Soil Management Plan
for
PROJECT
Heavy Water Management Building (HWMB)
D2O Storage Facility
Purchase Order No 00217807

Black & McDonald Limited
Power Generation Region
915 Sandy Beach Road
Pickering, Ontario L1W 3N6
Tel. (905) 837-1291
Fax. (905) 837-6599

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		Approved by:	
		Bruce Smith, Project Manager — Date 25-Sep-13	
		Acceptance by OPG	
		ROGER DALY, Name — MMGR. CHEM & ENV., Title — 30SEP 13, Date	

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REVISION LIST

REV #	DESCRIPTION OF CHANGE	REVISION PREPARED BY	AMENDMENT DATE
0	Original Issue	Roger Luck	3 Apr 2013
1	a. Revised Sec. 2.0 b. Revised Sec. 3.1 c. Revised Ref. 10.4 d. Appendix "B" final issue added e. Added Appendix "C"	Roger Luck	25 Apr 2013
2	a. Revised Sec. 1.2 b. Revised Sec. 1.3 c. Added Sec. 3.3; 5.0; 6.0; 7.0; 8.0; 9.0 d. Changed Sec. 5.0 to 10.0	Roger Luck	21 May 2013
3	a. Section 4.0 revised paragraph 2 b. Sec 4.0 added paragraph 3 & 4 c.. Revised Appendix "C"	Roger Luck	11June2013
4	a. Added Section 1.4 b. Revised Section 3.3 c. Added Section 3.4; 5.4; 6.4; 7.3; 7.4; 8.3; 11.0 d. Revised Section 5.1; 5.3 e. Revised Section 6.2; 6.3 f. Revised section 8.1 g. Changed Section 9 to Sump and Tank water sampling h. Changed Section 10 to Backout Provisions i. Added Table A j. Added Table B k. Revised Appendix "C" l. Added Appendix "D" m. Added Appendix "E" n. Added Appendix "F" o. Added Appendix "G" p. Added Appendix "H" q. Added Appendix "I" r. Added Appendix "J"	Roger Luck	14 June 2013
5	a. Revised section 1.2 b. Removed section 1.4 c. Removed section 3.4 d. Revised sections 3.1;3.2;3.3 e. Revised section 4.2,4.3,4.4		20 Sep 2013

5	f. Revised sections 5.1;5.2;5.3 g. Removed sections 6.2; 6.3 h. Revised section 6.1 i. Moved section 6.3 to 4.2 j. Removed section 8 "Monitoring and active management of tritiated soil", Table A moved to section 6 k. Revised Table B l. Added Table C m. Added Backout Provision 8.5 n. Revised title Soil Management Plan for C13 Area o. Revised section 7.0		

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1.0 General

The scope of this plan is to provide a means for Black and McDonald to inform all interested parties of B&M's intended methods and means for handling the excavated soil for the new Heavy Water Management Building.

1.1 Purpose

The purpose/objective of the Soil Management Plan is to:

a. Ensure compliance with environmental legislation, regulations and conditions of approval.
b. Ensure proper records are maintained to meet regulatory environmental requirements.

1.2 Scope

Phase 1

The scope of this issue of the plan deals with the following excavated materials:

1. Daylighting using vacuum truck (Top 3 metres)
2. Daylighting using vacuum truck (3m to 5.5m depth)

This plan is to be used in conjunction with 48070014-CEMP "Contractor Environmental Management Plan" (Ref 9.5)

The scope of this Revision addresses Phase 2 of the HWMB construction schedule.

1.3 Phase 2

Phase 2 of this plan addresses the relocation of buried underground services, required to be relocated in order to build the new HWMB. These services include the following:

1. Relocation of the Argon and Oxygen tanks
2. TMOD for SG Cable Duct Bank relocation
3. Cut and cap for 6"air line, 12" steam line, 3" condensate line and 8" water line
4. PMOD for yard drainage
5. Relocation of underground inactive drainage line
6. Removal of underground miscellaneous fire protection line
7. Relocation of LPSW line

The details for these activities are covered in various work plans. Items 1 through 6 above reach no deeper than 3m in depth from grade.

2.0 Roles and Responsibilities:

1. Project Manager (PM) – responsible for the overall SMP, ensuring that it is prepared, approved and followed. (Bruce Smith 416-791-1898)
2. Work Coordinator (WC) – responsible for the implementation of the SMP on the project. (Kurt McDonald 416-677-7273)
3. Construction Superintendent (CS) – Responsible for all site construction activities. (Kurt McDonald 416-677-7273)
4. Environmental Consultant – responsible for soil / water sampling as required (Salima Jaffer – 905-668-4908 x 113)
5. All onsite personnel - All personnel are responsible for identifying and reporting any adverse conditions or issues that could affect soil management.

3.0 Daylighting and Excavation

3.1 Phase 1

Daylighting
In order to confirm that there are no underground services that enter the footprint of the new HWMB building a vacuum truck will be used to daylight the first three (3) metres depth of the foot print. This will be done in a trench like fashion. B&M and field engineering shall verify that there are no services and if declared clear the trench will be back filled with lean concrete (0.7Mpa). This is to ensure that the area is stable and avoid cave-ins during the main excavation with excavators.
The daylighting will continue around the perimeter of the building foot print, and when an underground service is encountered the area around the underground service will be further daylighted in order to allow a construction crew access to relocate the service. The area will be fenced off for safety.

3.2 B&M has contracted Kinectrics Inc / PGL to sample the first 3 metre depth at 5 borehole locations. The test results have indicated that the top 3 metres of soil is below the allowable limit of tritium, confirmed with a report. Appendix "B" provides the conclusion of the report only. The full report (172 pages) is available upon request. (Ref 9.9)
Based on the results of the tests the daylighted material will be transported by truck to a temporary laydown area (C13 on the campus plan).

3.3 Phase 2

1. Daylighting of scopes 1 through 6 will be done using a vacuum truck. None of the daylighting for these services will be below the 3 metre depth. All soil removed for

these activities will be taken to the temporary laydown pad inside the PA identified as C13. Once on the pad the soil will be dewatered, tested by Kinectrics Inc / PGL or OPG Chem Lab and if radiological testing identifies that the material is not tritiated it will be moved to a MOE licensed facility, or to outside the PA (F1 site).

2. Daylighting of scope 7 (LPSW) will be done using a vacuum truck. The top 3 metres will be treated the same as scopes 1 through 6. The top 3 metres of excavated soil from the LPSW can be reused as back fill of the LPSW trench provided the soil meets the conditions listed below. The daylighting of the LPSW system is expected to go to a depth of 5.5 metres. In order to daylight to that depth a dewatering system needs to be in place, see ref 9.7 for the dewatering system details. The soil from the 3 metre depth to the 5.5 metre depth will be removed by vacuum truck and taken to area C13 pad. This soil will be segregated on the pad from the balance of soil which is above the 3 metres depth. Once on the pad the soil will be dewatered, tested and if deemed clean it will be moved to an appropriate disposal location. Soil is considered dewatered at the discretion of the superintendent.

<u>Conditions for Excavated material at C13 lay down area to be reused as backfill:</u>

- Meet Engineering conditions for backfill
- Meet the following parameters:
  - Gross Gamma is LESS THAN MDA.
  - IF gamma activity is GREATER THAN MDA,
    THEN Gamma Scan for Naturally Occurring Radioactive Material (NORM).
    Consultation with Responsible Health Physicist is required.
  - Tritium is LESS THAN 4000 Bq/L
  - IF Hydrocarbon contamination is evident and/or hydrocarbon spill occurred and/or suspected,
    THEN, test for MOE Table 3 parameters. (Soil that has exceeded MOE Table 3 parameters generally cannot be used for backfill).
  - C13 soil to be used for backfill is free of odours, visible staining or debris (i.e. garbage, shingles, painted wood, other waste, etc).
  - Note: Consult with Rad Protection (RP) for the number of samples required for radiological samples required.

3. The "TMOD for SG Cable Duct Bank Relocation" scope of work is running outside the footprint of the new HWMB so PGL was contracted to perform some additional soil sampling along the proposed cable route. Ref 9.10 Appendix "D" provides the results of this sampling and concludes that the soil is clean.

4.0 Laydown Area C13 Future site of Rad Waste Processing Building (RWPB)

4.1 The temporary laydown area inside the PA is identified as C13 on the Darlington Nuclear Campus Plan Proposed Refurbishment General Arrangement. (Appendix "A")

4.2 Area C13 is approximately 80m x 80m and will be divided into areas to hold soil from different areas without cross contamination. See appendix "B" for preliminary testing tritium results.
To contain the daylighted material of approximately 200cuM, an area pad 30mx40m shall be constructed of an impermeable membrane on the surface with a 400mm high berm on 3 sides (Appendix "C"). The area will slope towards a sump so that any water would naturally drain to the sump.

The volume of soil for each area will be tracked by monitoring the number of trucks for each area being excavated and/or calculation of area excavated. A truck tracking form may be used to document this information if the need arises. A copy of this form is included in Appendix "G". After a truck has dumped soil onto C13, the wheels will be washed off while it is still on the pad to ensure no soil from C13 is tracked elsewhere on site. Vacuum trucks have a pressurized hose system to facilitate this.

The C13 area will be graded with gravel and sloped towards the sump. This will be covered with a 16 oz non-woven geotextile, this will then be covered with 1 layer of Enviro Liner 3040 followed by another layer of 16 oz non-woven geotextile. To protect the liner, a 4-inch Geoweb (Geo Cell) will be in placed on top of the liner, filled with granular b and compacted. This Geoweb is rated for 40,000 lbs and will protect the liner from possible damage from equipment.

In order to anchor the Enviro Liner the liner has to overlap the berm and jersey barriers will be placed on the overlapped liner. In addition, some sand bags will be placed in the centre area.

Sediment run-off will be prevented by using a geotextile filter to prevent any sediment from flowing out of C-13.

4.3 This is a temporary storage location and once the daylighting is complete and material dried, this material will be transported by truck to a MOE approved landfill site.. Based on a Kinectrics Inc report this material has been deemed "clean" as outlined in Appendix "B".
A 68,000 litre storage tank will be in place so that the water collected in the sump can be pumped to the storage tank for sampling to determine its quality for disposal options. Disposal pathways will be implemented according to the Groundwater and Dewatering Plan, Ref 9.7. The tank will have an internal weir so the fines may settle out. Tank and sump should be checked daily to ensure proper operation according to the CEMP checklist, Ref 9.5.

4.4 Soil sent to the C13 area from the footprint needs to be separated based on depth. (i.e. Pile 1) 0-3m bgs and Pile 2) 3m bgs and deeper).

5.0 Soil Sampling Protocol

5.1 Ontario Regulation 153/04 characterizes imported fill at a site for purposes of filing an RSC. It is also used as an industry standard for providing an acceptable level of characterizing soil. The Regulation specifies sampling requirements if soil is to be re-used as clean fill onsite or offsite. If offsite, one sample is required for every 160cuM for the first 5,000cuM and one

sample per 300cuM after that. The Regulation also identifies the number of samples required to re-use soil onsite. This consists of field screening 50 soil samples and analyzing 10 samples for every 1,000cuM. Based on the nature of the work and the potential contaminants we recommend that 10 soil samples be analyzed for every 1,000cuM.

5.2 The estimated quantity of soil that will be moved to temporary laydown pad C13 is 700cuM. Soil samples (following RP requirements in Appendix I) will be taken from various areas of the pile and sent to the Chem lab or Kinectrics Inc for testing of contaminants of concern (radiological and conventional parameters as shown in Table A). Kinectrics Inc/PGL will track the soil samples and issue a report summarizing their findings. Soil samples collected for soil intended to be shipped offsite to a MOE approved landfill must be submitted to and external lab for testing.

Table A: Soil Parameter Summary

Parameter Type	Analytical Testing
Radiological Parameters	H3 = Tritium GG = Gross Gamma GS = Gamma Spectroscopy
Conventional Parameters	PHC = Petroleum Hydrocarbons F1 to F4 M&I= Metals and inorganics VOC =volatile organic compounds (including benzene, toluene, ethyl benzene and xylenes)
TCLP	TCLP = metals and inorganics, VOC, sVOC, bulk and leachate PCBs, soil pH and ignitibility

5.3 To be taken to a landfill disposal site, the soil must fall within the following specified limits:

- Gross Beta/Gamma and Gamma scan must show GG<MDA/NORM
- Tritium (H_3) levels must be less than 0.02 µCi/kg
- The TCLP test should identify the soil as non-hazardous

Soil samples will be collected by PGL and soil will be analyzed by the OPG Chem Lab or Kinectrics Inc.

If soil has GG>MDA, RP/Health Physics will be consulted regarding next steps.

If soil passes Gross Beta/Gamma scans but contains unacceptable levels of Tritium, the soil will remain on C13 until the F1 site is ready. The soil will be processed with the rest of the soil at F1.

If soil passes radiological analysis but is identified as hazardous (i.e. fails TCLP tests), it will be disposed of at a hazardous landfill.

5.4 Radiological and TCLP parameters will be tested and results evaluated prior to determining offsite shipment from Area C13 to a MOE approved land fill facility. Additional testing for conventional parameters will be required for material to be reused at Darlington, outlined in Table A above.
Once soil is tested, newly excavated material should not be mixed with tested material. If newly excavated material is mixed in, the soil pile would require retesting.

6.0 Approved Designated Laydown Area

6.1 The temporary approved designated laydown area is C13 inside the PA. This location has to be vacated by October 2013. The plan for soil segregation is as follows for Phase 1 and 2 work:

1. Soil from grade to 3 metre depth.
2. Soil below 3 metre depth for the LPSW system.

The soil will be left on the pad until it is dewatered. Soil is considered dewatered at the discretion of the construction supervisor.

7.0 Sump and Tank Water Sampling

7.1 The C13 soil storage pad will have a sump to collect water from the soil and a limited amount of rainwater. The water will be held in aboveground tanks. The Tank and Sump will be inspected daily and an inspection checklist will be completed. The checklist will include the following items: date/time, personnel name, observed leaks/accumulated debris, condition of tank and sump, volume in tank. (See ref 9.5 for check list)

7.2 The tank will be sampled when it is 50% full. The sampling parameters are provided in the Table B and Table C below. The samples will be submitted to the OPG Chem lab for analysis.

Table B. Dewatering collection tank parameter part (1 of 2)

Parameter	OPG Limits
Gross Gamma	GG < MDA/NORM
Total Suspected Solids*	≤70mg/L
Visible Oil*	No visible sheen
Total Organic Carbon	≤15mg/L
Oil in water	≤15mg/L
pH	6.0-9.5

* Effluent shall be essentially free of floating and settleable solids and cannot contain oil or any other substance in amounts of sufficient to create a visible film sheen foam or discolouration to receiving waters

Table C. Dewatering collection tank parameter part (2 of 2)

Tritium Level	Action
< 0.108 uC/kg (or 4000 Bq/L)	Pump out water via Yard Drainage
>0.108 µCi/kg	See Section 7.4, Section 7.5

7.3 IF the sample results are below the limits in Table B AND Table C THEN the water can be disposed to yard drainage.

7.4 IF the sample results are below the limits in Table B, BUT exceed the limit in Table C for yard drainage pump-out , AND it is not feasible to dilute the water with dewatering waste water, THEN complete the following:

Pre-requisite conditions:

a) Ensure dedicated Vac truck is used for all transfers. If a new vac truck is required, then sample must be submitted for Table B parameters again (i.e. start from step 7.4.2).

b) The Aquatech holding tank cannot be filled with water during this period. If it is refilled then the water will need to be tested for Table B and Table C parameters

c) The vac truck cannot be used for other work until this tote transfer of approx. 80,000L is complete. IF the vac truck is used for other work in between, then, start at step 7.4.2.

7.4.1 B&M: Use dedicated Clean Vac truck for all Aquatech holding tank water transfers.

7.4.2 B&M: Vac water out of holding tank (about 10 minutes).

7.4.3 PGL: Sample water in vac truck for Table B parameters and Table C (tritium).

7.4.4 PGL: Obtain results from OPG Chem lab, keep results as part of OWRA Minor Mod notification.

7.4.5 IF the test results meet Table B discharge limits, THEN Go to step 7.4.6.
IF the test results do not meet Table B discharge limits, THEN Go to step 7.5.

7.4.6 B&M: Discharge water from the vac truck to the forebay at the same location as the Box Drain Pump out in a controlled manner (1hour discharge).

7.4.7 PGL: Complete Vac truck tracking form (Appendix J)

7.4.8 B&M: B&M supervisor to sign off on form (Appendix J).

7.4.9 Vac water out of holding tank (about 10 minutes).

7.4.10 Repeat steps 7.4.6 to 7.4.10 until holding tank is empty and as long as the prerequisite conditions are met.

7.5 IF the sample results exceed the limits in Table B and/or Table C, consult with NR-Environment. Disposal via Detox to Clean Harbours may be required.

8.0 Backout Provisions

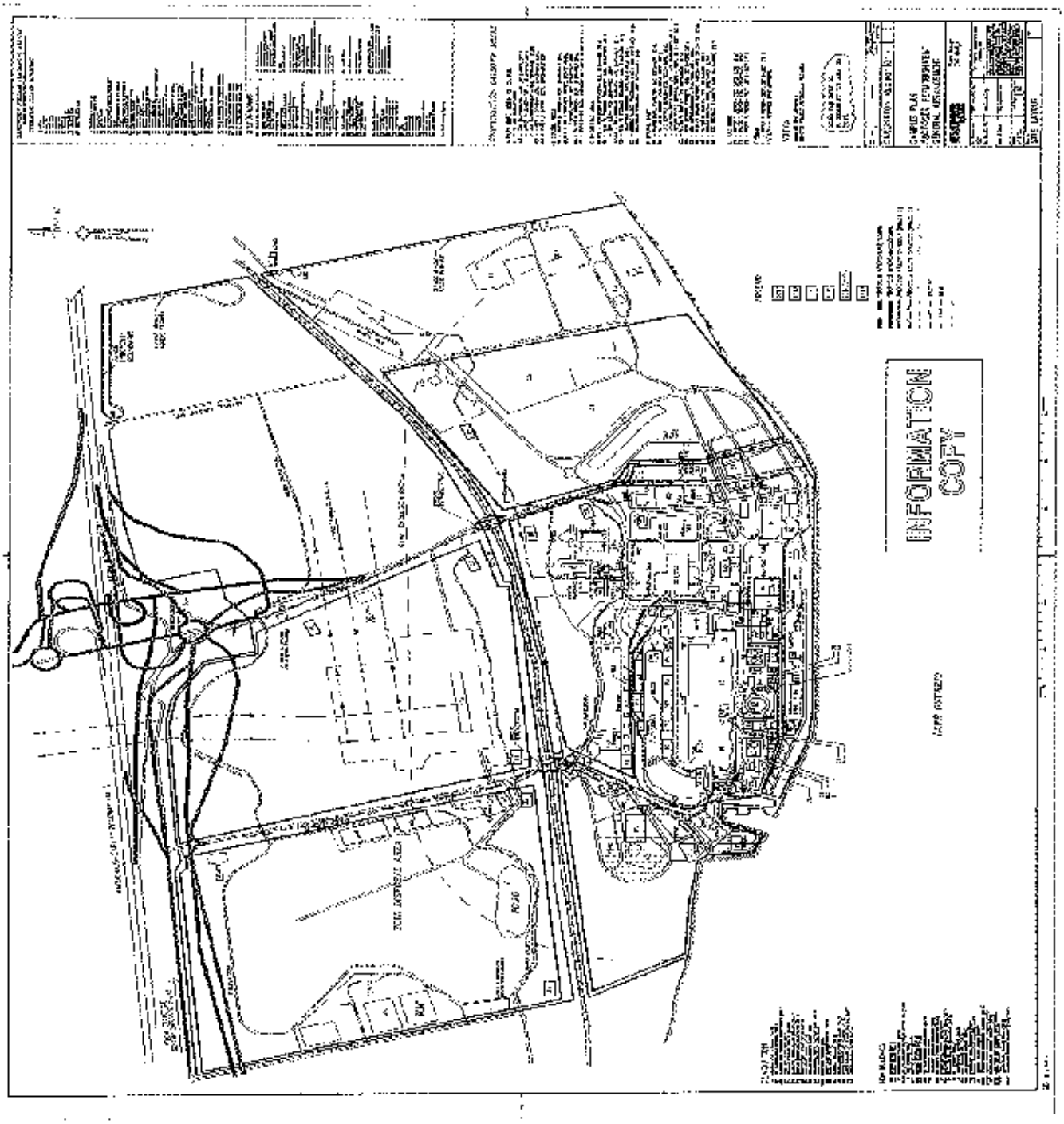
In the event that backout condition occurs, excavation equipment should be left in a safe state.

1. Backout in the case of fire or personal injury. In addition to backout procedures, workers will immediately notify the CMO who will immediately notify the shift manager. If the CMO is not immediately available, contact the Shift Manager directly (x4500).
2. Backout in the case of an electrical storm or unsafe weather conditions such as high winds, rain or snow.
3. Backout if petroleum products, oils or contaminated soil is discovered. See N-PROC-OP-0044 (Contaminated Lands and Groundwater Management)
4. In the event of a station alarm: Stop work, listen and follow instructions given on the public address system. Ensure that the work area does not pose a safety hazard, cover any open areas. All workers shall proceed to the designated assembly area identified in the daily pre-job briefing.
5. Backout in the case of a spill event. Follow spill plan actions outlined in Ref 9.6.

9.0 References

9.1	N-GUID-09701-10013	Environmental Requirements Guideline
9.2	D-INS-79000-10002	Waste Disposal Guidelines for Solid Waste and Recycling at Darlington
9.3	D-INS-07290-10000	Darlington Spill Prevention and Contingency Plan
9.4	B&M 48070038-Sketch 001	Soil Laydown Pad (C13) (Appendix "C")
9.5	B&M 48070014-CEMP	Contractor Environmental Management Plan
9.6	B&M 48070014-SPCP	Spill Prevention and Contingency Plan
9.7	B&M 48070014-GDP	Groundwater and Dewatering Plan
9.8	B&M 48070014-WMP	Waste Management Plan
9.9	Kinectrics K-415072-003 -TM-0001-R00	Shallow Soil Sampling (Appendix "B")
9.10	Memo PGL File 3821-01.02	Cable Trench Sampling (SGTMOD)(Appendix "D")
9.11	Kinectrics K-415072-002 -RA-0001-R00	Borehole Drilling investigation (Appendix "E")
9.12	J.D. Barnes 11-25-432-07-A	Decommissioned Well Diagram (Appendix "F")
9.13	B&M	Truck Tracking Form (Appendix "G")
9.14	Darlington Environmental Review Tool	DERT Guidelines (Appendix "H")

APPEND



APPENDIX "B"

Heavy Water Storage Building Project: Shallow Soil Sampling during Daylighting Activities -- Preliminary Results Ontario Power Generation - Darlington Nuclear (OPG-DN)

Kinectrics Report: K-415072-003-TM-0001-R00
April 24, 2013

Kinectrics Inc
Analytical and Waste Services

Kinectrics Inc., 800 Kipling Avenue, Unit 2
Toronto, Ontario, Canada M8Z 5G5

Heavy Water Storage Building Project: Shallow Soil Sampling during Daylighting Activities – Preliminary Results Ontario Power Generation - Darlington Nuclear (OPG-DN)

Kinectrics Report:

K-415072-003-TM-0001-R00
April 24, 2013

Prepared by: Pottinger Gaherty Environmental Consultants Ltd
Unit 102-260 Water Street
Whitby, ON, L1N 0G5

Reviewed by: Ruth Burany, PhD, PEng
Engineer
Analytical and Waste Services
Kinectrics Inc

Approved by: Otto Hermann, PhD
Department Manager
Analytical and Waste Services
Kinectrics Inc.

Dated: April 24, 2013

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REVISIONS

Revision Number	Date	Comments	Approved
DRAFT	March 28, 2013	DRAFT RELEASE	OH
R00	April 24, 2013	FINAL RELEASE	OH

PGL
Pottinger Gaherty
Environmental Consultants Ltd.
250 Water Street, Unit 102
Whitby, ON Canada L1N 0G5
T 905 668 4806
F 905 668 4969
www.pgroup.com

Memo

PGL File #: 3821-01.02

DATE: April 23, 2013

TO: Ruth Burany, Kinectrics Inc.

FROM: Salima Jaffer, PGL
John DeWilde, PGL

**Re: Heavy Water Storage Building Project:
Shallow Soil Sampling during Daylighting Activites
Ontario Power Generation – Darlington Nuclear (OPG-DN)**

Pottinger Gaherty Environmental Consultants Ltd. (PGL) has conducted shallow-soil sampling during daylighting activities to provide disposal options as a part of the Heavy Water Storage Building (HWSB) construction project at OPG DN. A summary of our work, results and conclusions is provided herein.

Background

A historic spill in December 2009 from Injection Water Storage Tanks (IWST) occurred in the area of the proposed HWSB excavation. The IWST water was primarily demineralized water containing 44,807,000Bq/L of tritium and 58.8mg/kg of hydrazine.

Twenty-nine boreholes and 28 wells have been installed since, in the area to investigate impacts from the spill event. The investigation identified tritium impacts to both soil and groundwater in the area of the HWSB and beyond. The investigation also identified petroleum hydrocarbons (PHC) and limited volatile organic compounds (VOC) impacts. The soil and groundwater quality were evaluated against Ontario Regulation 153/04 Table 3 Industrial/commercial/community standards for coarse-textured soil in a non-potable groundwater condition.

PGL was contracted to evaluate the asphalt, soil, bedrock and groundwater as part of the excavation and disposal work required for the construction project. Our sampling program for these materials was outlined in our *Sampling and Analysis Plan (SAP), Heavy Water Storage Building, Ontario Power Generation, Darlington Nuclear Generating Station, Bowmanville ON*, dated January 23, 2013 previously submitted under separate cover.

Sampling Rationale

PGL recommended completing an *in situ* sampling and scan survey to collect data that will allow for offsite disposal of soils. It is intended that after the collection of this data, soils can be cleared directly for disposal onsite or offsite either under a Conditional Transfer Permit (CTP) or Unconditional Transfer Permit (UTP).

As identified in our Sampling and Analysis Plan, five boreholes in the area of the proposed building footprint were to be completed to augment existing soil and groundwater data collected this past year (2012) at the Site. The first 3m (10') of each borehole location was daylighted using a vacuum truck operated by Badger Daylighting Inc. This preliminary technical memo details the results of the sampling during daylighting activities. The rest of the soil and bedrock sampling associated with drilling activities will be reported under separate cover.

To assess disposal options, PGL compared the conventional analysis data with the Ministry of Environment's (MOE) standards found in *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*, April 15, 2011. We compared data to both Table 1 Full Depth Background Site Condition Standards and Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition. For Table 3 we used coarse-grained soil standards for an industrial/commercial/community use.

Work Program: Shallow Soil Sampling

As a part of this work, PGL conducted the following tasks:

- Prepared a Sampling and Analysis Plan as required by Ontario Regulation 153/04;
- Prepared both a health and safety plan and Job Safety Analysis form;
- Attended a Project Readiness meeting February 15, 2013;
- Collected shallow-soil samples during daylighting work at the five proposed borehole locations (BH281 to BH285)
- Sampled soil at 0.5m intervals using a hand auger;
- Logged and screened samples using a Model 3 Ludlum Analog Ratemeter with Model 44-9 pancake detector and screened for organic vapours with the use of an RKI Eagle 2 equipped with both photoionization device sensor and LEL/PPM catalytic sensor;
- Collected soil samples in laboratory supplies bottles, labelled the bottles and kept samples refrigerated or on ice until submission to the laboratory;
- Submitted soil samples based on elevated Ludlum Ratemeter results, elevated photoionization device results and to provide vertical coverage, to be representative for the full length of the borehole at each location;
- Collected composite soil samples and submitted them to OPG chem lab for tritium and gross gamma screening. These results were provided to OPG Health Physics to assess the type of release permit for the samples prior to shipment to Kinectrics Inc. (Kinectrics) for analysis;
- Submitted six samples for radiological parameters and conventional parameters and two samples for TCLP analyses; and
- Evaluated the data and prepared this memo.

Findings

This technical memo presents the available results of the shallow soil sampling conducted. The results are included in Table 1 to 4 and laboratory certificates are attached.

The gross gamma and tritium results from the OPG chem lab for the composite soil samples required for shipping are presented in Table A below. PGL obtained confirmation from OPG on March 25, 2013 that composite soil samples for pre-laboratory shipment was not required if Kinectrics was performing gamma scans and tritium analysis of samples (see included correspondence). A standing conditional transfer permit (SCTP 29) was provided for use for the rest of the project work. The conditions of SCTP apply to soil only and no OPG Chem lab analysis of soil samples is required.

Table A: Gross Gamma and Tritium Composite Soil Results

OPG Chem Sample ID	Sample Date	Gross Gamma (µCi/L)	Tritium (µCi/kg)	S. Taras Review/Response
2013-02-G766	Feb 20, 2013	0.00428	0.144	H3 > UTP limit CTP required
2013-02-H111	Feb 21, 2013	0.0051	1.97	Activity and H3 > MDL CTP required
2013-02-H493	Feb 22, 2013	0.00474	<0.003	activity > MDL CTP required
2013-02-H494	Feb 22, 2013	0.00283	<0.003	activity > MDL CTP required
2013-02-I427	Feb 25, 2013	0.00633	0.366	Review not required

Radiological Parameter Results

Most of the radionuclide results were less than the laboratory detection limits with the exception of Potassium-40 (K-40), Thorium-series (Th-series), uranium-series (U-series), and tritium (H3). Tritium results in the shallow soil samples ranged from 18.2 to 291Bq/kg. All tritium results were less than 0.02µCi/kg (740 Bq/kg). Refer to Table 1.

PGL also compared the tritium data collected with that obtained in previous investigations. All tritium results from CH2M Hill's investigations of the top 3m of soil from the area are also below 0.02uCi/kg.

The tritium results from the OPG Chem Lab (Table A) vary from the data provided by Kinectrics. PGL understands, based on a conversation with Chris Wood (OPG), that this is typical and that the Kinectrics data is considered to supersede the OPG Chem Lab data.

Conventional Parameter Results

BTEX and PHC F1-F4 Results

All the sample results were below the laboratory method detection limits for the samples submitted.

Refer to Table 2.

VOC Results

All the sample results were below the laboratory method detection limits for the samples submitted.

Refer to Table 3.

Metals Results

All the sample results were below MOE Table 1 and 3 standards except for one sample. Sample BH280-2 from 0.8m to 1m below ground surface (bgs) exceeded the MOE Table 1 standard for electrical conductivity. Electrical conductivity is a measure of soil salinity and excess salts have an adverse affect on plants. This standard is intended to be protective of agricultural habitat which is not the case here. PGL would argue that since only one in

six samples exceeded electrical conductivity that this is not considered an issue for soil disposal. PGL does not believe that this result will affect offsite soil disposal options as landfills do not request this analysis for soil disposal. Refer to Table 4.

Results for sodium absorption ratio are outstanding and will be provided as a part of the investigation report when data is available.

Hydrazine was not detected in soil with the exception of a field blank. This result was only slightly over the detection limit and is likely an instrument issue.

TCLP

The Ontario Regulation 347/558 leachate extraction data is attached. The soil was evaluated against Schedule 4 and is not leachate toxic. These soils are classified as non-hazardous and maybe disposed of at an MOE approved landfill.

QA/QC

For ease of use, a detailed discussion on quality assurance and quality control is not included in this technical memo. Instead it will be included in the larger investigation report for the full borehole drilling program. In general however, the data meets quality assurance/quality objectives and is suitable for use in assessing disposal options.

Recommendation

PGL recommends that this memo and results be submitted to OPG Health Physics to assess the type of release permit for the material.

Standard Limitations

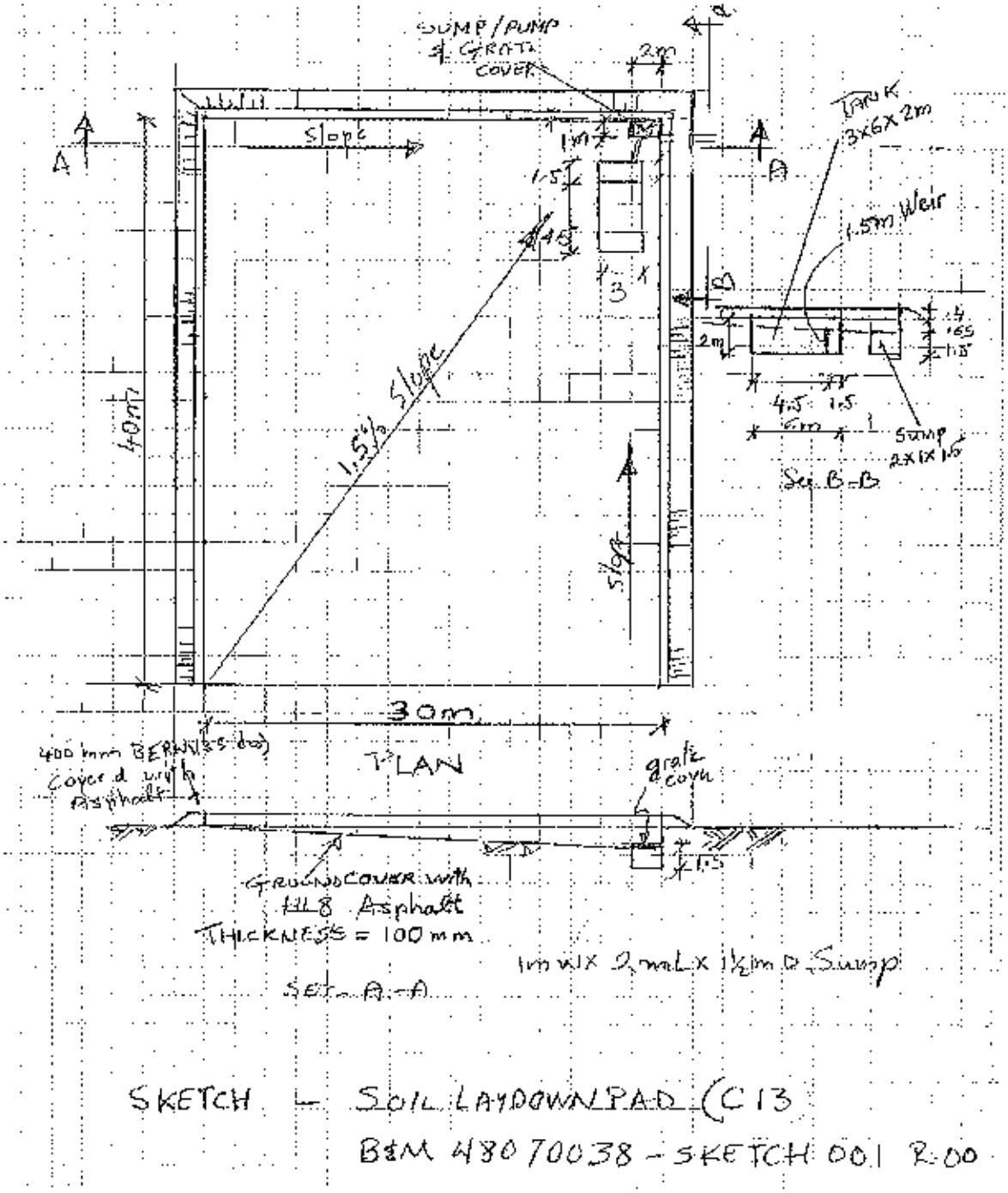
PGL prepared this memo for our client and its agents exclusively. PGL accepts no responsibility for any damages that may be suffered by third parties as a result of decisions or actions based on this report. The memo's purpose is to transmit and interpret monitoring data and so will need to be used in conjunction with previous reports by PGL or others. As is true for all environmental investigations, potential remains for the presence of unknown, unidentified, or unforeseen surface or subsurface contamination. More or different investigation may be required if other risks are identified. The data presented in this report is valid for the date of sampling, but site conditions may change with time.

The findings and conclusions are Site-specific and were developed in a manner consistent with that level of care and skill normally exercised by environmental professionals currently practicing under similar conditions in the area. Changing assessment techniques, regulations, and site conditions means that environmental investigations and their conclusions can quickly become dated, so this memo is for use now. The memo should not be used after that without PGL review/approval.

The project has been conducted according to our instructions and work program. Additional conditions and limitations on our liability are set forth in our work program/contract. No warranty, express or implied, is made.

Attachments: Correspondence
Tables
Soil Lab Results
TCLP Lab Results

APPENDIX "C"


SUMP / PUMP & GRATE COVER
2m
Slope
1m
1.5
4.5
3
TANK 3x6x2m
1.5m Weir
2m
4.5
1.5
6m
Sump 2x1x1.5
Sec B-B
1.5% Slope
40m
Slope
30m
PLAN
400 mm BERM (Less dry) Covered with Asphalt
grate cover
GROUNDCOVER with HL8 Asphalt
THICKNESS = 100 mm
1m wx 2m L x 1½m D Sump
SEC. A-A
SKETCH – SOIL LAYDOWN PAD (C13
B&M 480 70038 – SKETCH 001 R:00

PPENDIX "D"

PGL
Pottinger Gaherty
Environmental Consultants Ltd
250 Water Street, Unit 102
Whitby, ON Canada L1N 0G5
T 905.668 4905
F 905.668 4909
www.pgeltd.com

Memo

PGL File #: 3021-01.02 Cable Trench

DATE: May 24, 2013

TO: Ruth Burany, Kinectrics Inc.

FROM: Saliine Jeffer, PGL
Will Gaherty, PGL

**Re: Heavy Water Management Building Project:
Cable Trench Sampling (SG TMOD)
Ontario Power Generation – Darlington Nuclear (OPG-DN)**

Pottinger Gaherty Environmental Consultants Ltd. (PGL) sampled shallow soil in advance of daylighting activities to support relocation of utility service cables as a part of the Heavy Water Management Building (HWMB) construction project at OPG DN. This summarizes our work, results and conclusions.

Background

A historical spill in December 2009 from Injection Water Storage Tanks (IWST) occurred in the area of the proposed HWMB excavation. The IWST water was primarily demineralized water containing 44,807,000Bq/l. of tritium and 58.8mg/kg of hydrazine.

Twenty-nine boreholes and 28 wells have been installed in the area to investigate impacts from the spill. The investigation identified tritium impacts to both soil and groundwater in the area of the HWSB and beyond. The investigation also identified petroleum hydrocarbons (PHC) and limited volatile organic compounds (VOC) impacts. The soil and groundwater quality were evaluated against Ontario Regulation 153/04 Table 3 Industrial/commercial/community standards for coarse-textured soil in a non-potable groundwater condition.

PGL was contracted to evaluate the asphalt, soil, bedrock and groundwater as part of the excavation and disposal work required for the construction project. Our sampling program for these materials was outlined in our January 23, 2013 *Sampling and Analysis Plan (SAP), Heavy Water Storage Building, Ontario Power Generation, Darlington Nuclear Generating Station, Bowmanville ON.*

As an added scope item, PGL was requested to collect additional soil samples to characterize shallow soils that are to be removed during daylighting activities for a utility service cable trench. This additional work was requested by Black & McDonald (B&M). The trench is estimated to be 200m long by 450mm deep by 900mm wide. The volume of material to be excavated for the trench is 85m^3. The material will eventually be disposed of offsite but will be temporarily stored within the Protected Area (PA) on an asphalt pad in a designated area called C13.

Material Categorization

To assess disposal options, PGL compared the conventional analysis data with the Ministry of Environment's (MOE) standards *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*, April 15, 2011. We compared data to both Table 1 Full Depth Background Site Condition Standards and Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition. For Table 3 we used coarse-grained soil standards for an industrial/commercial/community use.

Work Program: Cable Trench Sampling

PGL recommended composite sampling, as detailed in a February 4, 2013 email, and revised March 15, 2013 (Attachment – Correspondence). As a part of this work, PGL conducted the following tasks:

- Attended a pre-job brief on April 24, 2013, however, work authorization and the completed dig card were delayed;
- Collected two composite soil samples (comp1-0.2 and comp2-0.45) from three separate holes in the proposed trench location on April 25, 2013 from two depth intervals; 0.2m to 0.4m and 0.45m to 0.6m below ground surface at each of the three locations;
- Soil was collected in laboratory-supplied bottles and were labelled;
- Cleared samples offsite by RP under a standing Conditional Transfer Permit;
- Transferred samples in a cooler packed with ice under chain of custody to Kinectrics Inc.;
- Requested radiological and conventional parameters analysis on two samples (comp1-0.2 and comp2-0.45) and one duplicate; and
- Evaluated the data and prepared this memo.

Findings

Conventional parameters met applicable standards except chromium and nickel while several radiological standards exceeded detection limits. The results are included in Table 1 to 4 and laboratory certificates are attached. The soil in the three holes was similar and comprised of sand and gravel fill with occasional cobbles.

Radiological Parameter Results

Most of the radionuclide results were less than the laboratory detection limits except
- Potassium-40 (K-40);
- Thorium-series (Th-series);
- Uranium-series (U-series); and
- Tritium (H3).

Tritium results in the composite soil samples ranged from 11.4 to 15.4Bq/kg. All tritium results were less than 0.02µCi/kg (740 Bq/kg) (Table 1). PGL compared the tritium data collected with previous investigations. All tritium results from CH2M Hill's investigations of the top 3m of soil from the area of the proposed HWMB are also below 0.02uCi/kg.

Conventional Parameter Results

BTEX and PHC F1-F4 Results

All the sample results were below the laboratory method detection limits for the samples submitted (Table 2).

VOC Results

All the sample results were below the laboratory method detection limits for the samples submitted (Table 3).

Metals Results

All the sample results were below MOE Table 1 and 3 standards except for two analytical parameters; chromium and nickel (Table 4). Comp1-0.2 and its duplicate sample exceeded the MOE Table 1 standard for chromium and the duplicate also exceeded the MOE Table 3 standard. The duplicate sample also exceeded the MOE Table 1 standard for nickel.

TCLP

The Ontario Regulation 347/588 leachate extraction data was completed due to the chromium exceedence and is attached. The soil was evaluated against Schedule 4 and is not leachate toxic. These soils are classified as non-hazardous and maybe disposed of at an MOE approved landfill.

QA/QC

For ease of use, a detailed discussion on quality assurance and quality control is not included in this technical memo. A duplicate sample was collected for soil sample comp1-0.2, however, since the sampling methodology was composite sampling, the samples are a mixture of soil collected from there different spots from the same depth interval and are non-homogenous. The relative percent difference for the duplicate sample does not meet the generally acceptable range for soil samples. However, the data meets quality assurance/quality objectives and is suitable for use in assessing disposal options. Discussion with the laboratory indicated that the variation in chromium results are due to non-homogeneous samples, a common issue with solids.

Conclusion/Recommendation

PGL understand that the soil will be temporarily stored at C13 within the PA. The material will eventually be removed from the PA to a new holding area outside the PA on the east side of the OPG-DN property. This area is called F1. The soils from F1 will be re-sampled and disposal options will be re-evaluated at that time.

PGL recommends that this memo and results be submitted to OPG Health Physics for evaluation of results. Additional samples may be necessary to assess the type of release permit for the material prior to removal from the PA.

Standard Limitations

PGL prepared this memo for our client and its agents exclusively. PGL accepts no responsibility for any damages that may be suffered by third parties as a result of decisions or actions based on this report. The memo's purpose is to transmit and interpret monitoring data and so will need to be used in conjunction with previous reports by PGL or others. As is true for all environmental investigations, potential remains for the presence of unknown, unidentified, or unforeseen surface or subsurface contamination. More or different investigation may be required if other risks are identified. The data presented in this report is valid for the date of sampling, but site conditions may change with time.

The findings and conclusions are Site-specific and were developed in a manner consistent with that level of care and skill normally exercised by environmental professionals currently practicing under similar conditions in the area. Changing assessment techniques, regulations, and site conditions means that environmental investigations and their conclusions can quickly become dated, so this memo is for use now. The memo should not be used after that without PGL review/approval.

R. Burany

May 24, 2013
PGL File: 3821-01.02

The project has been conducted according to our instructions and work program. Additional conditions and limitations on our liability are set forth in our work program/contract. No warranty, express or implied, is made.

Attachments: Correspondence
Tables
Field Sketch
Soil Lab Results
TCLP Lab Results

APPENDIX "E"

Heavy Water Storage Building Project: Borehole Drilling Investigation Ontario Power Generation - Darlington Nuclear (OPG-DN)

Kinectrics Report: K-415072-002-RA-0001-R00
June 4, 2013

Prepared by: Pottinger Gaherty Environmental Consultants Ltd
Unit 102-250 Water Street
Whitby, ON, L1N 0G5

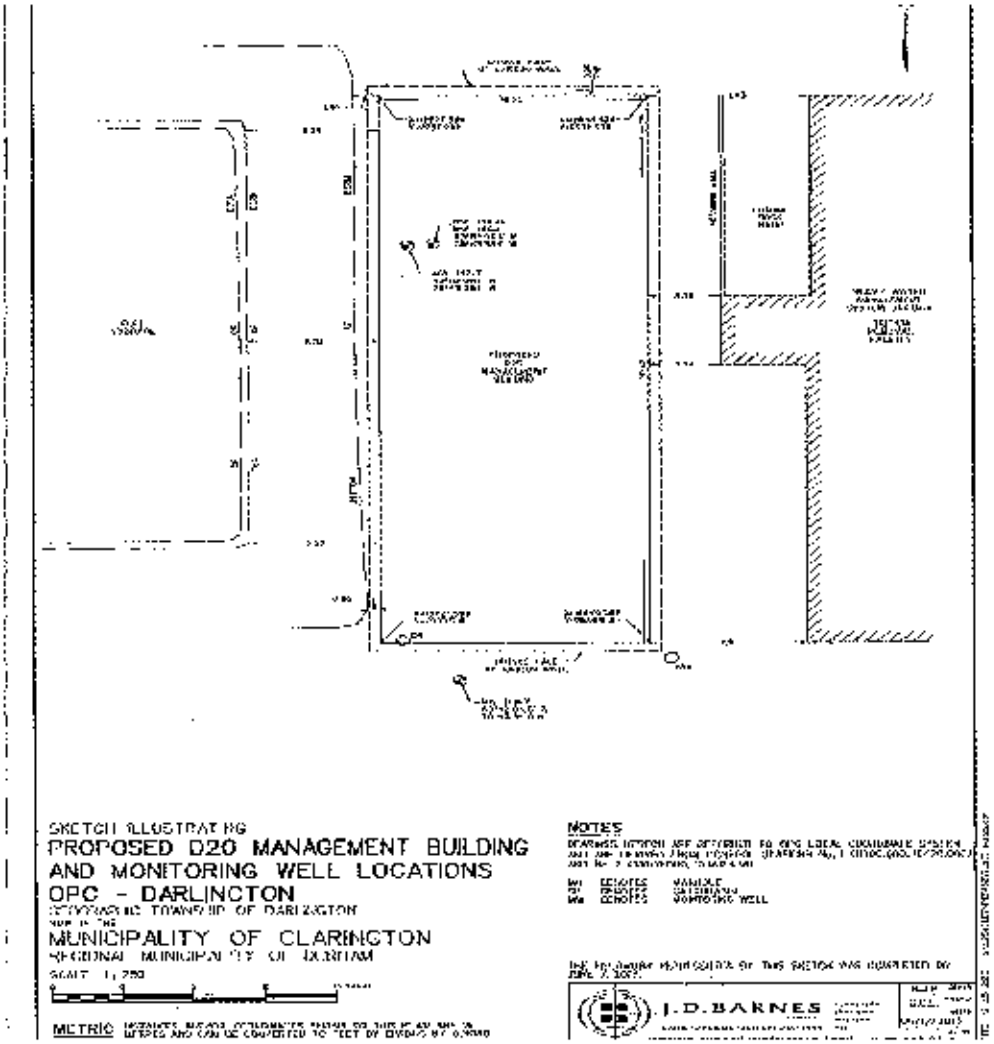
Reviewed by: _____
Ruth Burany, PhD, P.Eng.
Engineer
Analytical and Waste Services
Kinectrics Inc

Approved by: _____
Otto Herrmann, PhD
Department Manager
Analytical and Waste Services
Kinectrics Inc.

Dated: June 4, 2013

Report is included in Rev 4. The scope of this plan has been changed, so this cover page is being kept for reference purposes only.

APPENDIX "F"


SKETCH ILLUSTRATING
PROPOSED D20 MANAGEMENT BUILDING
AND MONITORING WELL LOCATIONS
OPC - DARLINGTON
MUNICIPALITY OF CLARINGTON
NOTES
J.D.BARNES

APPENDIX "G"

SOIL TONNAGE TRACKING SHEET

Site Location: ____________ Date: ____________ Project No.: ____________

Soil Type: ____________ Soil Disposal Location: ____________

Load Number	Soil Hauler Information: Company	Truck Number	License Plate	Truck Type	Time On-Site	Time Off-Site	Percentage Filled (%)	Estimated Soil Tonnage (tonnes)

Total Estimated Tonnage for Day ____________

Personnel (Signature): ____________

Personnel (Print): ____________

Page ____ of ____

Appendix "H"

ONTARIO POWER GENERATION

Darlington Environmental Review Tool (DERT)

Waste	Conventional	Will quantities of conventional waste be potentially large enough to require further review? Will asphalt, soil, or concrete waste be generated? Will wastewater be generated? (i.e. washing equipment, septic work, etc.)	Yes Yes Yes	See Waste Management Plan BSM 4807-0014-WMP See Groundwater and Dewatering Plan BSM 4807-0014-GDP
	Radiological	Will liquid or solid radiological waste be generated? Will work be taking place in Zone 3?	No Yes	New HWMB
	Chemical (Haz/Conv.)	Will hazardous/chemical waste be generated? Will Banned substances (PCBs, CFCs) be generated?	No No	
Air	Conventional	Will asbestos, paints, or outgassing chemicals be used? Are other airborne contaminants possible? (e.g.: dust, steam, engine emissions, etc.) Is there a possibility for the release (spill) of air contaminants?	Yes (paint) Yes Yes	See Waste Management Plan BSM 4807-0014-WMP
	Radiological	Is there a risk of tritium or contaminants being released to atmosphere?	Yes	
Water	Conventional	Does the work take place in or around the water, shoreline, storm water ponds Does the work have potential for discoloration, foam, sheen, chemicals, or solids to reach receiving waters or groundwater? Will the work involve shifting of soils around water (i.e., involve dredging, piling, or erosion?	No Yes No	See Groundwater and Dewatering Plan BSM 4807-0014-GDP
	Radiological	Is there a risk of tritium or contaminants being released to groundwater, yard drainage, or lake?	Yes	See Groundwater and Dewatering Plan BSM 4807-0014-GDP
Spills	Is there a risk of spills? Contained indoors? Outdoors? Will on-site fueling or the use of heavy equipment be required? Is the spill risk addressed in the Darlington Spill Risk Assessment?		Outdoors Yes Yes	See Spill Prevention and Contingency Plan BSM 4807-0014-SPCP
Contaminated Lands & Groundwater	Could project activities result in disturbance or release of contamination present in soil? Could the project activities result in a spill to soil and/or groundwater? Does the project take place near under or above ground equipment (i.e., tanks, lines), whether drained or not, that could contain contaminants?		Yes Yes Yes	See Soil Management Plan 4807-0014-SMP See Spill Prevention and Contingency Plan BSM 4807-0014-SPCP
Biodiversity	Will the planned activities impact site flora or fauna? Will the project require land development? If so, does it result in destruction of or changes to habitat?		Yes, FI Yes	
General	Approvals (e.g.: C of A, permits, licenses, work permits)	Will the planned activities have an impact on current regulatory approvals? Will modifications be made to equipment, systems, or pathways that could change current approvals? Are environmental approvals required for the planned activities (Conservation Authority, Provincial, Federally)?	No No CLOCA F1, ESE PTTW	
	Reporting	Do the planned activities include substances or events that require reporting?	No	
	Environmental Management System (EMS)	Do EMS aspects require updating?	No	
	Community Impact	Is there potential for noise, traffic, dust, light, noise, odour, or other pollutants to migrate offsite? Is there any risk to historical or archeologically significant sites?	No No	

Appendix "I"

ONTARIOPOWER GENERATION

Darlington Nuclear P.O. Box 4000 Bowmanville, Ontario L1C 3Z8

MEMORANDUM

April 23, 2013

File: NK38-03426 P

Special Instructions to Complete N-FORM-11113

Material: **Excavation materials (gravel, asphalt, soil, concrete, etc)**

Conditions: Excavation materials from the Unzoned area only.
Material will be disposed of off-site.

1. Prior to excavation, perform direct contamination check of area using Hilly floor monitor and GR series meter. The UTP process may continue if unable to perform initial surveys due to weather conditions, surface configuration or if excavation has been initiated.

2. After excavation, obtain representative samples (1000 ml nalgene bottle, 12 samples per pile, labeled to identify pile, location and sample number) of excavation material. Sample collection may require breaking/crushing materials in order to fill sample bottles.

3. Submit to Darlington Chemistry lab for gamma scan and tritium analysis using the Request for Chemical Analysis form. On the form, request the Chemistry lab to perform a 3000 second gamma scan on samples using the NORM library.

4. Submit Chemistry lab analysis reports to Health Physicist for review and interpretation.

5. Monitor large pieces of material (i.e. concrete, asphalt, etc.) with a contamination meter (25% of surfaces) and GR series meter (100% of surfaces) as material is being loaded into disposal bin.

6. Perform verification surveys on the disposal bins containing excavation materials using a GR series meter.

S. Taras

Steve Taras
Health Physicist
Darlington Nuclear

Appendix J

PGL

PGL Vac Truck Tracking Form

Project Information

Project Number:	2821-01.03 C13 Tote discharge
Site Address:	OPG-DN Bowmanville, ON

Notes:
1. Sample first round in Vac truck - confirm lab data before discharge.
2. Same truck must be used, if not water to be re-tested.
3. Discharge flow rate must be monitored and reduced to take 1 hour.

Vac Truck #	Date of Discharge	Sample Collection	Volume Discharged	B&M Supervisor		
		(Y/N)	(L)	Name	Signature	Date

Page _____ of _____