FORMER INUIT CAMP AREA

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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Travaux publics et Services gouvernementaux Canada

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

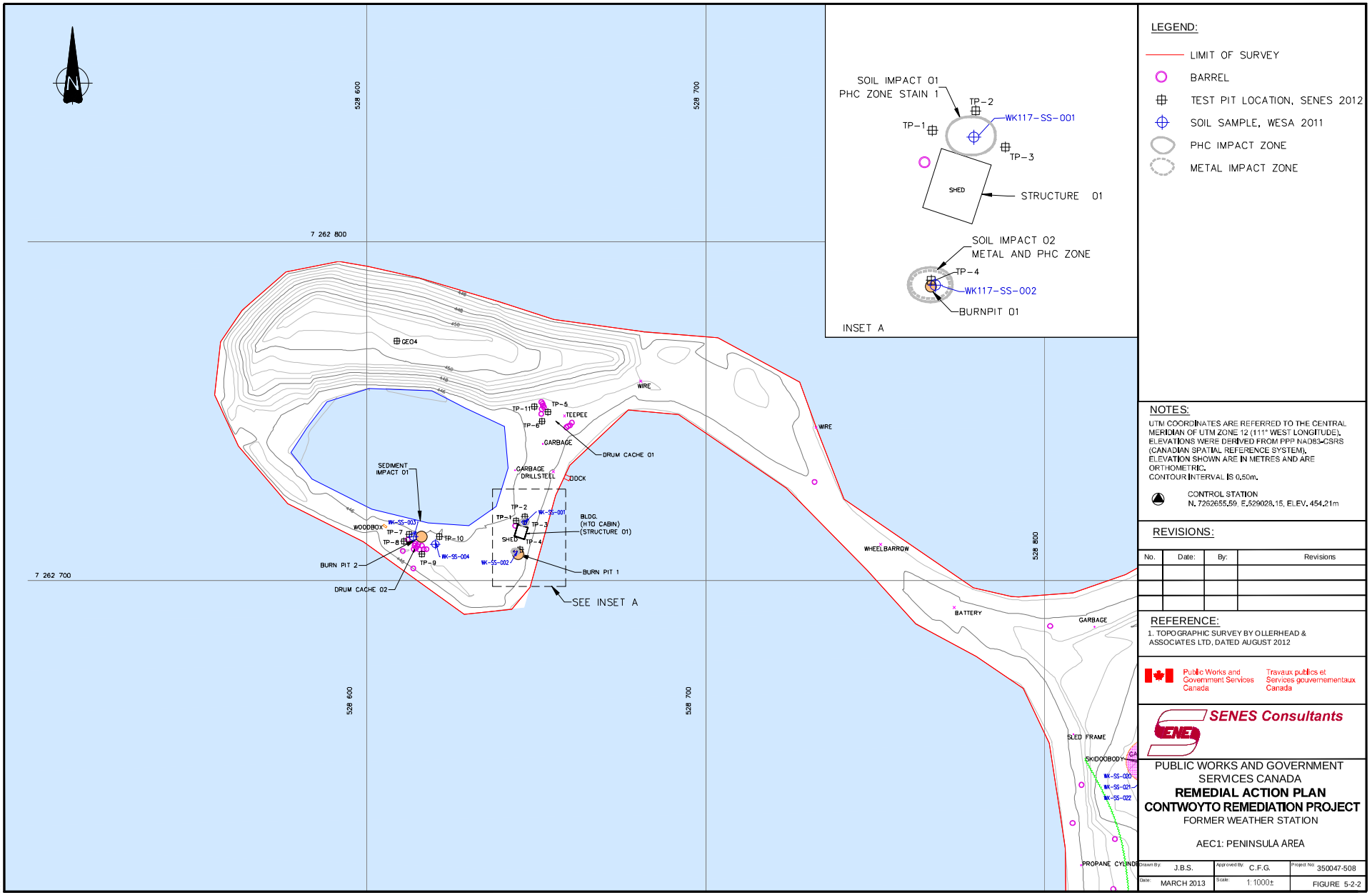
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

SITE AREAS OF ENVIRONMENTAL CONCERN

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:4500±		FIGURE 5-2-1



LEGEND:

- LIMIT OF SURVEY
- BARREL
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- PHC IMPACT ZONE
- METAL IMPACT ZONE

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

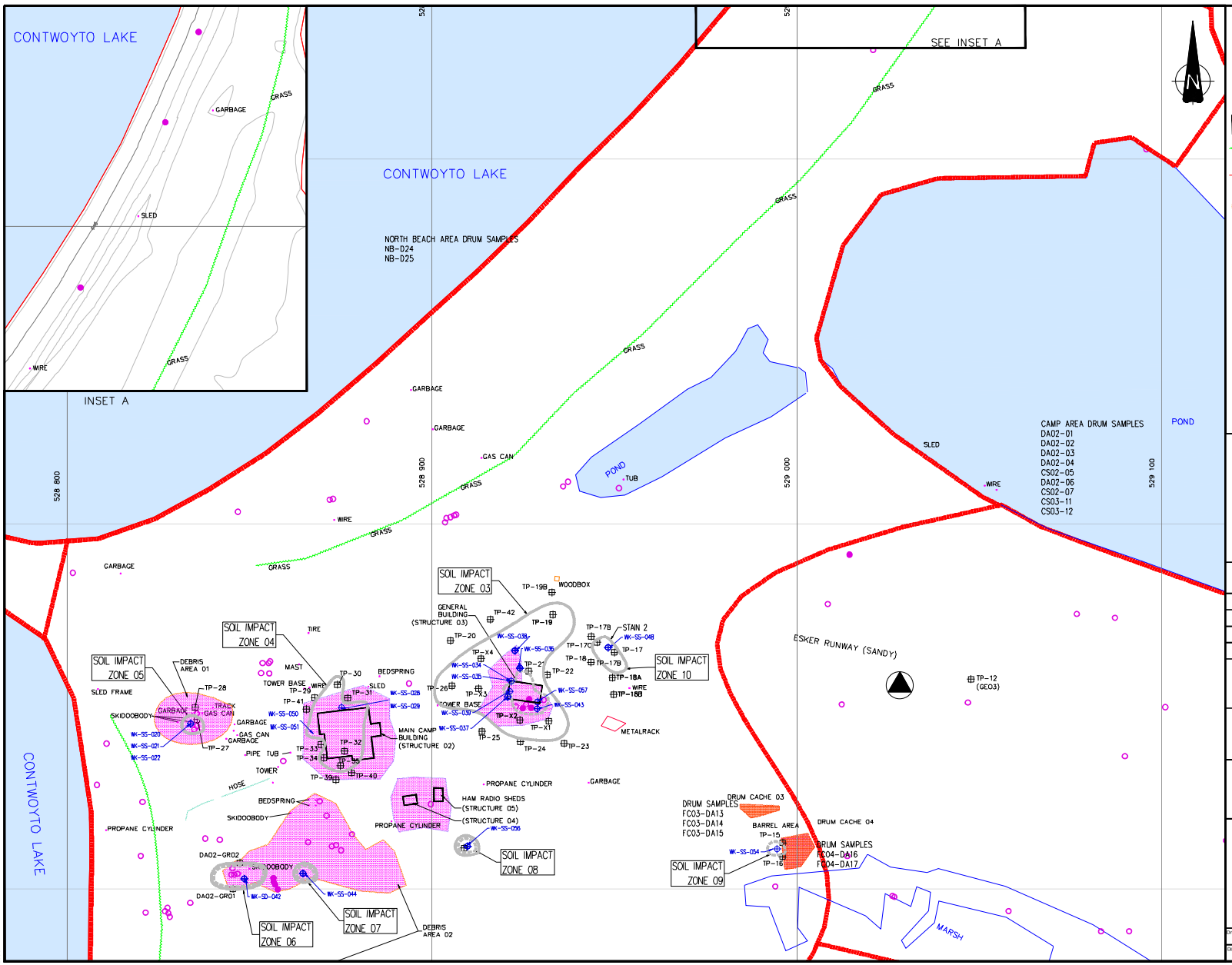
SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

AEC1: PENINSULA AREA

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:1000±		FIGURE 5-2-2



LEGEND:

- BARREL
- TEST PIT LOCATION,SENES 2012
- SOIL SAMPLE, WESA 2011
- BUILDING
- VEGETATION LINE
- LIMIT OF SURVEY
- AREAS OF CONCENTRATED WASTE/DEBRIS AREA
- PHC IMPACT ZONE
- METAL IMPACT ZONE

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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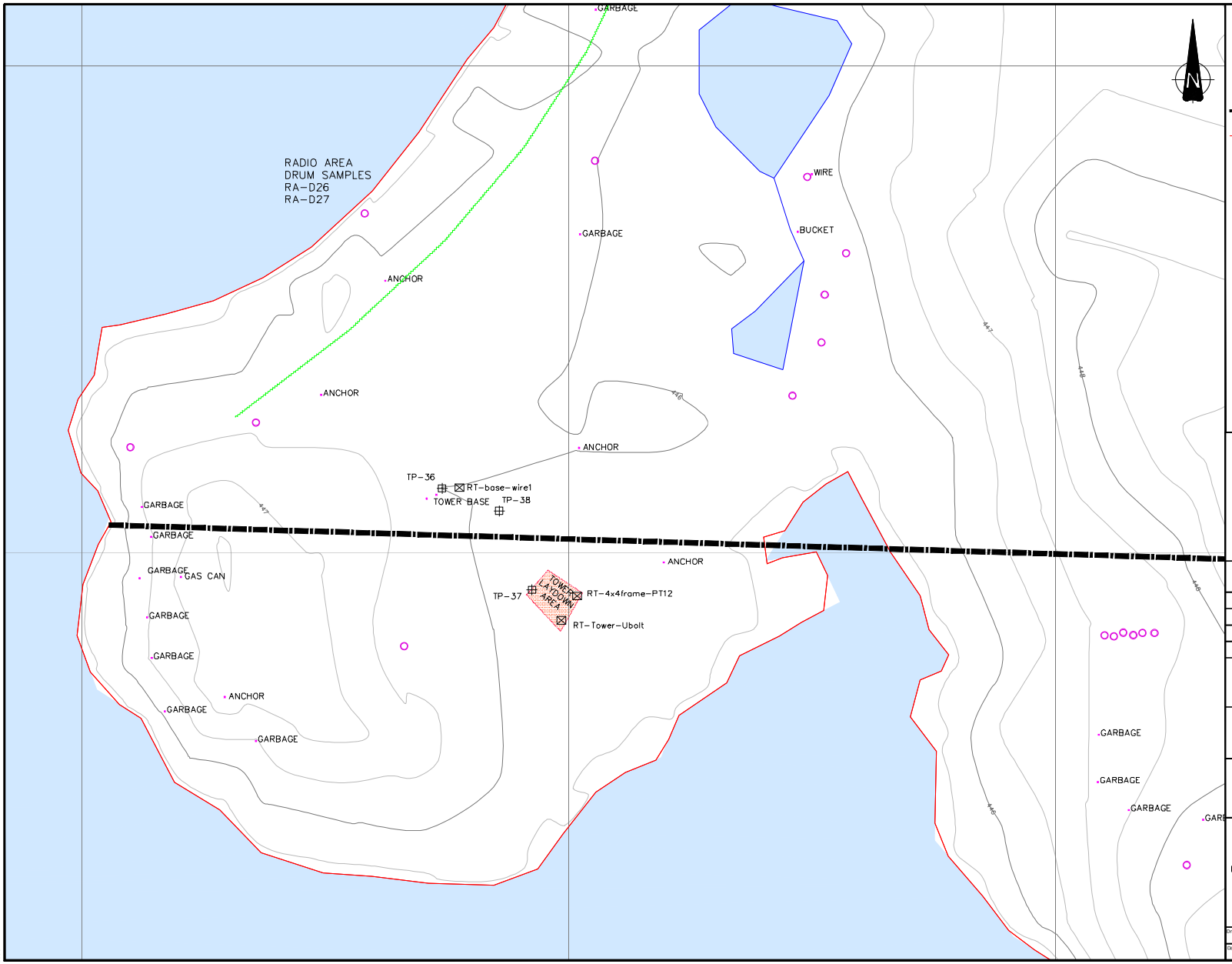
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

AEC 2: CAMP AREA

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:1000±		FIGURE 5-2-3



LEGEND:

- BARREL
- TEST PIT LOCATION, SENES 2012
- INUIT OWNED LANDS BOUNDARY
- LIMIT OF SURVEY
- BUILDING MATERIAL SAMPLE, SENES 2012

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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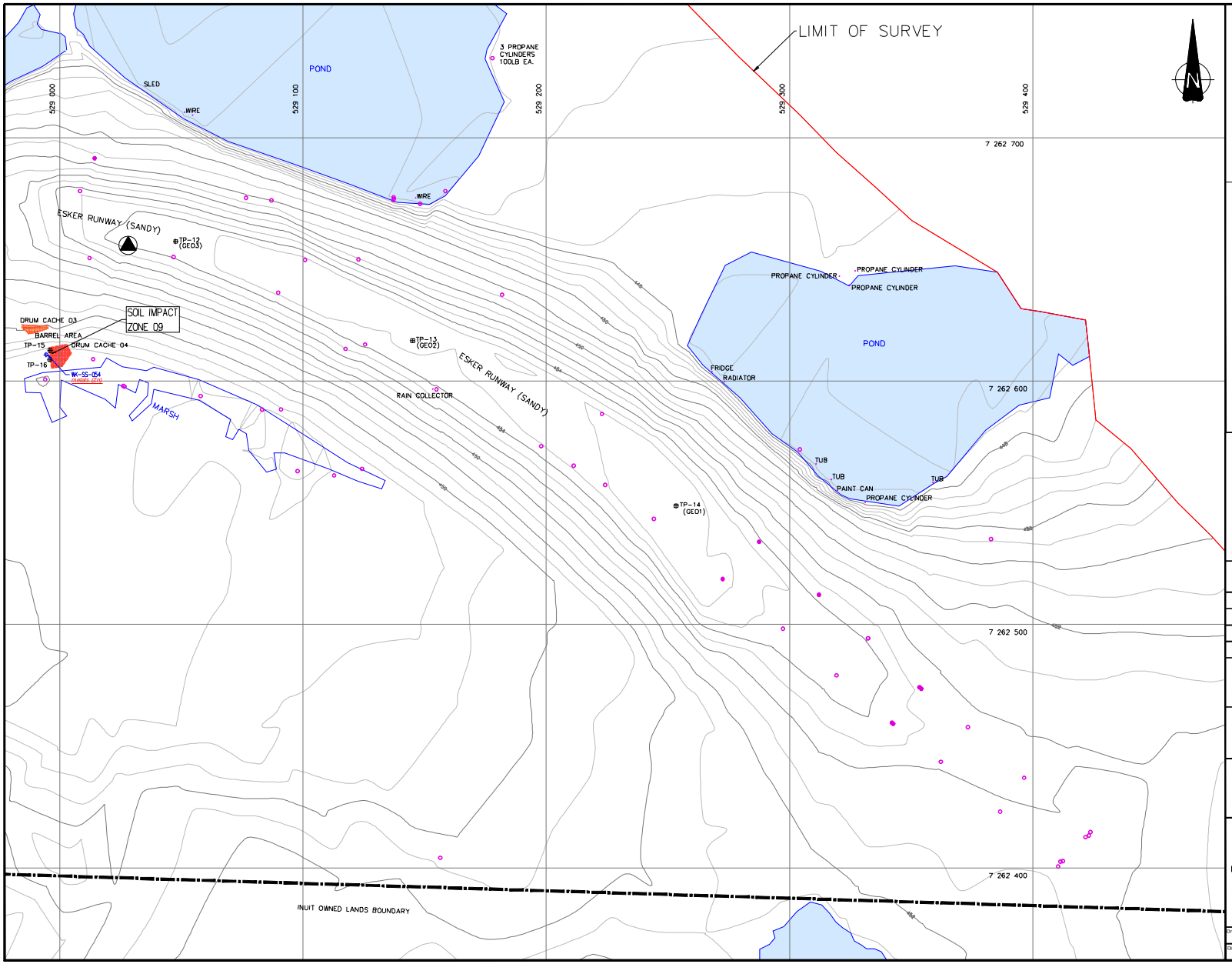
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMEDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

AEC 3: RADIO TOWER AREA

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:750±		FIGURE 5-2-4



LEGEND:

- BARREL
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- INUIT OWNED LANDS BOUNDARY

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

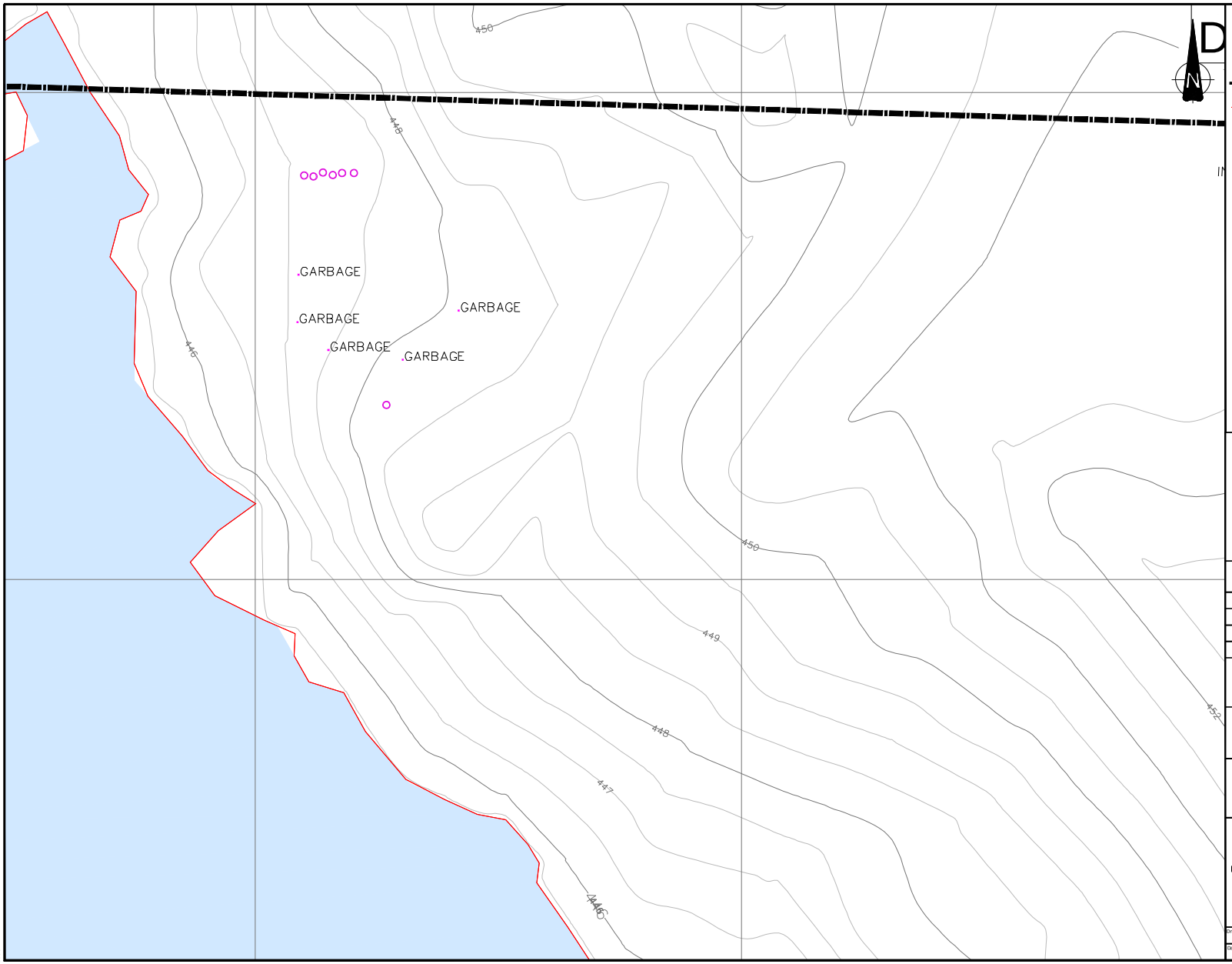
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 4: AIRSTRIP AREA

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:1500±		FIGURE 5-2-5



LEGEND:

- BARREL
- INUIT OWNED LANDS BOUNDARY
- LIMIT OF SURVEY

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

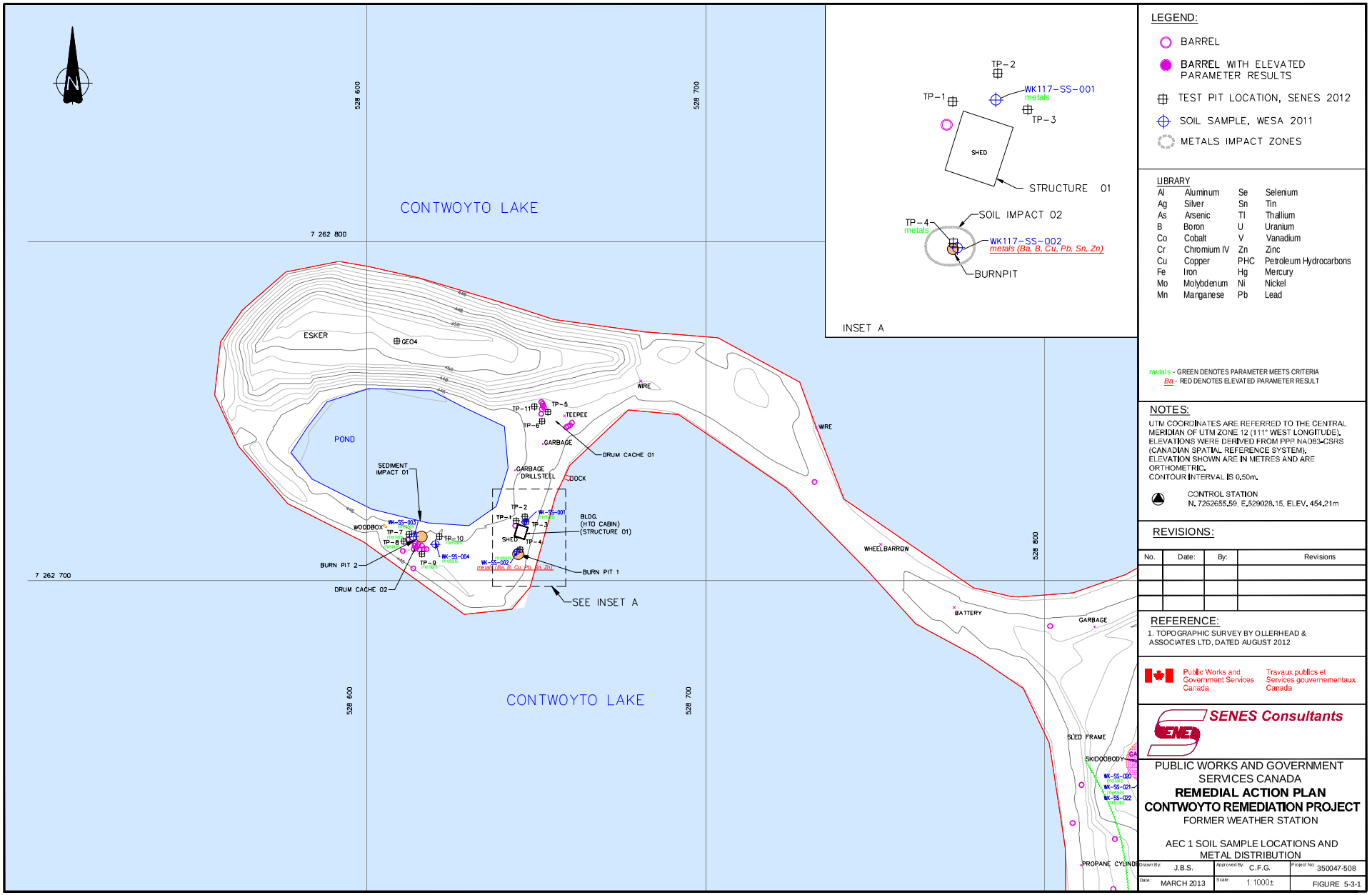
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 5: FORMER INUIT CAMP AREA

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:750±		FIGURE 5-2-6



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- METALS IMPACT ZONES

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	Hg	Mercury
Mo	Molybdenum	Ni	Nickel
Mn	Manganese	Pb	Lead

metals - GREEN DENOTES PARAMETER MEETS CRITERIA
Ba - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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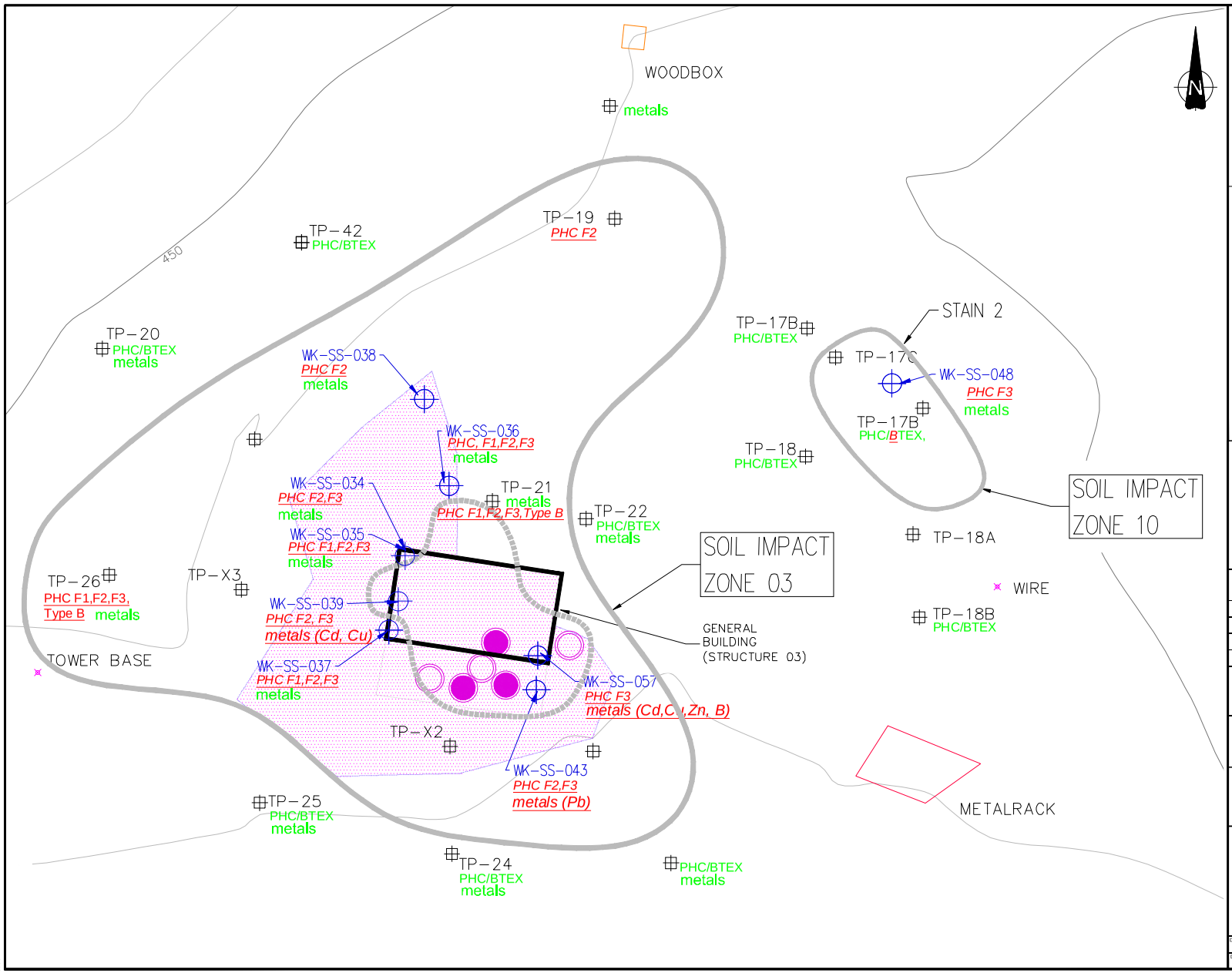
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 1 SOIL SAMPLE LOCATIONS AND METAL DISTRIBUTION

Drawn By:	Approved By:	Project No:
J.B.S.	C.F.G.	350047-508
Date: MARCH 2013	Scale: 1:1000±	FIGURE 5-3-1



LEGEND:

- BARREL
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- PHC IMPACT ZONES
- METALS IMPACT ZONE
- AREAS OF CONCENTRATED WASTE/DEBRIS AREA

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	F1	(C6-C9) Hydrocarbons
Hg	Mercury	F2	(C10-C16) Hydrocarbons
Mo	Molybdenum	F3	(C16-C34) Hydrocarbons
Ni	Nickel	F4	(C34-C60) Hydrocarbons
Naph	Naphthalene	BTEX	Benzene
Mn	Manganese		Toluene
Phenan	Phenentharene		Ethylbenzene
Pb	Lead		Xylene

PHC - GREEN DENOTES PARAMETER MEETS CRITERIA

BTEX - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m
N. 65° 29' 06.1", E.-110° 22' 22.9", ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

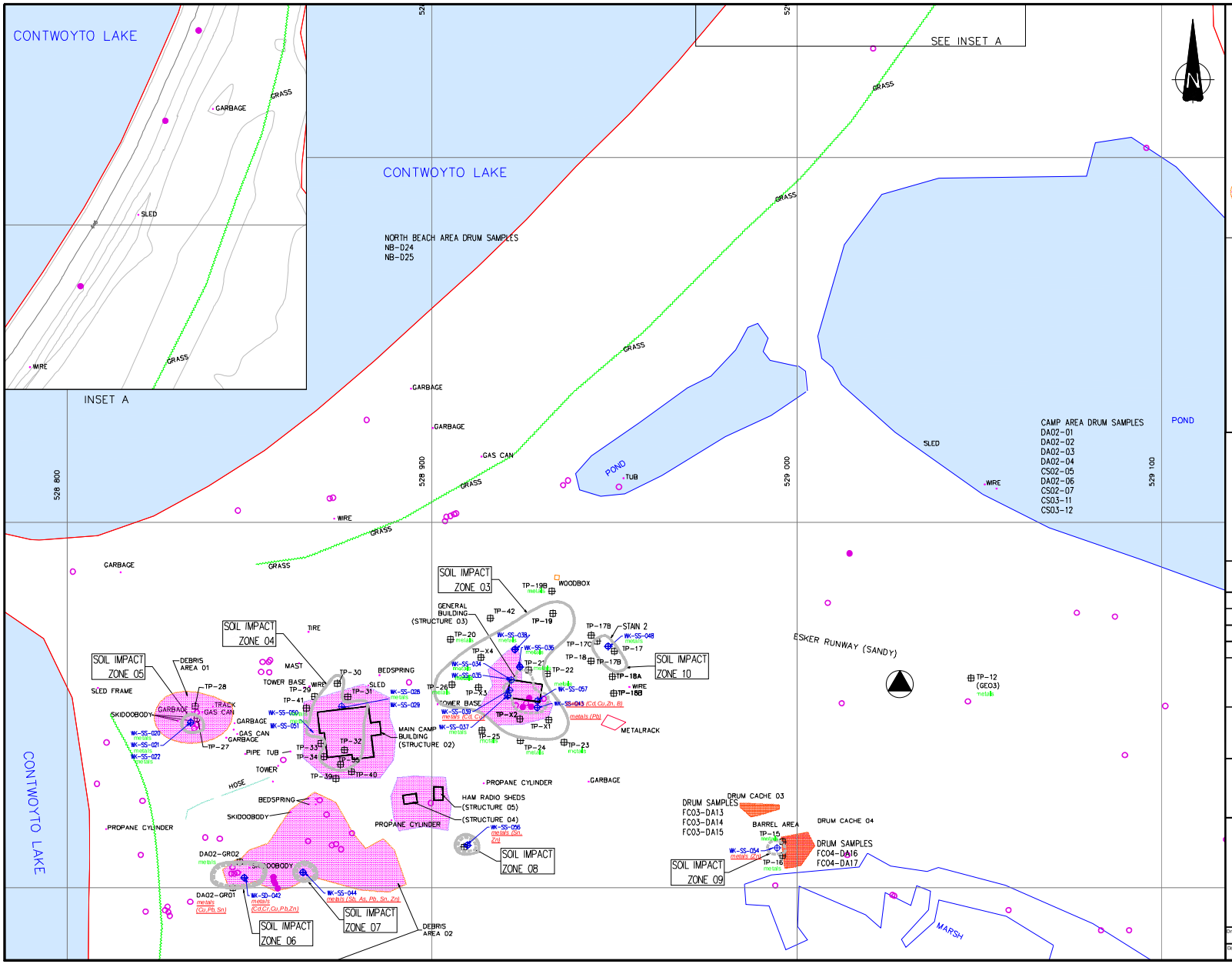
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 2, STRUCTURE 03 SAMPLING LOCATION PLAN

Drawn By:	J.B.S.	Approved By:	C.F.G.
Project No:	350047-508		
Date:	MARCH 2013	Scale:	1:200±
			FIGURE 5-3-10



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- METALS IMPACT ZONES
- AREAS OF CONCENTRATED WASTE/DEBRIS AREA

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	Hg	Mercury
Mo	Molybdenum	Ni	Nickel
Mn	Manganese	Pb	Lead

metals - GREEN DENOTES PARAMETER MEETS CRITERIA

Al - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

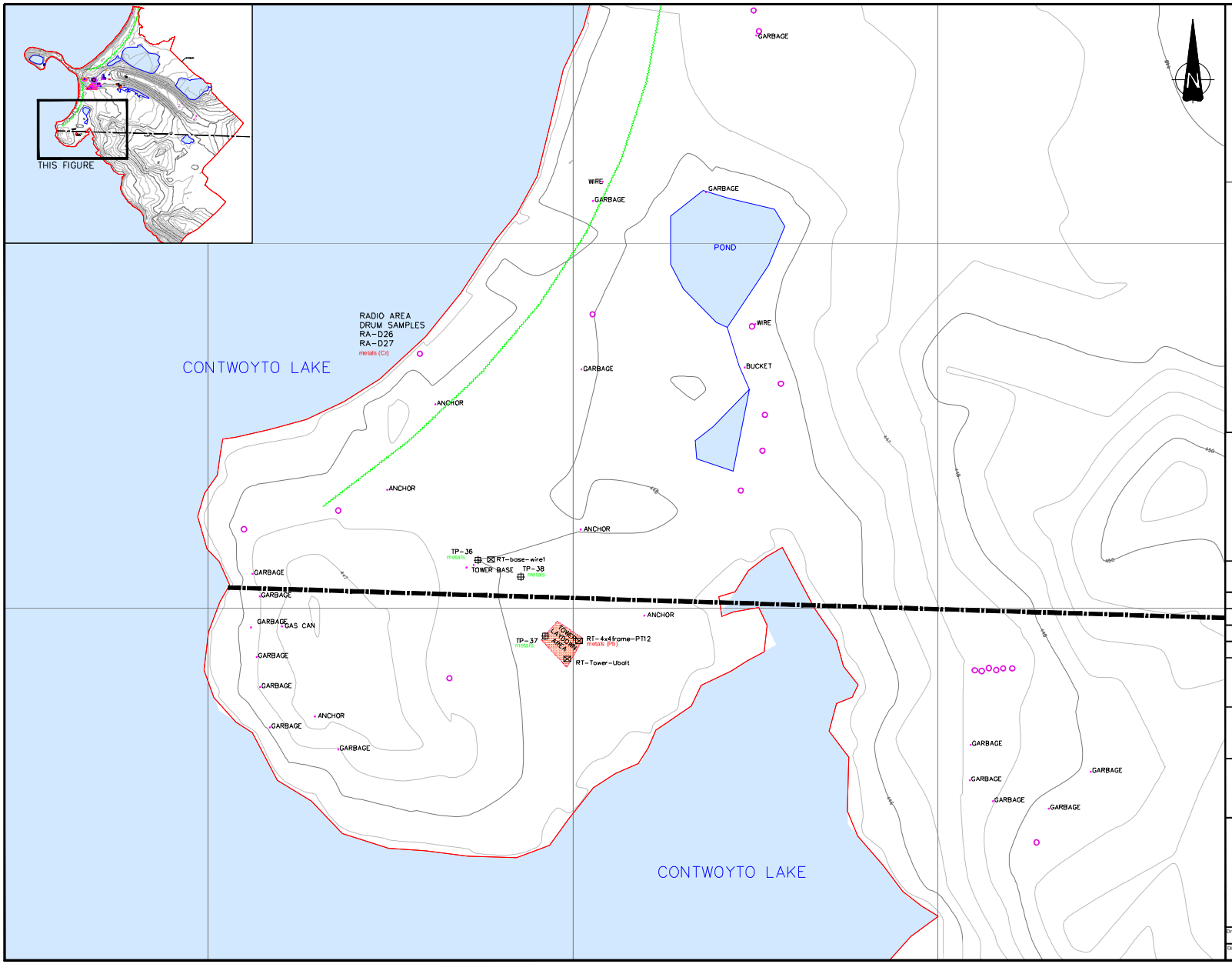
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 2 SOIL SAMPLING LOCATIONS AND METAL DISTRIBUTION

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:1000±	FIGURE 5-3-2	



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- INUIT OWNED LANDS BOUNDARY
- BUILDING MATERIAL, SENES 2012

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	Hg	Mercury
Mo	Molybdenum	Ni	Nickel
Mn	Manganese	Pb	Lead

metals - GREEN DENOTES PARAMETER MEETS CRITERIA

Al - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

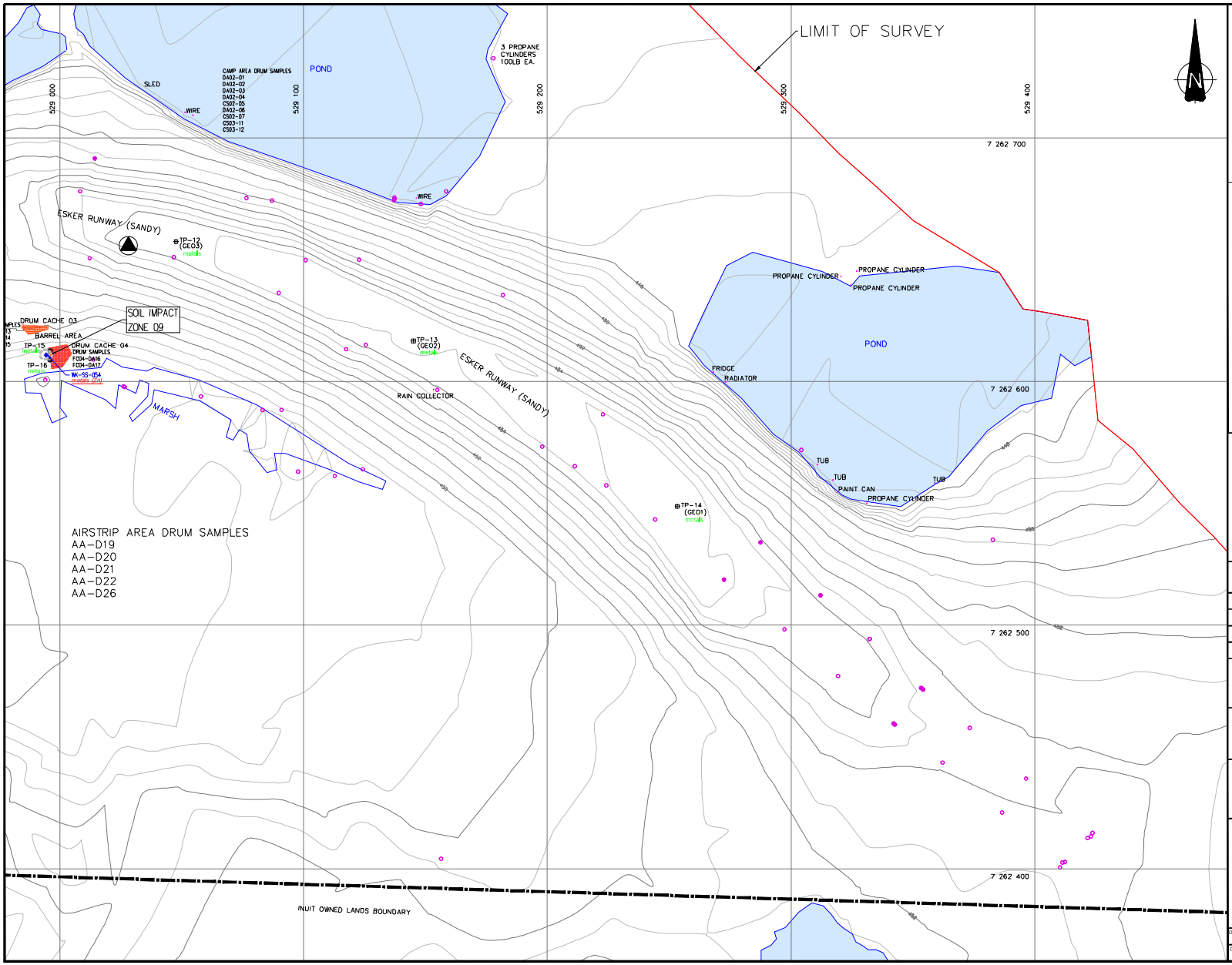
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 3 SOIL SAMPLING LOCATIONS AND METAL DISTRIBUTION

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:1000±	FIGURE 5-3-3	



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- INUIT OWNED LANDS BOUNDARY
- METALS IMPACT ZONE

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	Hg	Mercury
Mo	Molybdenum	Ni	Nickel
Mn	Manganese	Pb	Lead

metals - GREEN DENOTES PARAMETER MEETS CRITERIA
Al - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PFP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

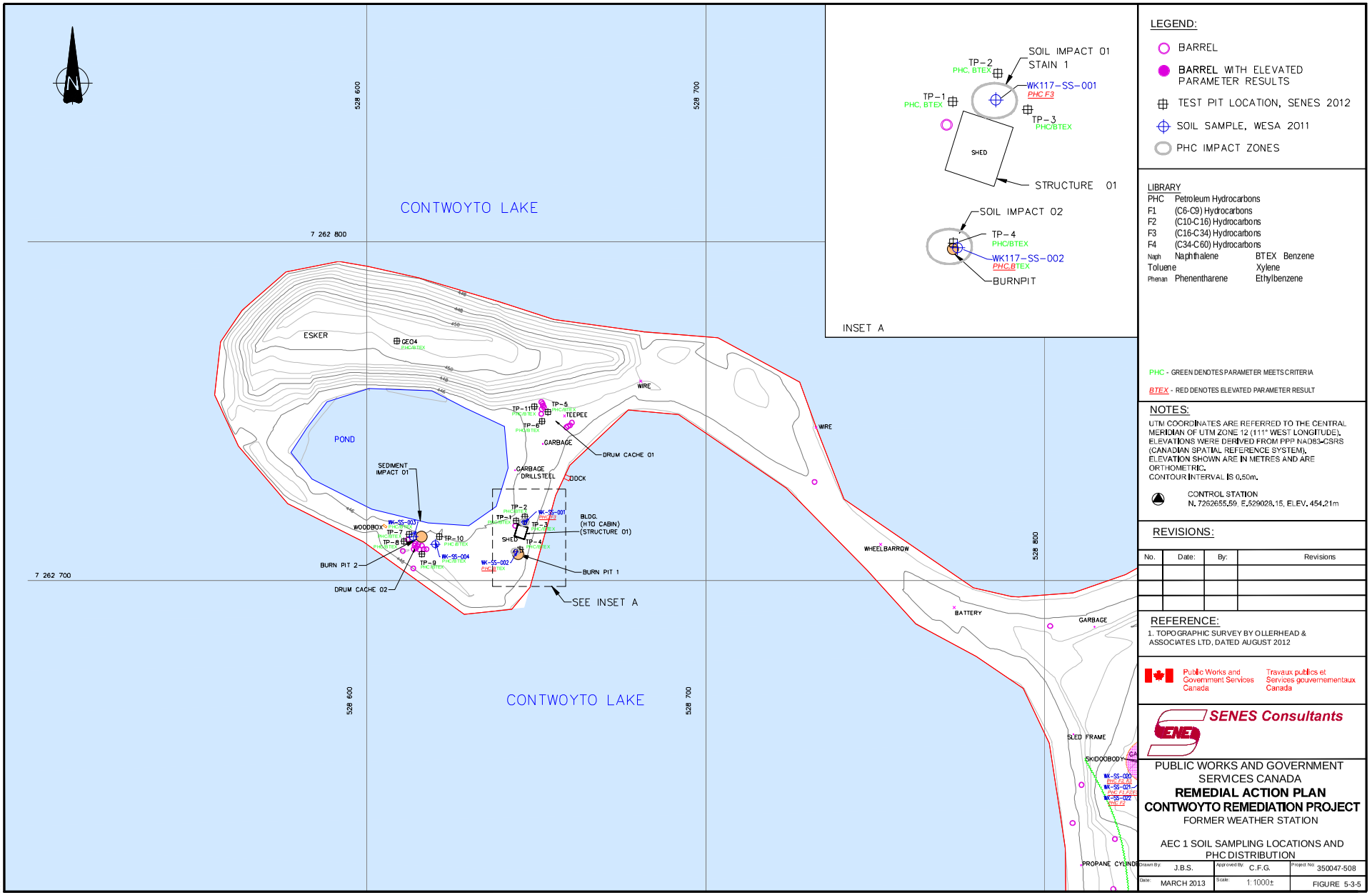
Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
REMEDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

AEC 4 SOIL SAMPLING LOCATIONS AND METAL DISTRIBUTION

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:1500±	FIGURE 5-3-4	



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- PHC IMPACT ZONES

LIBRARY

PHC	Petroleum Hydrocarbons		
F1	(C6-C9) Hydrocarbons		
F2	(C10-C16) Hydrocarbons		
F3	(C16-C34) Hydrocarbons		
F4	(C34-C60) Hydrocarbons		
Naph	Naphthalene	BTEX	Benzene
Toluene		Xylene	
Phenan	Phenentharene	Ethylbenzene	

PHC - GREEN DENOTES PARAMETER MEETS CRITERIA

BTEX - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

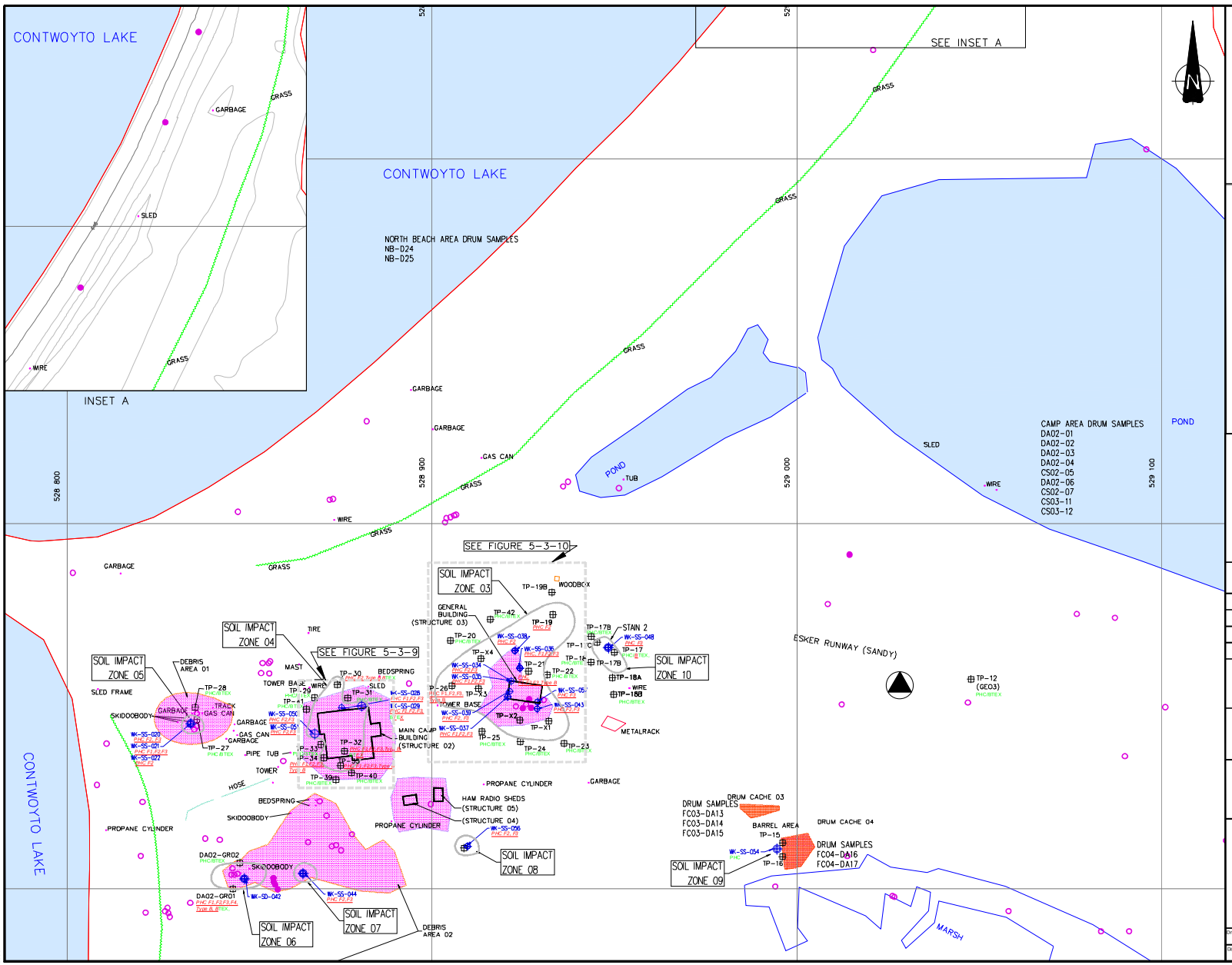
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 1 SOIL SAMPLING LOCATIONS AND PHC DISTRIBUTION

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:1000±	FIGURE 5-3-5	



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- PHC IMPACT ZONES

LIBRARY

PHC	Petroleum Hydrocarbons		
F1	(C6-C9) Hydrocarbons		
F2	(C10-C16) Hydrocarbons		
F3	(C16-C34) Hydrocarbons		
F4	(C34-C60) Hydrocarbons		
Naph	Naphthalene	BTEX	Benzene
	Toluene		Xylene
Phenan	Phenentharene		Ethylbenzene

PHC - GREEN DENOTES PARAMETER MEETS CRITERIA

BTEX - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

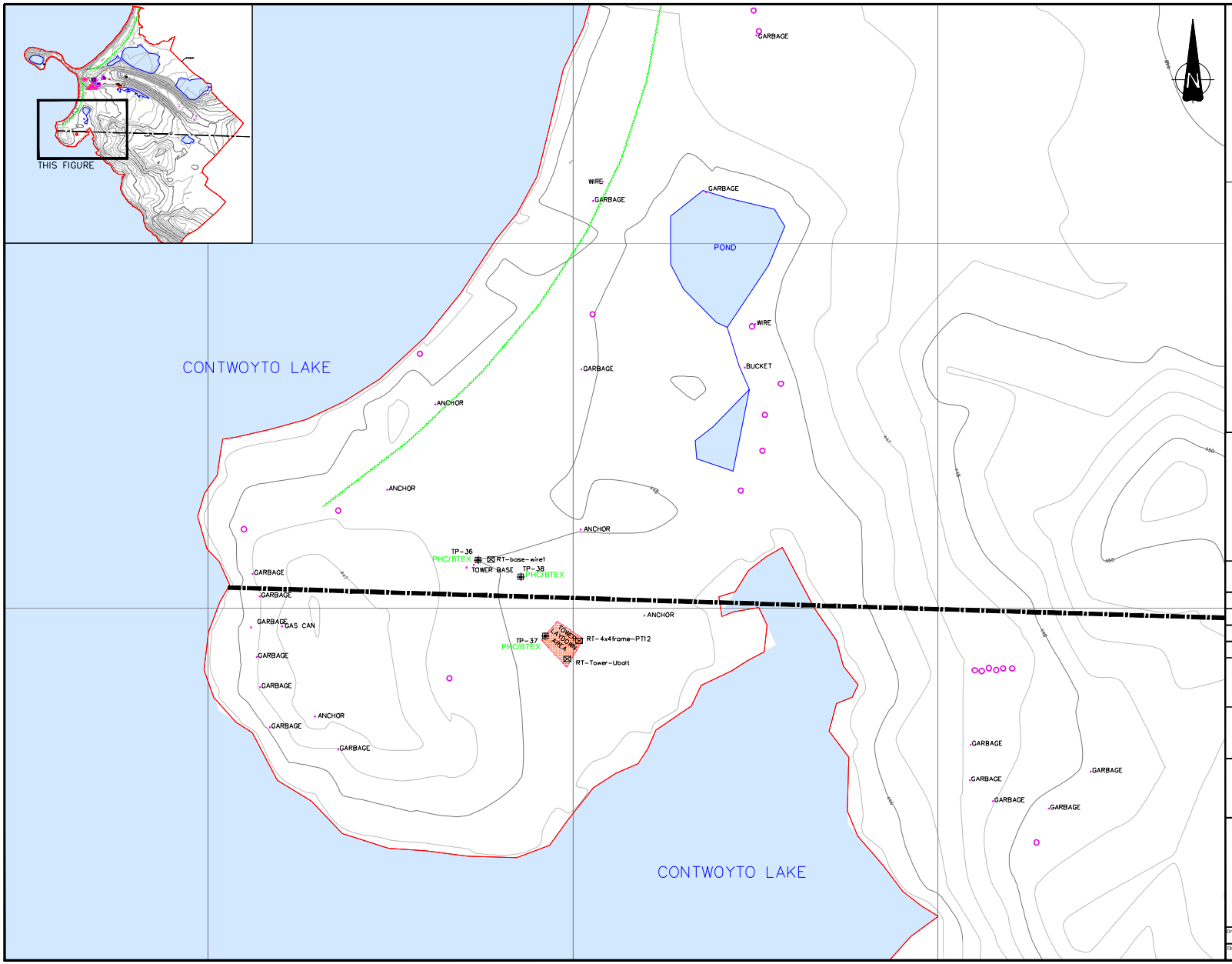
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 2 SOIL SAMPLING LOCATIONS AND PHC DISTRIBUTION

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:1000±	FIGURE 5-3-6	



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- INUIT OWNED LANDS BOUNDARY
- BUILDING MATERIAL, SENES 2012

LIBRARY

F1	(C6-C9) Hydrocarbons	
F2	(C10-C16) Hydrocarbons	
F3	(C16-C34) Hydrocarbons	
F4	(C34-C60) Hydrocarbons	
Naph	Naphthalene	BTEX Benzene
Toluene		Xylene
Phenan	Phenentharene	Ethylbenzene

PHC - GREEN DENOTES PARAMETER MEETS CRITERIA

BTEX - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

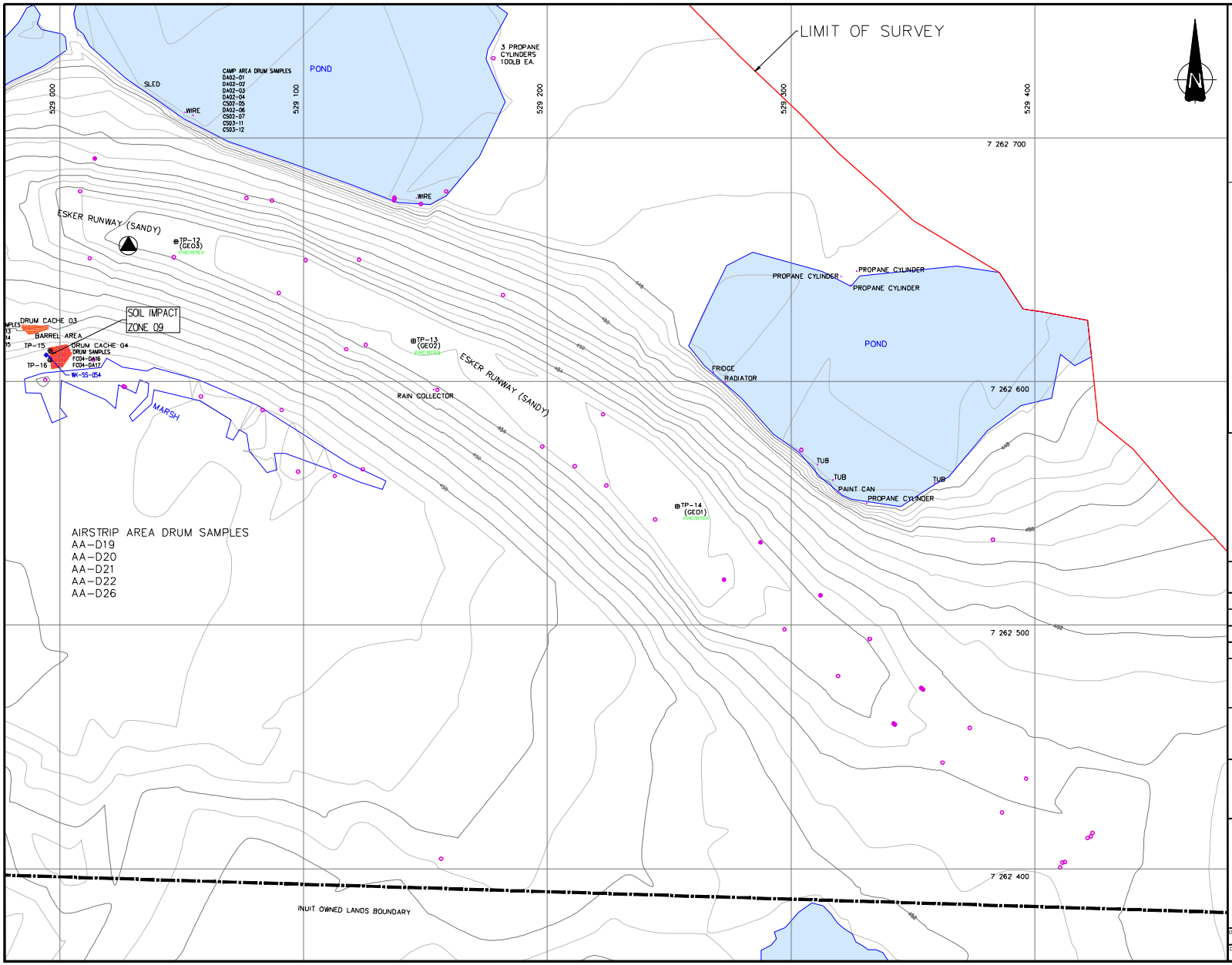
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 3 SOIL SAMPLING LOCATIONS AND PHC DISTRIBUTION

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:1000±	FIGURE 5-3-7	



LEGEND:

- BARREL
- BARREL WITH ELEVATED PARAMETER RESULTS
- TEST PIT LOCATION, SENES 2012
- INUIT OWNED LANDS BOUNDARY

LIBRARY

PHC	Petroleum Hydrocarbons		
F1	(C6-C9) Hydrocarbons		
F2	(C10-C16) Hydrocarbons		
F3	(C16-C34) Hydrocarbons		
F4	(C34-C60) Hydrocarbons		
Naph	Naphthalene	BTEX	Benzene
Toluene			Xylene
Phenan	Phenentharene		Ethylbenzene

PHC - GREEN DENOTES PARAMETER MEETS CRITERIA

BTEX - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC. CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

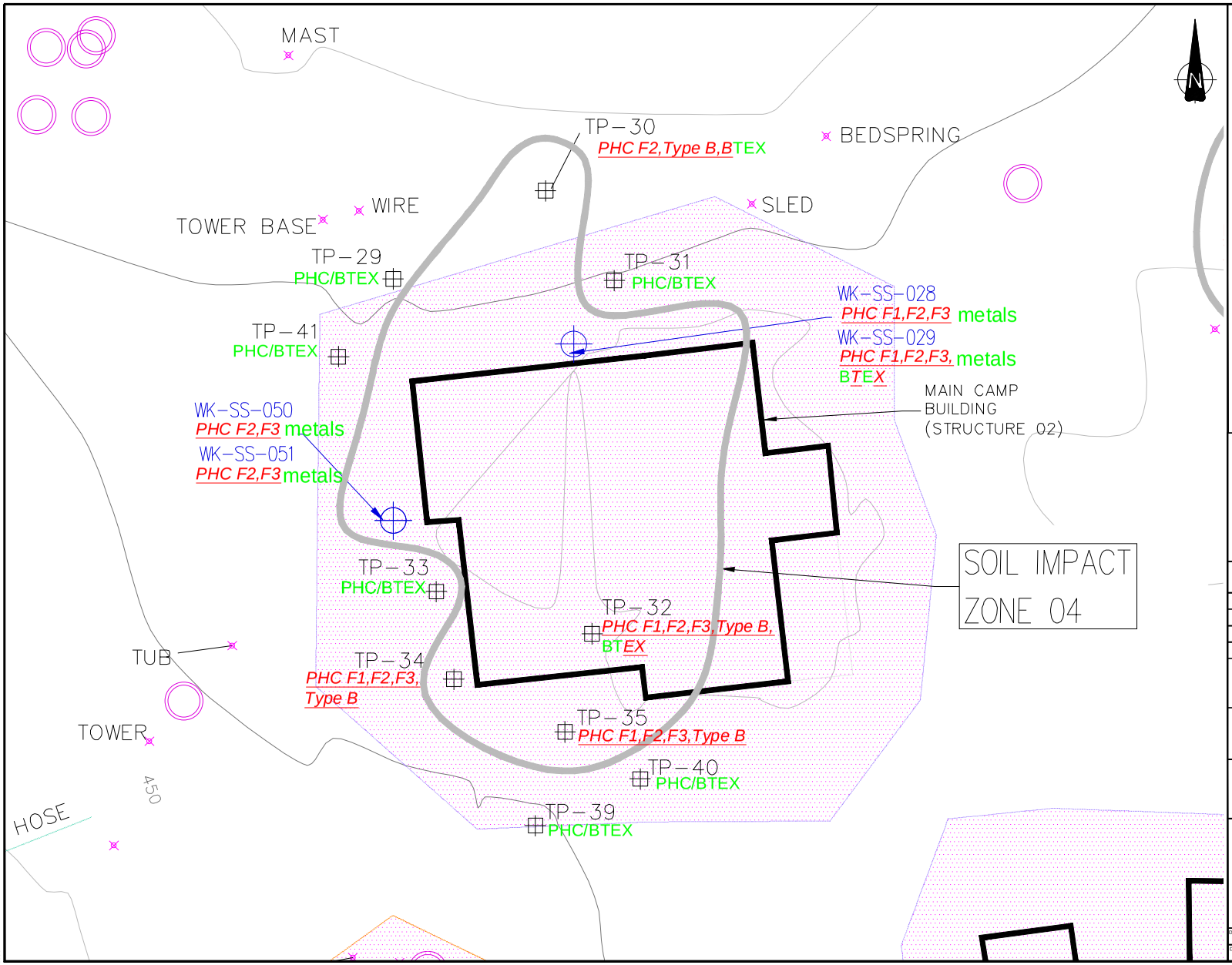
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 4 SOIL SAMPLING LOCATIONS AND PHC DISTRIBUTION

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:1500±	FIGURE 5-3-8	



LEGEND:

- BARREL
- TEST PIT LOCATION, SENES 2012
- SOIL SAMPLE, WESA 2011
- PHC IMPACT ZONES
- AREAS OF CONCENTRATED WASTE/DEBRIS AREA

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	F1	(C6-C9) Hydrocarbons
Hg	Mercury	F2	(C10-C16) Hydrocarbons
Mo	Molybdenum	F3	(C16-C34) Hydrocarbons
Ni	Nickel	F4	(C34-C60) Hydrocarbons
Naph	Naphthalene	BTEX	Benzene
Mn	Manganese		Toluene
Phenan	Phenentharene		Ethylbenzene
Pb	Lead		Xylene

PHC - GREEN DENOTES PARAMETER MEETS CRITERIA

BTEX - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E. 529028.15, ELEV. 454.21m
N. 65° 29' 06.1", E. -110° 22' 22.9", ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

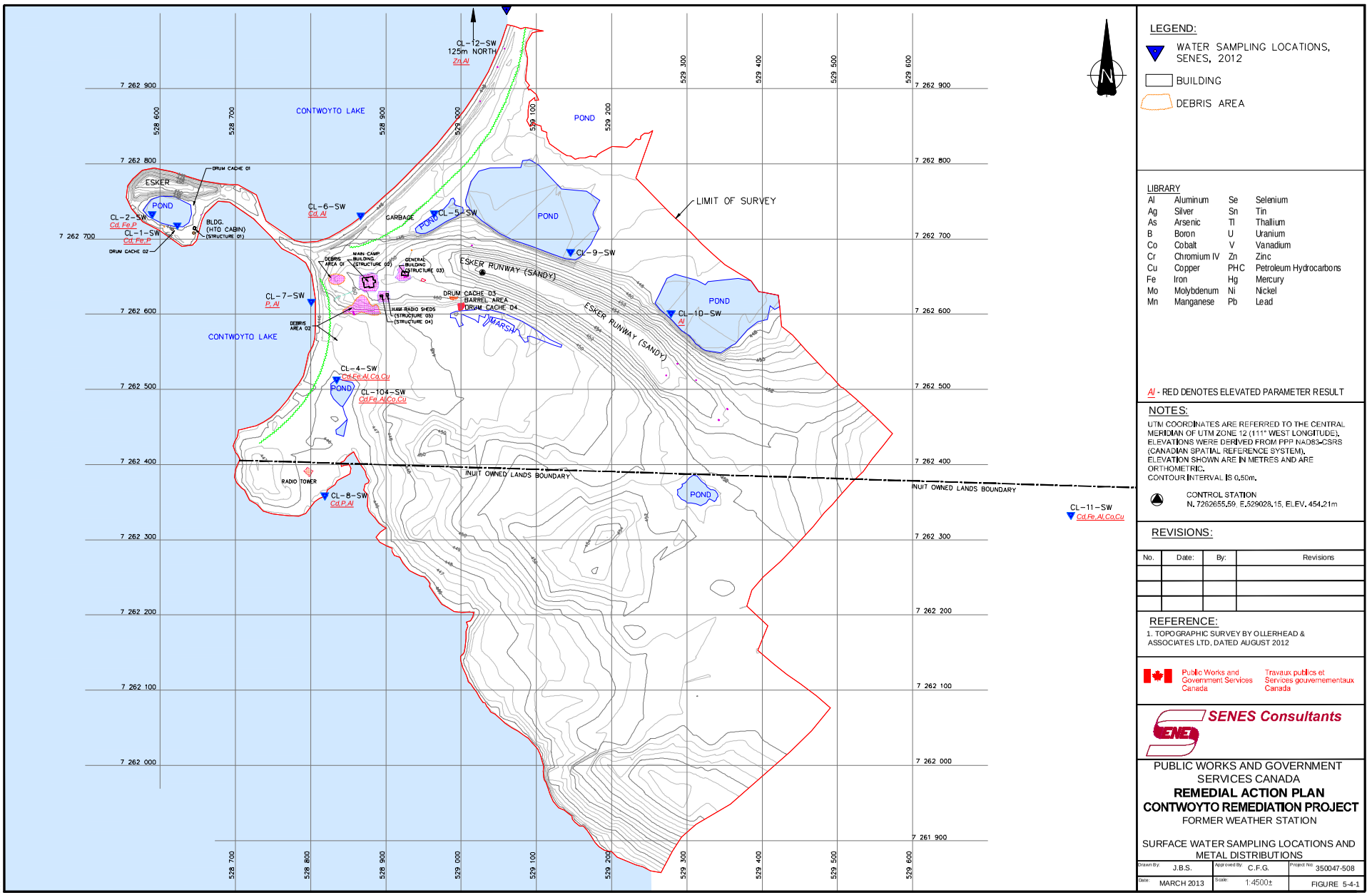
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

AEC 2, STRUCTURE 02 SAMPLING LOCATION PLAN

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:150±	FIGURE 5-3-9	



LEGEND:

- WATER SAMPLING LOCATIONS, SENES, 2012
- BUILDING
- DEBRIS AREA

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	Hg	Mercury
Mo	Molybdenum	Ni	Nickel
Mn	Manganese	Pb	Lead

Al - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC. CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

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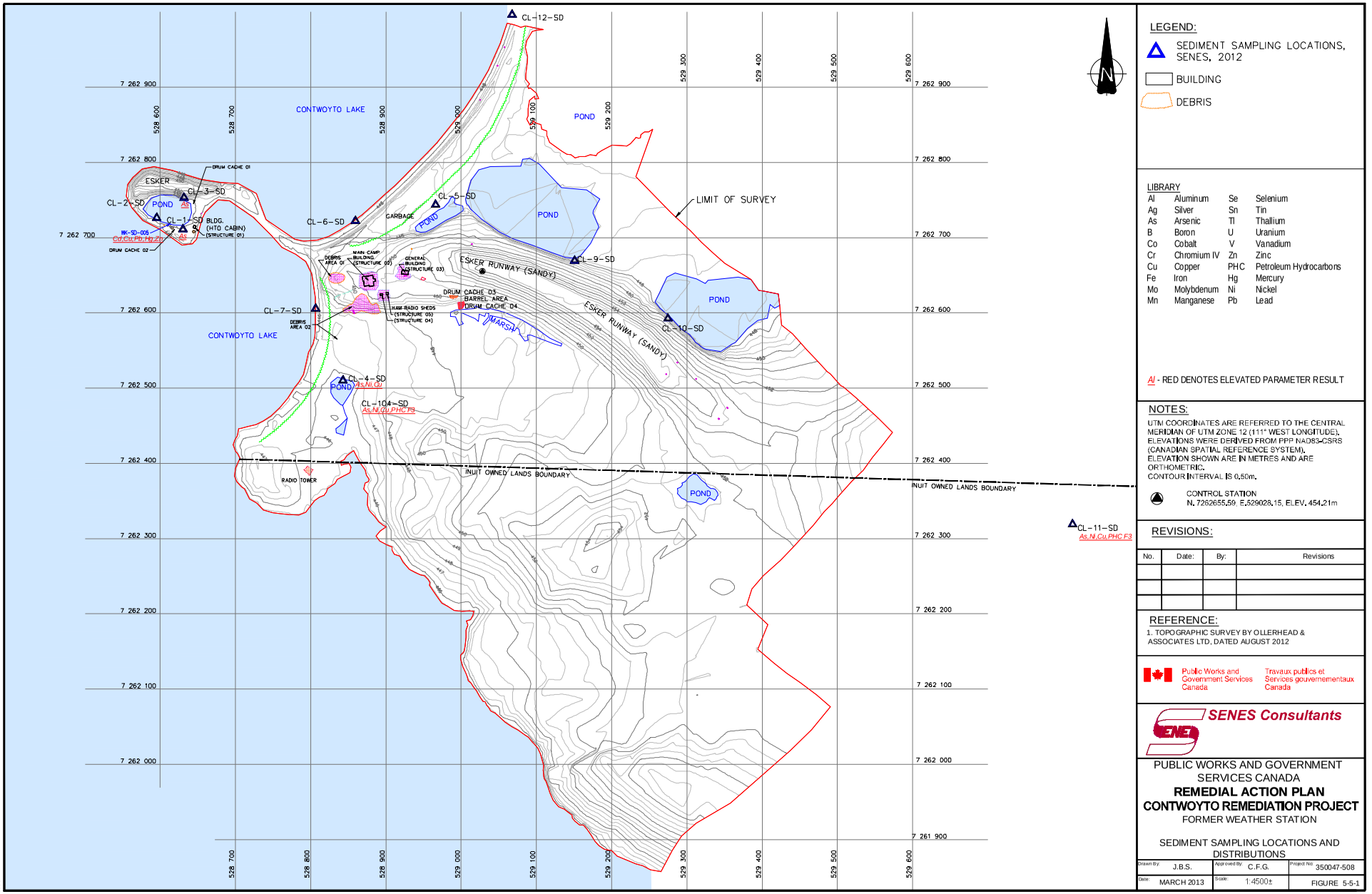
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION

SURFACE WATER SAMPLING LOCATIONS AND METAL DISTRIBUTIONS

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:4500±	FIGURE 5-4-1	



LEGEND:

- SEDIMENT SAMPLING LOCATIONS, SENES, 2012
- BUILDING
- DEBRIS

LIBRARY

Al	Aluminum	Se	Selenium
Ag	Silver	Sn	Tin
As	Arsenic	Tl	Thallium
B	Boron	U	Uranium
Co	Cobalt	V	Vanadium
Cr	Chromium IV	Zn	Zinc
Cu	Copper	PHC	Petroleum Hydrocarbons
Fe	Iron	Hg	Mercury
Mo	Molybdenum	Ni	Nickel
Mn	Manganese	Pb	Lead

Al - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC. CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

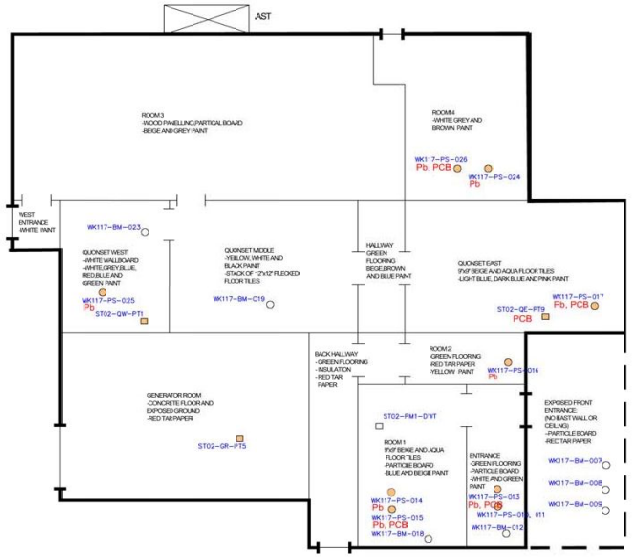
REMEDIAL ACTION PLAN

CONTWOYTO REMEDIATION PROJECT

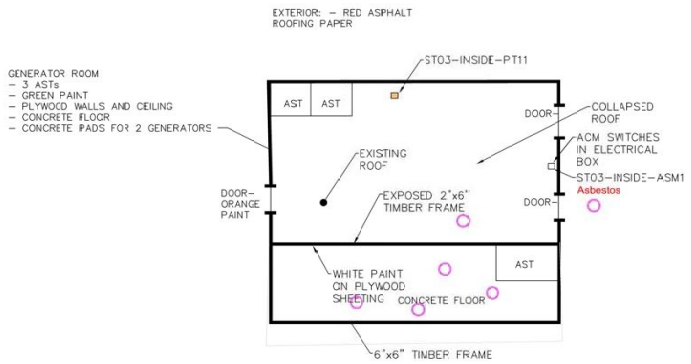
FORMER WEATHER STATION

SEDIMENT SAMPLING LOCATIONS AND DISTRIBUTIONS

Drawn By: J.B.S.	Approved By: C.F.G.	Project No: 350047-508	
Date: MARCH 2013	Scale: 1:4500±	FIGURE 5-5-1	



MAIN CAMP BUILDING
STRUCTURE 02



GENERATOR BUILDING
STRUCTURE 03

LEGEND:

- EXISTING STRUCTURE
- COLLAPSED PORTION OF BUILDING
- BUILDING MATERIAL SAMPLE, WESA 2011
- PAINT SAMPLE, WESA 2011
- BUILDING MATERIAL SAMPLE, SENES 2012
- PAINT SAMPLE, SENES 2012

LIBRARY
Asbestos
Pb: Lead
PCB

PCBs - GREEN DENOTES PARAMETER MEETS CRITERIA

Pb - RED DENOTES ELEVATED PARAMETER RESULT

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.5m.

CONTROL STATION
N. 7262655.59, E 529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revsions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012
2. SURVEY BY WESA, OCTOBER 2013

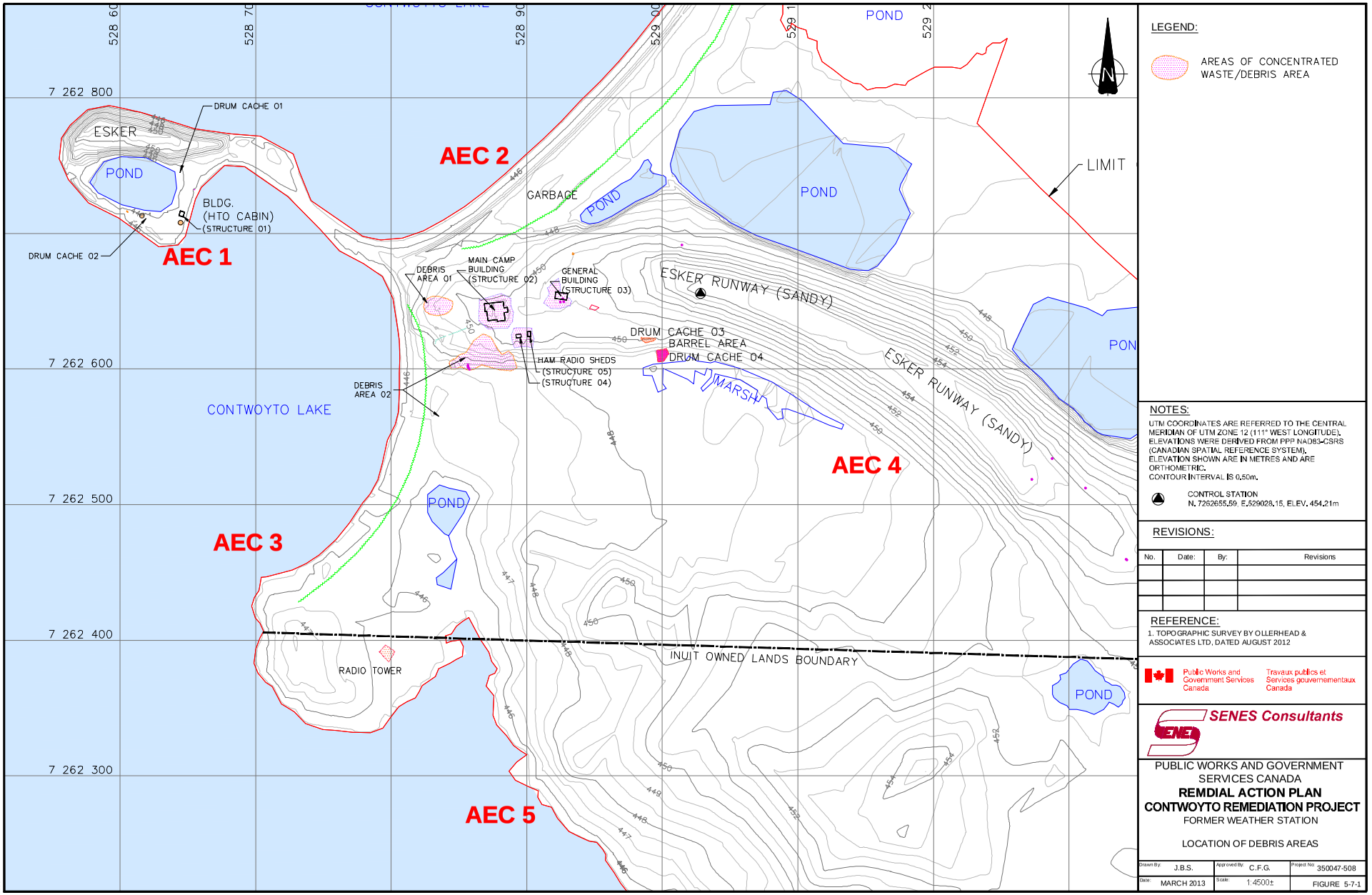
Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
REMEDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

BUILDING MATERIAL
SAMPLING LOCATIONS

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:150±		FIGURE 5-6-1



LEGEND:

AREAS OF CONCENTRATED WASTE/DEBRIS AREA

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

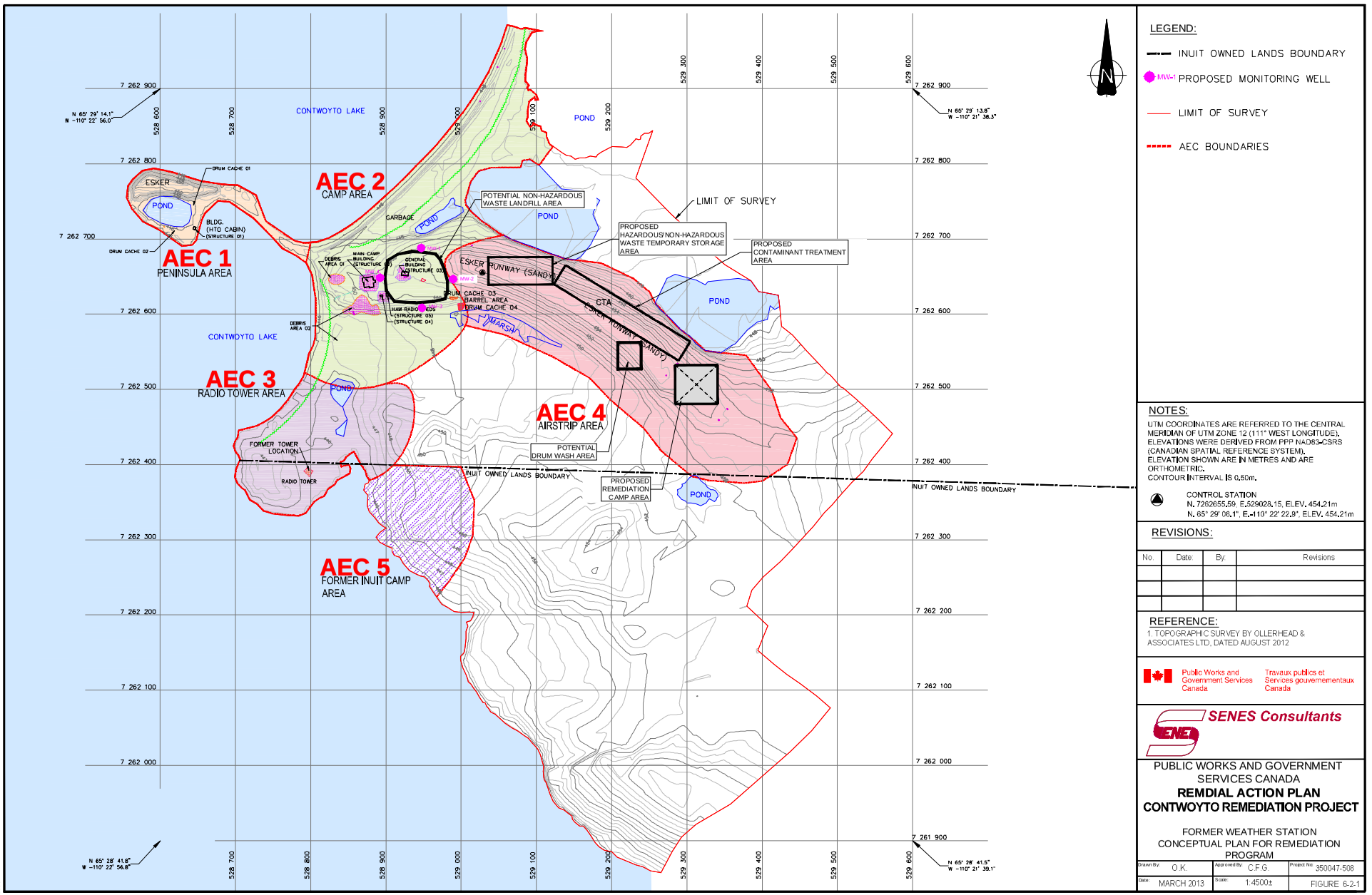
SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT
FORMER WEATHER STATION

LOCATION OF DEBRIS AREAS

Drawn By:	J.B.S.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:4500±		FIGURE 5-7-1



LEGEND:

- INUIT OWNED LANDS BOUNDARY
- MW-1 PROPOSED MONITORING WELL
- LIMIT OF SURVEY
- AEC BOUNDARIES

NOTES:

UTM COORDINATES ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 12 (111° WEST LONGITUDE). ELEVATIONS WERE DERIVED FROM PPP NAD83-CSRS (CANADIAN SPATIAL REFERENCE SYSTEM). ELEVATION SHOWN ARE IN METRES AND ARE ORTHOMETRIC.
CONTOUR INTERVAL IS 0.50m.

CONTROL STATION
N. 7262655.59, E.529028.15, ELEV. 454.21m
N. 65° 29' 06.1", E.-110° 22' 22.9", ELEV. 454.21m

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1. TOPOGRAPHIC SURVEY BY OLLERHEAD & ASSOCIATES LTD, DATED AUGUST 2012

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

SENES Consultants

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

REMDIAL ACTION PLAN
CONTWOYTO REMEDIATION PROJECT

FORMER WEATHER STATION
CONCEPTUAL PLAN FOR REMEDIATION PROGRAM

Drawn By:	O.K.	Approved By:	C.F.G.	Project No:	350047-508
Date:	MARCH 2013	Scale:	1:4500±		FIGURE 6-2-1