F1 Soil Management Plan for Construction and Excavation Activities within the Protected Area (PA)

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List of Acronyms

B&M	-	Black and McDonald
CCW	-	Condenser cooling water
COG	-	CANDU Owners Group Inc.
CLOCA	-	Central Lake Ontario Conservation Authority
CTP	-	conditional transfer permit
DNGS	-	Darlington Nuclear Generating Station
Frac Tank	-	Fracturing tank
IWST	-	Injection Water Storage Tanks
MOE	-	Ontario Ministry of Environment
MW##	-	monitoring well
NSRD	-	Nuclear substance + RADIATION DEVICES
NORM	-	naturally occurring radioactive material
OPG	-	Ontario Power Generation
OWRA	-	Ontario Water Resources Act
PA	-	protected area
PCBs	-	polychlorinated biphenyls
PGL	-	Pottinger Gaherty Environmental Consultants Ltd.
TCLP	-	Toxicity Characteristic Leaching Procedure
TLP	-	Transportation Logistics Plan
Vac Box	-	Vacuum Box

1.0 GENERAL

The scope of this plan is to provide a means for Black and McDonald (B&M) to inform all interested parties of B&M's intended methods and means for handling excavated soil from within the Protected Area (PA) once it is delivered to Campus Plan F1 soil staging area (F1). This plan does not address the decision for the final soil destination (i.e., F10 (if available) location or offsite).

As soil piles are managed, tested and confirmed to meet requirements for either F10 location (if available) or offsite; individual summary reports will be prepared to document the work.

As part of the Darlington Refurbishment and Continued Operations Project, large volumes of soil (including bedrock) will be excavated at the Darlington Nuclear Generating Station (DNGS) site to accommodate new infrastructure within the PA.

Large volumes of soil from within the PA will be removed as a result of these excavations and there is insufficient laydown area within the PA to stage these materials. Therefore, the excavated soil will be transported and staged on a geotextile pad constructed at F1. This pad is required to be in-service application for up to 10 years. The design of the pad is described in Section 6.0.

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; and
c. Ensure that all personnel involved with the F1 area are aware of the scope of work and the requirements for soil transportation and soil management.

1.2 Scope

This plan deals with the following types of excavated materials from within the PA:

a. Daylighting soil using a vacuum truck;
b. Spoils from caisson drilling;
c. Bulk excavated soil; and
d. Bulk excavated bedrock;

This plan is to be used in conjunction with "Contractor Environmental Management Plan" (Ref. 15.4).

2.0 BACKGROUND

In 2009 there was a spill event from the Injection Water Storage Tanks (IWST). The IWST water was primarily demineralized water containing 44,807,000Bq/L of tritium and 58.8mg/kg of hydrazine. Historically, 29 boreholes and 28 wells were used to investigate spill effects. The investigation identified tritium impacts near the Heavy Water Management Building. Two samples both from MW148 had tritium levels over 0.02µCi/kg (0.041µCi/kg and 0.074µCi/kg at 3.6m and 9.7m, respectively).

OPG has conducted ongoing groundwater monitoring and sampling across the Site to evaluate the tritium impacts in groundwater. Tritium in the groundwater system is observed to be migrating towards the Forebay Channel (Ref. 15.15 and Ref 15.16), but concentrations remains elevated in parts of the PA (Ref. 15.17).

3.0 REGULATORY REQUIREMENTS

The following regulatory requirements need to be met to use the F1 soil staging area:

a. Soil pre-characterization should be completed in advance to understand both radiological and conventional conditions of the soil. A report documenting soil quality should be completed by a Qualified Person under Ontario Regulation 153/04;
b. OPG has prepared a document "*Darlington Projects Soil Management Strategy*" (NK38-PLAN-12200-10001-000) for guidance on Darlington construction projects;
c. OPG Health Physicist have prepared a document "*Protocol for Obtaining Representative Samples for Unconditional Transfer Permit (UTP) Approval*" (NK38-CORR-03426-0502913) that should be used to develop soil sampling plan for radiological testing;
d. Soil sampling and management procedure will follow Ontario Regulation 153/04 soil sampling requirements;
e. OPG's standard for F1 is the Ministry of Environment (MOE) Table 3 Industrial Commercial Community standards for a coarse-textured soil in a non-potable groundwater condition. All soil received should meet this standard;
f. The F1 area is within a wetland area regulated by Central Lake Ontario Conservation Authority (CLOCA); therefore, a Large Fill permit was prepared and submitted to CLOCA for approval. The Permit (C13-204-GW Amended) expires on September 23, 2015, and will be reapplied for (or amended), as required by OPG;
g. Soil transportation and soil movement at the F1 laydown area has been designed such that it will not interrupt bird migratory season and will not interfere with endangered species habitat;
h. All federal, provincial and municipal regulations will be followed, including conditions stipulated by the CLOCA Large Fill permit; and
i. Completion of OWRA – Minor Modification Notice (N-FORM-10559) within 30 days of discharging F1 sump water to OPG yard drainage/CCW Duct.

4.0 ROLES AND RESPONSIBILITIES

B&M (with their subcontractors, PGL and EllisDon) will work in coordination with OPG to ensure compliance of this Plan. The list below identifies personnel involved in the Plan and their roles and responsibilities.

a. Project Manager (PM) – responsible for the overall F1 Soil Management Plan, ensuring that it is prepared, approved and followed. (B&M, Thom Boulding 905-409-2506).Construction Manager (CM) – responsible for the implementation of the F1 Soil Management Plan on the project. (B&M, Kurt McDonald 416-677-7273).
b. Environmental sampling, analysis, and monitoring (ES) – Responsible for all environmental sampling, analysis, and monitoring activities at F1. (PGL, Salima Jaffer/Brandon Partridge 905-668-4908).
c. F1 OPG SPOC – OPG Project interface for F1 Soil Transfers (John Ieraci 905-623-6670 x1179 /Mark Ciana 905-623-6670 x1683).
d. All onsite personnel – all personnel are responsible for identifying and reporting any adverse conditions or issues that could affect soil management.
e. OPG Contractor Administrator, (OPG CA, Sue Luxton, 905-623-6670 x 3820).

5.0 F1 SOIL STAGING AREA – PHYSICAL DESCRIPTION

Area F1 is shown on the Campus Plan. The site is covered with vegetation and mixed gravel fill. An existing concrete pad, approximately 72m x 23m, is on the northwest side of F1. On the east side is an existing building that is not being used. Once the excavated soil has been dewatered, sampled, tested and declared suitable for transfer under a UTP; it will be shipped offsite for landfilling or spread out on area F10 (another soil staging area at OPG DN) as available.

Sediment runoff will be prevented by using a geotextile filter to prevent any sediment from flowing out of F1. Soil moisture and precipitation will infiltrate to the liner and be directed to the sumps. Three underground sumps (57,000L each) and six Frac tanks (80,000L each) are present at F1 to control water. The three sumps have been instrumented with high level alarms. In the case that the critical level alarm is reached, the stakeholders, (i.e., OPG CA, OPG PM, B&M PM, PGL PM), will be notified immediately. The solar-powered automated system will notify via e-mail responsible parties so that action can be taken. Sumps will be inspected and emptied as identified in Section 10. Manual checks will only be conducted during the week days.

The cells will be eventually covered by a manual tarping system. The tarps are multi-layered material and will be provided in roughly 100ft by 30ft sections. The sections will be positioned using an excavator (similar) and manually joined together in the field using woven straps. Tarps will be placed on the soil pile after cell is filled, typically starting from the concrete-block wall out. The tarps will limit the amount of rainwater that F1 cells accumulate and minimize the volume of rain water that enters the F1 sump system.

6.0 CONTROL OF ACCESS TO F1

Access to F1 area will be controlled. Only soil generated from construction projects within the Darlington PA with potential radiological impacts (e.g., the D20 Storage Project) will be accepted.

a. The soil quality information will be provided to the F1 SPOC in a report two weeks in advance of any soil shipment. The report will include all analytical results evaluated against MOE Table 3 coarse standards. F1 SPOC is to provide same to B&M/PGL.

b. B&M/PGL representative will need to be notified two days in advance that specific construction projects are mobilizing to F1. A schedule will need to be provided identifying type of material to be received (dry/wet soil or slurry) and number of trucks (i.e., estimated volume) as well as soil quality for that material. This information is to be provided to the F1 SPOC and the F1 SPOC is to provide same to B&M/PGL.

c. All three access points at F1 will be secured with gates/chains and locks. A silt fence will enclose rest of the area.

d. A placard will be installed on the gate identifying F1 site contact names.

e. PGL will record truck number and license plate (Truck tracking form – see Appendix C) and provide direction for offloading soil to the correct cell based on excavated materials.

7.0 F1 MOBILIZATION PLAN

a. The trucks will deposit excavated soil onto the F1 laydown area in the entrance of the appropriate cell as determined by PGL. To minimize tracking of soil via the truck tires; trucks should remain on the gravel pad/concrete apron at F1.

b. Trucks leaving F1 will cross a rip-rap section of road which will shake debris off the truck and tires. Drivers will stop the truck near the F1 gate and will inspect the truck/tires and remove any additional debris using a stiff-bristle broom prior to exiting the site. The trucks will travel back to the PA on the assigned route (Ref. 15.8).

c. Trucks will stop before leaving F1 area to allow PGL personnel time to inspect truck tires before leaving F1. PGL personnel will provide go/no-go to the driver after visual inspection. If it is a no-go, the driver will have to clean the tires again.

d. To leave the site at the end of the day (i.e., travel on public roads); Tires and truck box will be inspected by PGL personnel and driver will brush truck tires before allowing the trucks to leave OPG property.

e. For traffic management and vehicle-noise management, see TLP (Ref 15.8).

8.0 F1 SOIL SEGREGATION PLAN AND VOLUME TRACKING

Soil will be transported to F1 in a dump truck or similar. The soil will be unloaded at the entrance to the cell and moved into the cell with a second piece of earth moving equipment. This method will minimize trucks tracking mud across the site.

Excavated soil will be placed in Cell 1 or Cell 2 at F1 based on *in situ* soil analytical data (i.e., where and from what depth below grade the soil originated).

- Cell 1 will be used to stage likely clean soil (i.e. soil that has a low probability of containing tritium and meets MOE Table 3 coarse standards). Within the PA this is soil that typically originates from less than 3m below grade (or above the water table).

- Cell 2 will be used to stage soil that is likely to contain tritium impacts (i.e., saturated soil from below the water table) and meets MOE Table 3 coarse standards.
- As an option, Cell 1 may be used to accept vac box material that has been allowed to settle and has been dewatered to remove free standing water. Analytical results for conventional parameters (one per vac box or as identified in NK38-CORR-03426-0502913) must be provided to OPG Projects and this type of use must be approved on a project by project basis. *In situ* results, provided they are from the project construction area, are acceptable. The results must be provided in a report or memo format and submitted by a Qualified Person under Ontario Regulation 153/04 as being a representation of the soil quality. OPG Projects must approve the transfer of this soil/slurry to F1 prior to the soil being unloaded at F1.
- As an option, Cell 1 may be used to accept excavated soil that is tritium impacted as well as conventionally impacted. Analytical results for conventional parameters (one per vac box or as identified in NK38-CORR-03426-0502913) must be provided to OPG Projects and this type of use must be approved on a project by project basis. *In situ* results, provided they are from the project construction area, are acceptable. The results must be provided in a report or memo format and submitted by a Qualified Professional under Ontario Regulation 153/04 as being a representation of the soil quality. Proposal for this option will be prepared by OPG Projects, and approval from OPG VP (Projects and Modification), SVP DNGS and VP Nuclear Services shall be required prior to unloading conventionally contaminated soil at F1.
- The first six months of operation (March – August 2014), will provide the greatest opportunity to reduce soil piles from the F1 system and create capacity. Excavated soil will only be received from one or two construction projects. Active management of soil and adequate testing to determine soil quality to facilitate offsite removal is necessary.
- Once multiple construction projects come online, the F1 system will have limited opportunity to actively manage the soil being received. Managing soil will depend on how quickly soil is being shipped to F1.
- Soil will be placed in either Cell 1 or 2. To facilitate manual tarping of the cells, soil will be placed adjacent to the cell walls to provide support to the tarp to be deployed. Moving the soil from the entrance area to where it is to remain while the cell is being filled will provide some aeration.

  a) Once the soil has been received at F1, active soil management will be evaluated on an ongoing basis. All segregated soil piles located at the F1 area will be sampled and submitted to an external lab for analysis. The analytical results will determine active soil management (i.e., aeration of the soil using mechanical equipment). Initial soil turnover will be performed two times a week to a maximum depth of 1m. Sampling and analysis will be conducted weekly per gridded area within the cell until a baseline can be established. Once the baseline is established (after one month) the sampling and aeration frequency will increase or decrease based on the soil-turnover aeration and tritium-removal efficiency. PGL will document sampling work conducted and track sample results versus depth and area within the cell. Other factors that will affect soil-turnover aeration are weather and temperature. Once a soil pile is deemed inert (i.e., meets the requirements of a UTP) the material will be removed at the earliest convenience to the final destination that is either offsite landfilling or at F10 as available.

  b) 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 will be used to document this information. (Appendix C – Inspection Forms).

9.0 SOIL SAMPLING PROTOCOL (FROM PA TO F1)

a) The sampling methodology for moving soil from the Protected Area to F1 meets the sampling requirements in Ontario Regulation 153/04. Mainly, the sampling protocol consists of *in situ* soil characterization, augmented with 2% audit sampling of the trucks as they leave the protected area.

i. Ontario Regulation 153/04 characterizes imported fill at a site for purposes of filing a Record of Site Condition. It is also used as an industry standard for providing an acceptable level of characterizing soil.

ii. 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 160m^3 for the first 5,000m^3 and one sample per 300m^3 after that. The regulation also identifies the number of samples required to reuse soil onsite. This consists of field screening 50 soil samples and analyzing 10 samples for every 1,000m^3. Based on the nature of the work and the potential contaminants, we recommend that 10 soil samples be analyzed for every 1,000m^3.

iii. The estimated capacity of F1 is 34,000m^3. The capacity of F1 will not be exceeded during its operation. Field screening of soil will not be conducted as it is transported from the PA to F1.

iv. Based on the *in situ* soil characterization completed as well as the 2% audit sampling to be conducted (on soil from trucks leaving the PA). The project that the soil is originating from must have an approved blanket Conditional Transfer Permit (CTP) from Radiation Protection to move the soil from within the PA to F1.

v. PGL will collect soil samples from 2% of the trucks (i.e., at a frequency of 1 sample per 50 trucks). Soil samples collected will be sent to an external lab for testing of conventional parameters, tritium and gross gamma for documentation purposes only.

b) The sampling methodology for moving soil from F1 to F10 (If available) or F1 to offsite will meet the requirements in Ontario Regulation 153/04 and be consistent with the CANDU Owners Group Inc. sampling methodology recommendations described in the report, "COG-08-3105I, "Protocols for sampling of representative scenarios of recurrent non-homogenous solid waste".

i. The sampling protocol to evaluate material prior to removing from the F1 pad will be conducted at a frequency of one sample for 100m^3; soil samples will be collected based on volume estimates of soil piles being evaluated within either Cell. These samples will be shipped under the blanket CTP provided by Radiation Protection. Additional sampling may be required based on evaluation of radiological and conventional results for material to be re-used at Darlington.

ii. Radiological and toxicity characteristic leaching procedure (TCLP) parameters will be tested and results evaluated prior to determining offsite shipment from F1 to F10 if available or to a MOE-approved landfill facility if necessary. The soil must meet: (i) the applicable release limits for radiological testing and be in compliance with the Nuclear Substances and Radiation Device regulation, and (ii) MOE Table 3 coarse-grain standards for the tested parameters of concern.

iii. Sample parameters associated with each type of analyses are listed in the Table A below.

c) Soil placed in the F1 laydown area cells will be tracked weekly as soil is moved from inside the PA to the F1 pad. Cells will be mapped in a grid system and soil will be traced to segregate any abnormal tritium, gamma or conventional parameter results (if possible based on capacity).

Table A: Soil Sample 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, ethylbenzene and xylenes
TCLP	TCLP = metals and inorganics, VOC, sVOC, bulk and leachate polychlorinated biphenyls (PCBs), soil pH and ignitibility.

10.0 SUMP SAMPLING

a) The F1 soil-storage cells have three underground sumps to collect water from the soil and rainwater. There will be an insulated valve controlling the flow of water between the two cell and the sump tanks (Sump 1, 2A and 2B). There are six 80,000L Frac tanks at F1 providing supplemental storage. The sumps and Frac tanks will be monitored daily (Monday to Friday) and the water level in them will be recorded on a Form. The Form will include the following items: date/time, personnel name, observed leaks/accumulated debris, approximate volume in sump/tote.

b) When sump tanks reach 50% capacity the water will be transferred using the mechanical equipment (vac truck, pumps and hoses) into a Frac tank. The valve to the sump from the F1 cell will remain open during this event.

c) Frac tanks will only be filled to 75% capacity (~60,000L). When it reaches that level no additional water will be added (unless an emergency situation arises). The Frac tank water will be sampled per the F1 SMP Table B F1 Sump Sample Parameter Summary. The samples will be submitted to OPG Chem Lab or an external lab for RUSH analysis.

d) The water results from the Frac tanks will be evaluated and the water will be discharged as per the F1 Plan items e) to j).

e) The F1 Plan has a standing conditional transfer permit (SCTP), issued by the Radiation Protection Department, to ship discharge water samples to an external laboratory for analysis.

f) If the limits in Table B are met, the water can be either discharged to surface or transferred to the nearest yard drainage point to F1 (see Section 11 and Appendix A).

g) If there is an oil sheen on the water and the rest of the parameters are acceptable, Detox will be called in to skim off the sheen for disposal as per item (h) or (i) below as applicable.

h) If there is total organic carbon or pH issues and the dewatering system is not available, the water will be disposed via Detox for disposal as per item (i) or (j) below as applicable.

i) If all parameters except Tritium from Table B are met, the following process can be followed to dispose of the water inside the protected area to the CCW duct via the dewatering system (if still in operation) or at the forebay as described in the following steps :

   i. Ensure dedicated vac truck is used for all transfers. If a new vac truck is required, or truck was utilized for a different task, then a sample must be submitted for Table B parameters;

   ii. If the sump has additional water added to it during this time, it will have to be re-tested for Table B parameters;

   iii. The vac truck cannot be used for other work until the sump transfer is complete; and

   iv. Discharge water from vac truck to the forebay at the same location as the Box Drain Pump out in a controlled manner (approximately 1hr discharge). Ensure vac-truck tracking form is complete (Appendix C).

j) If tritium limits *and* other parameters in Table B are exceeded, the following options should be considered for practical effectiveness in achieving the parameter criteria:

   i. Dilute with station non-chlorinated waste water, if the intent is to meet (f), or

   ii. Transfer to the dewatering system (if still in operation)

   iii. Dispose water via Detox to Clean Harbours (via a CTP).

Table B: F1 Sump Sample Parameter Summary

Parameter	OPG Limits
Tritium	<100Bq/L can be discharged to surface ditch. Between 100Bq/L to 4000Bq/L will be transferred to yard drainage for release at catch basin 654 or 468 (Appendix A). >4000Bq/L can be diluted (with non-chlorinated waste water) and re-tested. If re-test of only tritium concentration persists, then either (i) dispose offsite via Detox or (ii) return water to the protected area for discharge at the CCW Duct, provided that all other parameters have been satisfied. >8000Bq/L cannot be diluted, either (i) dispose offsite via Detox or (ii) return water to the protected area for discharge to the dewatering system (if still in operation) or at the forebay, provided that all other parameters have been satisfied.
Gross gamma	GG < MDA/NORM (verify with Radiation Protection)
Total Suspended Solids*	≤70mg/L
Visible Oil*	No visible sheen/allowed

Parameter	OPG Limits
Total Organic Carbon*	≤15mg/L
pH	6.0-9.5

Notes:
1.(*) The effluent shall be essentially free of floating and settleable solids and cannot contain oil or any other substance in amounts sufficient to create a visible film, sheen foam or discolouration on the receiving waters.
2. Offsite disposal of sump water by Detox will be covered by the blanket CTP with an upper limit of 2µCi/L (74,000Bq/L).

Table C: Additional Considerations for F1

Concern	Mitigation
Weather – rain/snow/wind events	Review weather forecast to plan for staffing, sampling of sump water, installation of tarp to cover soil pile, inspection of silt fence.
Timing for receipt of analytical results	Ensure that samples are collected timely so that sump water can be discharged/disposed of appropriately

11.0 YARD DRAINAGE POINTS

The nearest yard drainage points to F1 are provided in Appendix A. Yard Drainage Catch Basins 654 and 468 (that have a maximum discharge limit of 4,000Bq/L) are potential options for re-routing water if the 100Bq/L groundwater limit is exceeded in the sump water tested at F1.

As a prerequisite to the use of the yard drainage system, these locations would need to be confirmed in the field (i.e., walkdown); accessibility and condition of the catch basin to receive the discharge water evaluated. This action will be completed by Ellis Don prior to soil being shipped to F1 and reported as being completed in an email communication to OPG Refurb. Environment and B&M.

12.0 GROUNDWATER MONITORING AT F1

Parameters and groundwater sampling frequency requirements for the F1 soil staging area are outlined in the F1 Groundwater Monitoring technical memo (NK38-REF-38000-0483349) provided in Appendix D. There are eight wells that will be sampled on a quarterly basis to evaluate groundwater tritium concentrations in specific wells at F1 and wells in close proximity to F1 (upgradient and downgradient).

In addition to these eight wells, five new sentinel wells will be installed at F1; three 1m south of the underground sump valves, one east and one west the F1 lay down area. The wells will be positioned along the southern edge of the soil staging pad down gradient of the pad and sump tanks. The sentinel

wells will be sampled according to the F1 Groundwater monitoring technical memo and are designed to monitor the possible introduction of tritium to groundwater from the subsurface piping system of the F1 pad and the sump tanks.

Background groundwater sampling will be conducted as a prerequisite at those well locations where historical tritium results were not available. Once soil is placed at F1, groundwater sampling will be conducted at these wells quarterly until the F1 pad is removed. The quarterly results will be tabulated and provided to OPG in an e-mail and an annual technical memo will be generated documenting the findings. Groundwater wells will continue to be sampled quarterly for one year after F1 has been decommissioned. A final report documenting all the work will be completed three months after the removal and restoration of F1 and a short technical memo will be completed documenting the groundwater monitoring work completed in the year after decommissioning works.

If groundwater well sampling results are higher than the prescribed limit, then: (i) increased sampling frequency will be followed per NK38-REF-38000-0483349 and (ii) remediation actions to restore F1 and surrounding affected area will discussed and scheduled for implemented by the Project.

13.0 RESTORATION OF F1

When F1 is no longer required for staging soil for the OPG Projects and/or, no longer needed by other Nuclear Refurbishment projects and/or as directed by OPG, the material installed for the soil staging (silt fence, geotextile, berms, etc.) will be removed, recycled as appropriate and or appropriately disposed of.

The area will be restored in consultation with OPG (i.e., if the area is to be developed for additional plant operations or remain unoccupied). If the area is to remain vacant, the original soil removed from the proposed pad location will be relocated, graded to allow precipitation to drain naturally to the existing swale, and hydro-seeded. Imported sand fill may remain at F1 if deemed clean.

Environmental testing of (soil/granular fill) materials to remain at F1 will be required as well as testing of the native material under the pad location to confirm that the soil quality has not been altered from its original condition as documented in the test pit work conducted by PGL at F1. Material will be tested for conventional and radiological parameters as identified in Section 10.0.

Soil/granular fill will be screened and sampled according frequencies set out in Ontario Regulation 153/04: for every 100m^3; five samples will be field screened and one submitted for analytical testing.

A report documenting the post F1 removal findings will be generated based on the soil quality results. If soil impacts are identified, recommendations for remedial works will be provided after consultation with OPG's Project team and Environment Group.

14.0 BACKOUT PROVISIONS

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

a) Backout in the case of fire or personal injury. Notify station emergency response team (ERT) first. In addition to backout procedures, workers will immediately notify the CMO who will immediately notify the shift manager.

b) Backout in the case of an electrical storm or unsafe weather conditions such as high winds, rain or snow.

c) Backout 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.

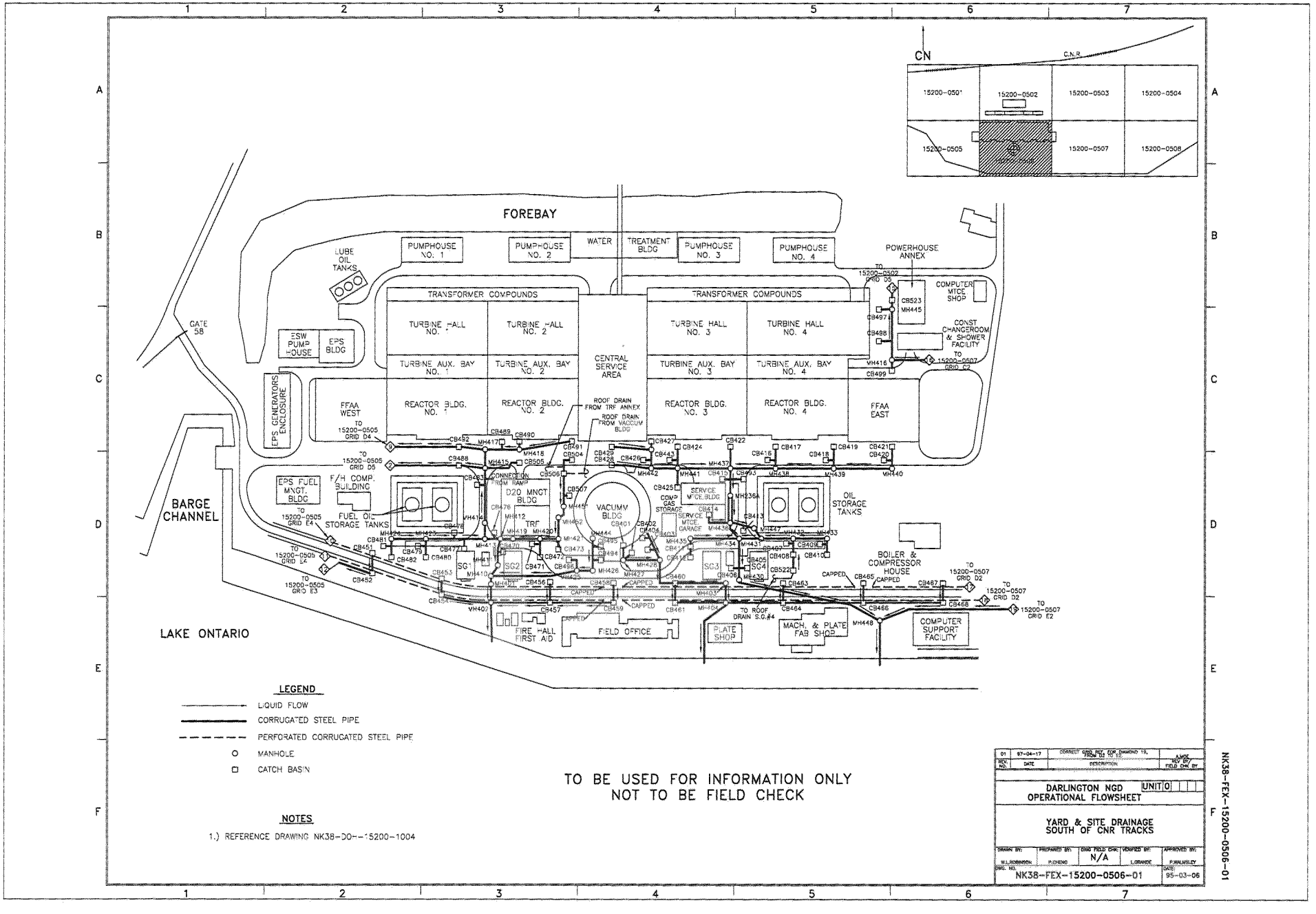
d) Backout in the case of a spill event. Follow Spill plan actions outlined in Ref 15.5.

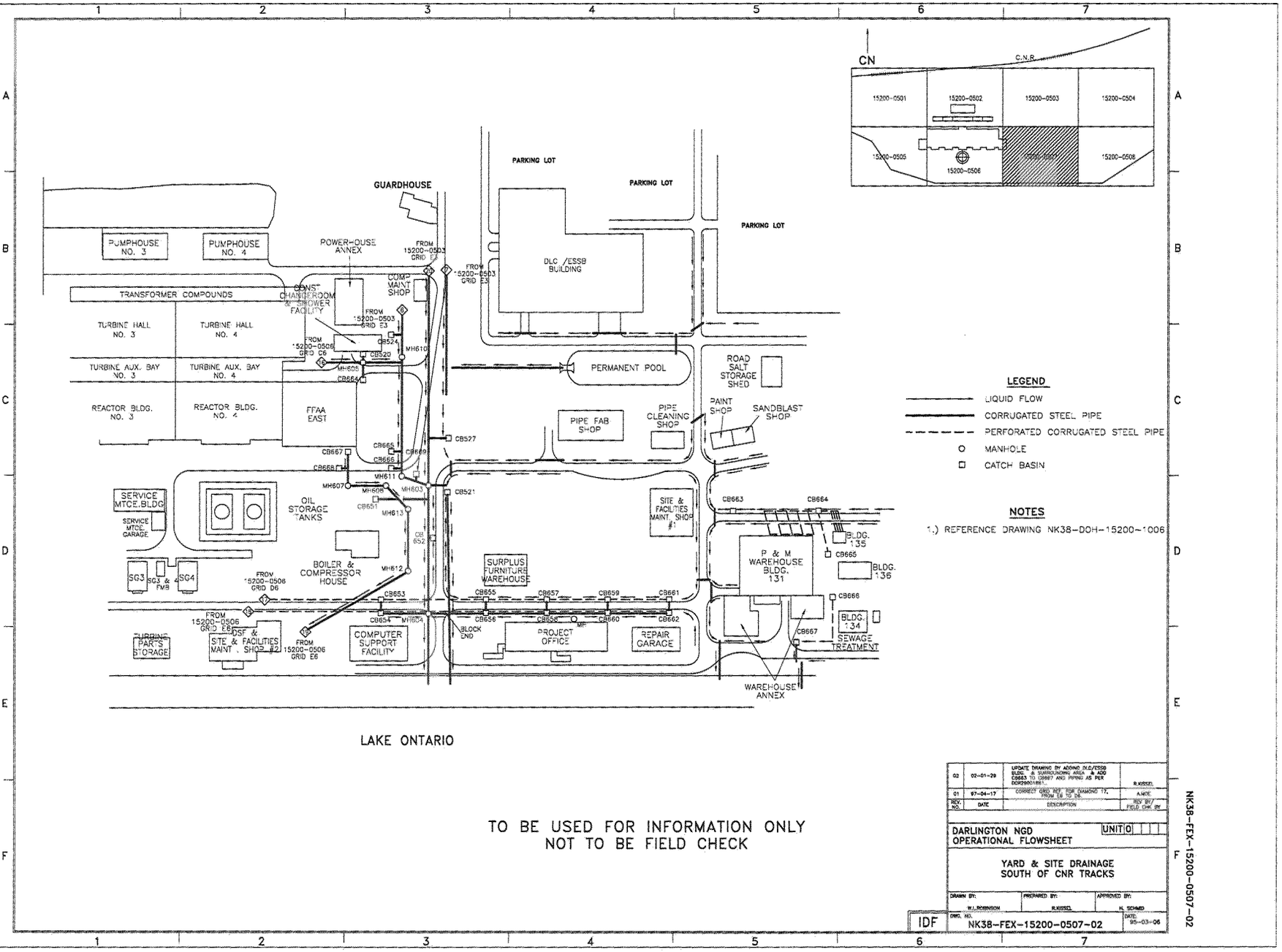
e) Backout if tangible evidence of hydrocarbon impacted soil is encountered. Notify OPG, B&M and PGL project managers. Contact PGL personnel to investigate so that soil is segregated/sampled as determined to be required for landfilling, per options outlined in this Plan.

15.0 REFERENCES

15.1. N-GUID-09701-10013: Environmental Requirements Guideline
15.2. D-INS-79000-10002: Waste Disposal Guidelines for Solid Waste and Recycling at Darlington
15.3. D-INS-07290-10000: Darlington Spill Prevention and Contingency Plan
15.4. NK38-PLAN-38000-10003: Contractor Environmental Management Plan (B&M 48070014-CEMP)
15.5. NK38-PLAN-38000-10005: Spill Prevention and Contingency Plan (B&M 48070014-SPCP)
15.6. NK38-PLAN-38000-10020: Groundwater and Dewatering Plan (B&M 48070014-GDP)
15.7. NK38-PLAN-38000-10006: Waste Management Plan (B&M 48070014-WMP)
15.8. NK38-PLAN-38000-10018: Transportation Logistics Plan (B&M 48070014-TLP)
15.9. NK38-PLAN-38000-10004: Soil Management Plan for C13 area (B&M 48070014-SMP)
15.10. NK38-REF-38000-0483816: F1 Test Pit report
15.11. NK38-PLAN-38000-0475693: F1 Early Works Plan
15.12. NK38-REF-38000-0483285: Borehole Drilling Investigation
15.13. NK38-FEX-15200-0506: Catch Basin 468 Location
15.14. NK38-FEX-15200-0507: Catch Basin 654 Location
15.15. CH2M HILL (2011A). Geological and Hydrogeological Environment Technical Support Document – Darlington Nuclear Generating Station Refurbishment and Continued Operation Environmental Assessment. Dated December 2011A. 538 p.
15.16. CH2M HILL (2011B). Groundwater Flow Modeling for the DNGS Refurbishment Environment Assessment. Dated August 2011A, 68 p.
15.17. Ontario Power Generation (OPG, 2013). CEM Results [Q2 to Q4, 2013]. Data release (MS Excel), dated November 29, 2013.

APPENDIX A


CN
C.N.R.
15200-0501
15200-0502
15200-0503
15200-0504
15200-0505
15200-0507
15200-0508
FOREBAY
PUMPHOUSE NO. 1
PUMPHOUSE NO. 2
WATER TREATMENT BLDG
PUMPHOUSE NO. 3
PUMPHOUSE NO. 4
POWERHOUSE ANNEX
LUBE OIL TANKS
TRANSFORMER COMPOUNDS
TURBINE HALL NO. 1
TURBINE HALL NO. 2
TURBINE HALL NO. 3
TURBINE HALL NO. 4
TURBINE AUX. BAY NO. 1
TURBINE AUX. BAY NO. 2
TURBINE AUX. BAY NO. 3
TURBINE AUX. BAY NO. 4
CENTRAL SERVICE AREA
COMPUTER MTCE SHOP
CONST CHANGEROOM & SHOWER FACILITY
GATE 5B
ESW PUMP HOUSE
EPS BLDG
EPS GENERATORS ENCLOSURE
FFAA WEST
REACTOR BLDG. NO. 1
REACTOR BLDG. NO. 2
REACTOR BLDG. NO. 3
REACTOR BLDG. NO. 4
FFAA EAST
ROOF DRAIN FROM TRF ANNEX
ROOF DRAIN FROM VACCUM BLDG
EPS FUEL MNGT. BLDG
F/H COMP. BUILDING
FUEL OIL STORAGE TANKS
D20 MNGT BLDG
VACUUM BLDG
TRF
SERVICE MTCE. BLDG
OIL STORAGE TANKS
BOILER & COMPRESSOR HOUSE
BARGE CHANNEL
LAKE ONTARIO
FIRE HALL FIRST AID
FIELD OFFICE
PLATE SHOP
MACH. & PLATE FAB SHOP
COMPUTER SUPPORT FACILITY
TO ROOF DRAIN S.G.#4
LEGEND
LIQUID FLOW
CORRUGATED STEEL PIPE
PERFORATED CORRUGATED STEEL PIPE
MANHOLE
CATCH BASIN
NOTES
1.) REFERENCE DRAWING NK38-DO--15200-1004
TO BE USED FOR INFORMATION ONLY
NOT TO BE FIELD CHECK
DARLINGTON NGD OPERATIONAL FLOWSHEET
UNIT 0
YARD & SITE DRAINAGE SOUTH OF CNR TRACKS
NK38-FEX-15200-0506-01
95-03-06
NK38-FEX-15200-0506-01

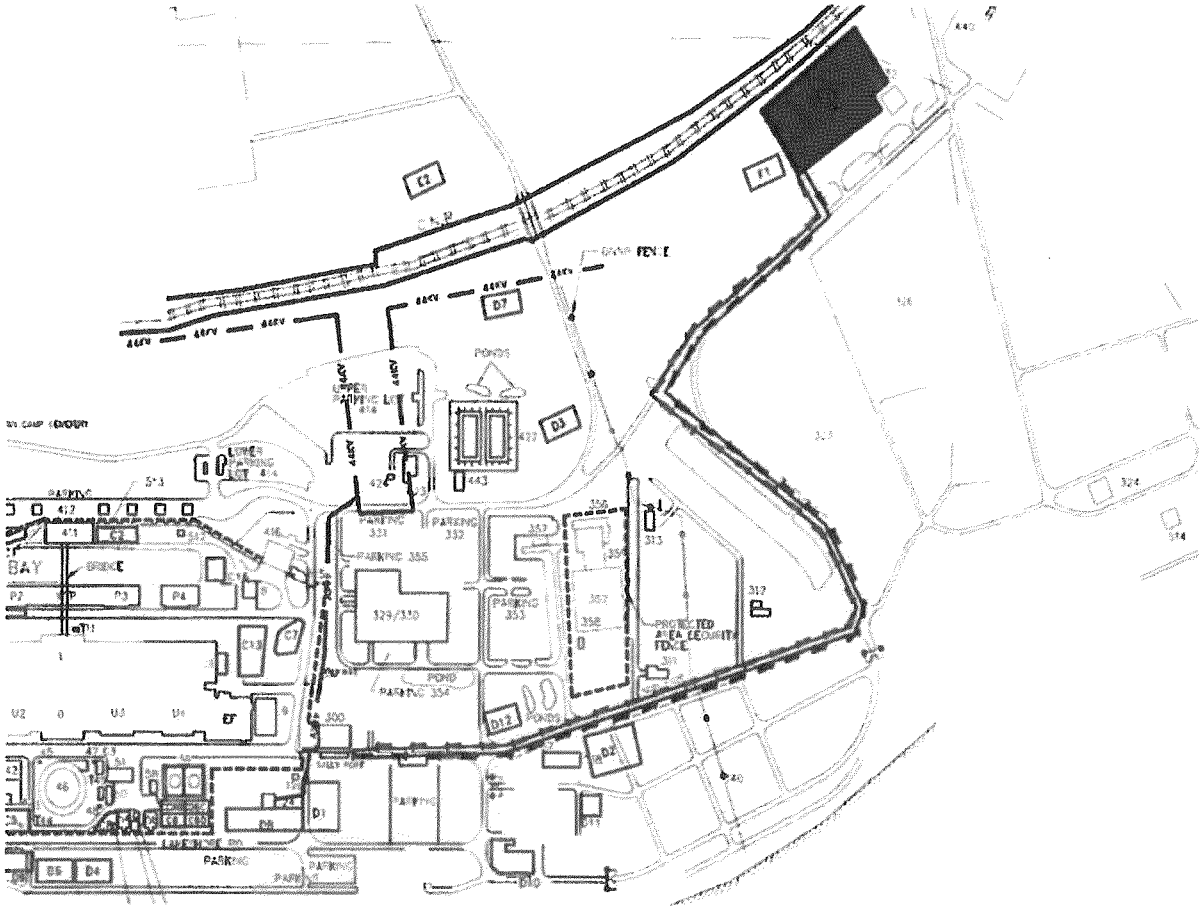

CN
C.N.R.
15200-0501
15200-0502
15200-0503
15200-0504
15200-0505
15200-0506
15200-0508
GUARDHOUSE
PARKING LOT
PARKING LOT
PARKING LOT
PUMPHOUSE NO. 3
PUMPHOUSE NO. 4
POWER-OUSE ANNEX
DLC /ESSB BUILDING
TRANSFORMER COMPOUNDS
CONST. CHANGEROOM & SHOWER FACILITY
COMP MAINT SHOP
TURBINE HALL NO. 3
TURBINE HALL NO. 4
TURBINE AUX. BAY NO. 3
TURBINE AUX. BAY NO. 4
REACTOR BLDG. NO. 3
REACTOR BLDG. NO. 4
FFAA EAST
PERMANENT POOL
ROAD SALT STORAGE SHED
PIPE FAB SHOP
PIPE CLEANING SHOP
PAINT SHOP
SANDBLAST SHOP
SERVICE MTCE. BLDG.
SERVICE MTCE. GARAGE
OIL STORAGE TANKS
BOILER & COMPRESSOR HOUSE
SG3
SG3 & FMB
SG4
SURPLUS FURNITURE WAREHOUSE
SITE & FACILITIES MAINT. SHOP #1
P & M WAREHOUSE BLDG. 131
BLDG. 135
BLDG. 136
BLDG. 134
SEWAGE TREATMENT
TURBINE PARTS STORAGE
SITE & FACILITIES MAINT. SHOP #2
COMPUTER SUPPORT FACILITY
PROJECT OFFICE
REPAIR GARAGE
WAREHOUSE ANNEX
LAKE ONTARIO
LEGEND
LIQUID FLOW
CORRUGATED STEEL PIPE
PERFORATED CORRUGATED STEEL PIPE
MANHOLE
CATCH BASIN
NOTES
1.) REFERENCE DRAWING NK38-DOH-15200-1006
TO BE USED FOR INFORMATION ONLY
NOT TO BE FIELD CHECK
DARLINGTON NGD
OPERATIONAL FLOWSHEET
UNIT 0
YARD & SITE DRAINAGE
SOUTH OF CNR TRACKS
DRAWN BY: W.L. ROBINSON
PREPARED BY: R.KUSSEL
APPROVED BY: H. SCHMID
DWG. NO. NK38-FEX-15200-0507-02
DATE: 95-03-06
IDF
NK38-FEX-15200-0507-02

APPENDIX B

Transportation Route

Sally Port to F1 and Back

F1 to Catch Basins and Back



APPENDIX C

PGL

BM FORM LIST

BM-FORM-000-F1SMP Rev0

Project Information	Project Number: 4325-02.01 F1 Soil Management Plan
	Site Address: OPG-DN Bowmanville, ON

Document #	Document	Revision	Date Issued
PGL-FORM-000-F1SMP Rev 0	PGL Form List	0	22-Jan-14
BM-FORM-182-F1SMP Rev 0	BM F1 Laydown Area Pad Grid Form	0	22-Jan-14
BM-FORM-183-F1SMP Rev 0	BM Soil Pile Sampling Sketch	0	22-Jan-14
BM-FORM-184-F1SMP Rev 0	BM Truck Tracking Form - F1 Laydown Area	0	22-Jan-14
BM-FORM-185-F1SMP Rev 0	BM Silt Fence Inspection Form	0	22-Jan-14
BM-FORM-186-F1SMP Rev 0	BM Sump Sampling Frequency at F1 Laydown Area	0	22-Jan-14
BM-FORM-187-F1SMP Rev 0	BM Vacuum Truck Tracking Form	0	22-Jan-14
BM-FORM-188-F1SMP Rev 0	BM Soil Pile Sampling Form	0	22-Jan-14
BM-FORM-189-F1SMP Rev 0	BM Truck Tracking Form - D20 Excavation	0	22-Jan-14
BM-FORM-190-F1SMP Rev 0	Soil Transfer Route Sheet	0	22-Jan-14

Black & McDonald

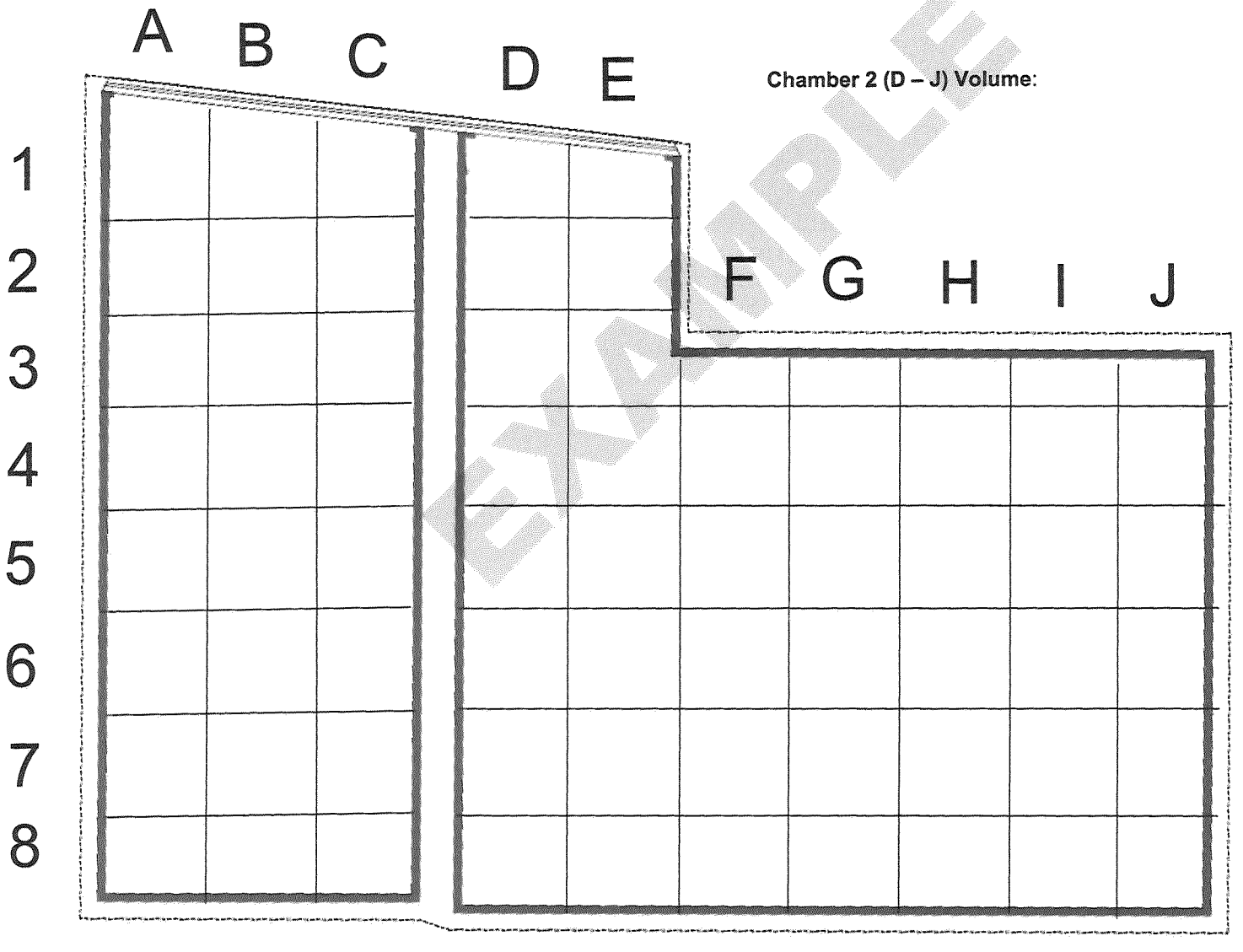
Black & McDonald Limited
F1 Laydown Area Pad Grid Form

Project Information

Project Number:	48070014	PGL Project Number	
Actvity	F1 Soil Management		

Chamber 1 (A – C) Volume:

Chamber 2 (D – J) Volume:



BM-182 Rev.0

Black & McDonald Limited

Soil Pile Sampling Sketch

Black & McDonald

Project Information

Project Number:	48070014	PGL Project Number	4325-02.01 T2
Actvity:	F1 Soil Management		

Dimensions: _____ **Volume:** _____ **Number of Samples:** _____

Examiner

BM-183 Rev.0

Black & McDonald

Black & McDonald Limited

Truck Tracking Form at F1 Laydown Area

Project Information			
	Project Number:	48070014	PGL Project Number: 4325-02.01 T2
	Actvity:	F1 Soil Management	

				Truck Information						
Initials &Date	**Load Number**	**Time On-Site**	**Time Off-Site**	**Company**	**Truck #**	**License Plate #**	**Material**	**Soil Location (Grid)**	**Circle Check by PGL (Y/N)**	**Volume (m^3)**
									Total Volume	

EXAMPLE

Material
(**CS**): Caisson Spoils
(**0 - 3**): 0 - 3 mbgs
(**3 - B**): 3 mbgs - bedrock
(**B**): Bedrock

Soil Location
(see F1 Pad Grid, form BM-182)

BM-184 Rev.0

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Black & McDonald Limited

Silt Fence at F1 Laydown Area

Project Information	Project Number: 48070014	PGL Project Number: 4325-02.01 T2
	Actvity: F1 Soil Management	Initials & Date:

Fence Section	Fence Condition		Comments
	Acceptable	Not Acceptable*	
North			
South			
East			
West			

EXAMPLE

* When determined Not Acceptable comments must be provided

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Black & McDonald Limited

Sump Sampling Frequency at F1 Laydown Area

Project Information

Project Number:	48070014	PGL Project Number	4325-02.01 T2
Actvity	F1 Soil Management	SUMP IDENTIFICATION	

				RESULTS			
Initials &Date	Time	Estimated Volume (fraction of full sump)	Sample Collected for Testing Y/N	GG, TSS, VO, TOC, pH within OPG Limits Y/N	Tritium Result	Dilution Required Y/N	Discharge Path

SAMPLE

Acronyms
GG: Gross Gamma
TSS: Total Suspended Solids
VO: Visible Oil
TOC: Total Organic Carbon

Black & McDonald

Black & McDonald Limited

Vacuum Truck Discharge Tracking Form

Project Information				
	Project Number:	48070014	PGL Project Number: 4325-02.01 T2	
	Actvity:	F1 Soil Management	SUMP IDENTIFICATION:	

SUMP Volume	
Date Sampled	
Date Empty	

SUMP SAMPLE ID		
Tritium (Bq/L)	TOC (mg/L)	pH
TSS (mg/L)	GG (µCi/L)	

				Truck Information							
Initials & Date of Discharge	**Sample Collected Y/N**	**Visible Oil in Sample Y/N**	**Volume Discharged**	**Company**	**Truck #**	**License Plate #**	**Time Start**	**Time End**	**Flowrate**	**Discharge Location**	**Comments**
	Total Volume										

EXAMPLE

General Comments:

Acronyms
GG: Gross Gamma
TSS: Total Suspended Solids
VO: Visible Oil
TOC: Total Organic Carbon

Black & McDonald Limited

Soil Pile Sampling Form

Project	Project Number:	48070014	PGL Project Number:
Information	Actvity :	F1 Soil Management	

SOIL PILE ID: _____ ESTIMATED SIZE _____

SOIL PILE ORIGIN: _____ PORTABLE GAS MONITOR _____

SOIL PILE LOCATION: _____ EXCAVATOR: _____ REP: _____

Sample Number	Volume (m^3)	Soil Type	Portable Gas Monitor (ppm)	Test required on Submitted Sample (check below)						Comments	Initials and Date
				H_3	GG & GS	PHC	BTEX	VOC	M & I		

EXAMPLE

Soil Description
(minor/major soil type, texture, density, structure, colour, moisture)

A: _____

B: _____

C: _____

D: _____

E: _____

F: _____

Laboratory Parameter Submission

H_3: Tritium

GG & GS: Gross Gamma and Gamma Scan

PHC: Petroleum Hydrocarbons F1 - F4

VOC: Volatile Organic Compounds

BTEX: Benzene, Toluene, Eythlbenzene, Xylene

M & I: Metals and Inorganics

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Truck Tracking Form at D2O Excavation Area

Project Information

Project Number:	48070014	PGL Project Number	
Actvity	F1 Soil Management		

				Truck Information						
Initials &Date	Load Number	Time On-Site	Time Off-Site	Company	Truck #	License Plate #	Material	Soil Destination (Grid)	Circle Check by PGL (Y/N)	Volume (m^3)
									Total Volume	

EXAMPLE

Material
(**CS**): Caisson Spoils
(**0 - 3**): 0 - 3 mbgs
(**3 - B**): 3 mbgs - bedrock
(**B**): Bedrock

BM-189 Rev.0

Black & McDonald

Black & McDonald Limited

SOIL TRANSFER ROUTE SHEET

Project Information	Project Number:	48070014	PGL Project Number	4325-02.01
	Actvity	F1 Soil Management		

Work Site			
Location:	Type of Work:		
Company:			
SOIL			
Soil Type:	Excavated Depth:	Estimated Volume:	
Destination:	Date:	Time:	
Load:	Truck #	Licence Plate	Company
Receiver			
Location: Grid:	Date:	Time:	

RESPONSIBLE PARTY	**SIGNATURE & DATE** **(Print and Sign Name. Show date signed.)**
Shipper:	
Transporter:	
Receiver:	

EXAMPLE

APPENDIX D

Heavy Water Management Building Project: Campus Plan F1
Background Groundwater Review
Ontario Power Generation - Darlington Nuclear (OPG-DN)

Kinectrics Report: K-415072-004-TM-0004-R00
September 13, 2013

Kinectrics Inc
Analytical and Waste Services

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

Heavy Water Management Building Project: Campus Plan F1
Background Groundwater Review
Ontario Power Generation - Darlington Nuclear (OPG-DN)

Kinectrics Report: K-415072-004-TM-0004-R00
September 13, 2013

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

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

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

Dated: September 13, 2013

DISCLAIMER

This report was prepared for Black and McDonald under the Kinectrics Inc ISO 9001 Quality Program Registered with QMI. Kinectrics Inc. takes reasonable steps to ensure that all work performed shall meet the industry standards, and that all reports shall be reasonably free of errors, inaccuracies or omissions. This report was prepared in accordance with Purchase Order Number 48005626 R001.

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REVISIONS

Revision Number	Date	Comments	Approved
R00	September 13, 2013	Initial Release	OH

PGL
Pottinger Gaherty
Environmental Consultants Ltd.
250 Water Street, Unit 102
Whitby, ON Canada L1N 0G5
T 905.668.4908
F 905.668.4909
www.pggroup.com

Memo

PGL File #: 3821-01.03

DATE: September 16, 2013

TO: Ruth Burany, Kinectrics Inc.

FROM: Archana Uprety, PGL
Salima Jaffer, PGL
Will Gaherty, PGL

Re: Heavy Water Management Building Project: Campus Plan F1 Background Groundwater Review – Ontario Power Generation – Darlington Nuclear (OPG-DN)

PGL was retained by Black and McDonald to evaluate the existing groundwater condition in the wells near Campus Plan F1 area (F1) and develop a groundwater monitoring program to support the F1 soil management plan.

1.0 INTRODUCTION

F1 will receive soil excavated from the Protected Area during the excavation and construction work associated with the new D2O Heavy Water Management Building. A 2009 spill event in the Protective Area at the Heavy Water Management Building foot-print means excavated soil may be impacted with tritium. Therefore, OPG has requested the development of a groundwater monitoring program for F1.

2.0 PURPOSE

The purpose/objective of this memo is to:

- Review existing reports provided by OPG to determine up and downgradient tritium concentration in groundwater at F1;
- Review the reports to identify overburden and shallow bedrock groundwater-flow directions;
- Identify gaps in available data provided by OPG; and
- Develop a groundwater monitoring program to support the F1 soil management plan.

Our technical memo presents a review of existing wells, results of the groundwater programs from existing reports provided by OPG and the proposed groundwater monitoring program.

3.0 DATA

PGL reviewed specific sections (groundwater flow direction and analytical data) of the below listed reports provided by OPG:

- EcoMetrix Incorporated – *Darlington Nuclear Generating Station Groundwater Monitoring Program Design*, March 2012;
- Genivar – *OPG Darlington Nuclear Site Delineation of Areas of Elevated pH in vicinity of Former Truck Wash Area, August 2009*. OPG File Number: NK38-REP-07010-0266518; and

- CH2M HILL (Excerpt 3 pages) – *Ontario Power Generation Inc. New Nuclear – Darlington Project Geological and Hydrogeological Environment Existing Environmental Conditions* Technical Support Document, 2008. OPG File Number: NK054-REP-07730-00005.

PGL reviewed data from 3 groundwater wells at F1 and 25 wells nearby to determine existing groundwater conditions. The groundwater wells that were selected for review based on groundwater-flow direction, and proximity to F1 (Figure 3 and 4.4). Results were compared to Ontario Regulation 153/04 Table 3 Standards.

In aggregate, data was available from 17 of the 28 wells:

1) EcoMetrix contained maximum values measured from 2008 to 2012 from 12 wells for benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHC) fractions F1 to F4, metals/inorganics, volatile organic compounds (VOCs), tritium and gamma.
2) Two wells were analyzed for tritium only in February and June 2008.
3) Groundwater samples collected from the three wells at F1 were analyzed for dissolved metals and inorganic parameters in December 2008.

There were exceedences of:

- Chloride in two wells;
- Selenium in one well;
- PHC fraction F3 in one well which a had concentration of 522 µg/L; and
- One well which had a concentration of 130Bq/L tritium, exceeding the F1 New Build limit of 100Bq/L.

All analytical results in the remaining wells were below the Table 3 Standards (See Table A).

Table A: Data Review

Groundwater Wells (EcoMetrix, March 2012)		
Well ID	**Analyzed Parameters**	**Exceedence**
MW010-18	-	NA
MW011-31	-	NA
MW012-5	-	NA
MW044-34	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	None
MW045-10	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	None
MW046-6	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	None
MW047-92	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	Chloride (37.2 M µg/L) exceeds the Table 3 Standards (2.3 M µg/L)
MW048-31	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	
MW049-20	-	NA
MW050-7	-	NA

Table A: Data Review (continued)

Groundwater Wells (EcoMetrix, March 2012)		
Well ID	**Analyzed Parameters**	**Exceedence**
MW052-15	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	Tritium (130 Bq/L) exceeds the F1 New Build limit of 100 Bq/L
MW053-31	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	PHC F3 (522µg/L) exceeds the Table 3 Standards (500µg/L).
MW054-20	-	NA
MW055-14	-	NA
MW056-85	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	Chloride (15.3M µg/L) exceeds the Table 3 Standards (2.3M µg/L)
MW057-27	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	Chloride (5.29M µg/L) and Selenium (234.7µg/L) exceed the Table 3 Standards (2.3M µg/L, 63µg/L, respectively)
MW058-6	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	None
MW059-12	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	None
MW063-98	No analytical	NA
MW064-40	BTEX and PHC F1-F4, Metals/Inorganics, VOC, Tritium and Gamma	None
MW065-25	-	NA
MW066-8	-	NA
MW106-29	-	NA
Groundwater Wells (C2M HILL, 2008)		
MW051-7	Tritium	None
MW105-6	Tritium	None
Groundwater Wells at F1 (Genivar, August 2009)		
MW08-12	Metals and inorganics	None
MW08-13	Metals and inorganics	None
MW08-14	Metals and inorganics	None

Notes: N/A = Not applicable
- = Not analyzed
M = Millions
Results evaluated against Ontario Regulation 135/04 Table 3
Last set of numbers in MW notation refer to depth of well in meters. For example, MW10-18 is 18 meters deep. This does not apply to the three wells at F1

GROUNDWATER FLOW DIRECTION

Based on the EcoMetrix report, overburden groundwater-flow direction is towards the southeast and the shallow groundwater-bedrock flow is towards the south.

3.1 DATA GAPS

PGL reviewed groundwater data from 28 wells; 11 wells did not have any analytical results available and 3 of the wells (at F1) were only analyzed for metals and inorganics. Therefore, a total of 14 wells did not have background tritium results available for review. The groundwater wells with no tritium results include the following wells: F1 wells (MW08-12 to MW08-14), and 11 downgradient wells (MW010-18, MW011-31, MW012-5, MW49-20, MW050-14, MW054-20, MW055-14, MW063-98, MW065-25, MW066-8, and MW106-29).

4.0 PROPOSED GROUNDWATER MONITORING PROGRAM

As part of the long-term strategy for groundwater protection at F1, PGL recommends a groundwater-monitoring and sampling program. No new wells are required. Eight existing groundwater wells were selected for the monitoring program which includes existing wells near and downgradient of F1 and wells with limited or no available analytical results. This includes the following wells:

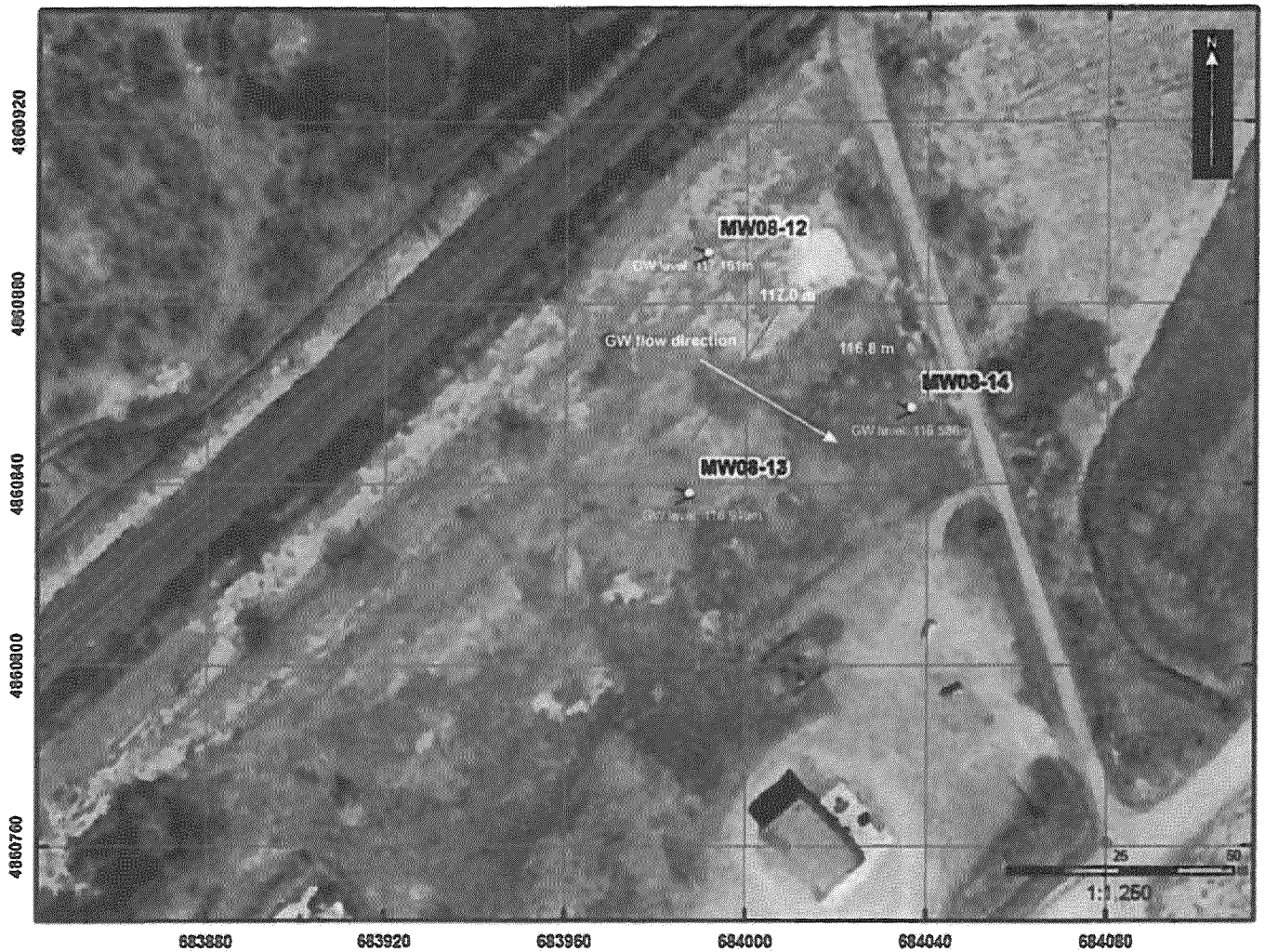
- One upgradient well (MW105-6);
- Three F1 wells (MW08-12 to MW08-14); and
- Four downgradient wells (MW050-14, MW051-7, MW058-6, and MW059-12).

PGL recommends that the wells selected for the monitoring program that do not have baseline tritium results (MW08-12 to MW08-14, and MW050-14) be sampled for tritium before any soil is staged at F1.

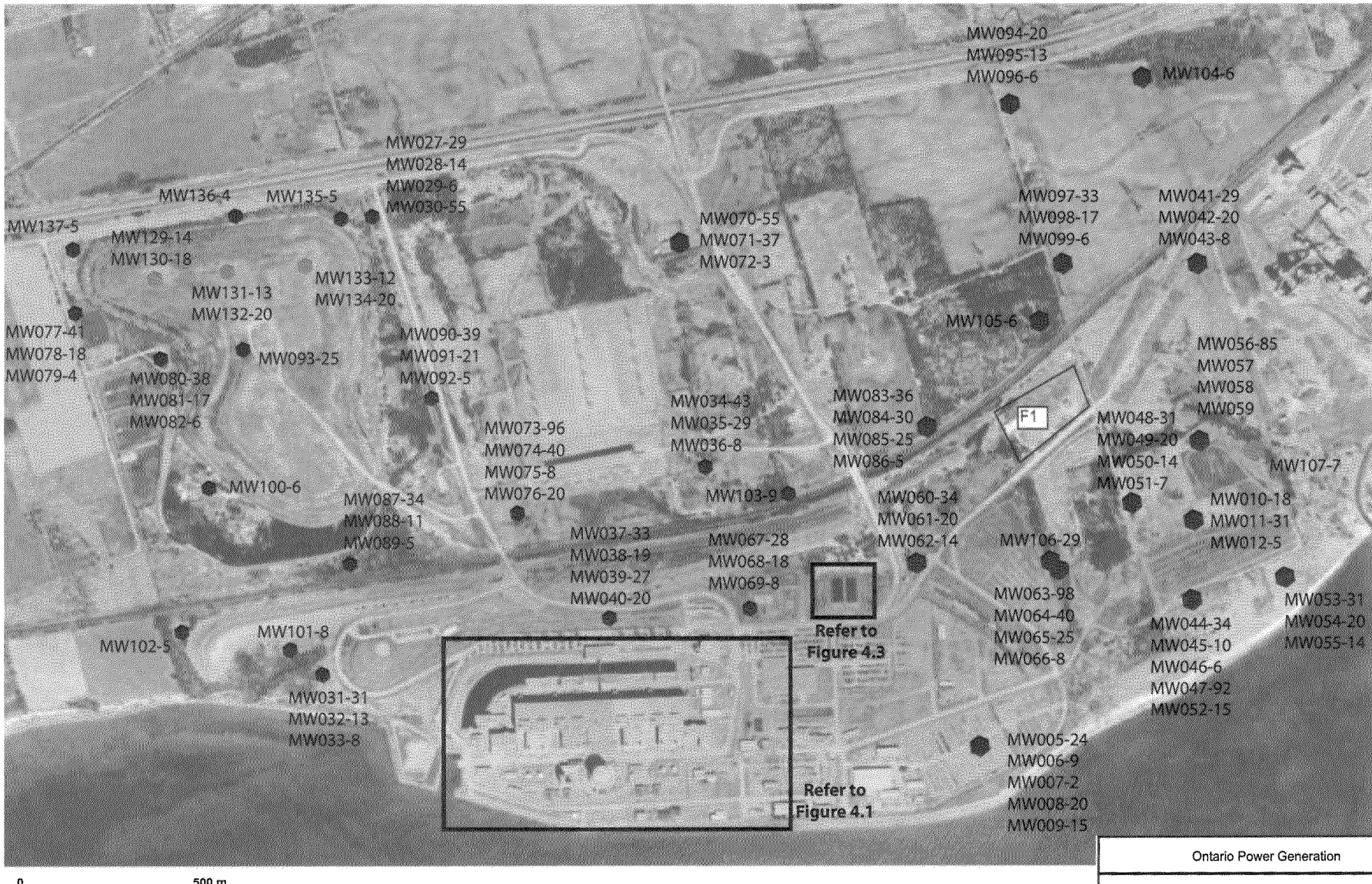
PGL recommends quarterly monitoring and sampling as presented in Table B. The monitoring and sampling will begin approximately four months after F1 is in use and will be continued for as long as soil is staged at F1.

Table B: F1 Groundwater Monitoring program

Objective	Monitor tritium concentrations in wells in close proximity to F1.		
Monitoring Well	**Frequency**	**Analysis Parameter**	**Considerations**
MW08-12	Quarterly	Tritium	At F1
MW08-13	Quarterly	Tritium	At F1
MW08-14	Quarterly	Tritium	At F1
MW050-14	Quarterly	Tritium	South Site Boundary
MW051-7	Quarterly	Tritium	South Site Boundary
MW058-6	Quarterly	Tritium	Southeast Site Boundary
MW059-12	Quarterly	Tritium	Southeast Site Boundary
MW105-6	Quarterly	Tritium	North Site Boundary
Method detection limit for tritium:		100 Bq/L	



DATE : June 2009	**Groundwater Flow Direction**	GENIVAR
SCALE : See Map		
FILE No. : MA-08-256-00-MA	**OPG Darlington Nuclear Site**	FIG No.: 3 / REV
APP'VD : M.H.		



Basemap source: Google Earth Pro Under Corporate License

Ontario Power Generation

Groundwater Monitoring Well Locations - Site Wide

EcoMetrix INCORPORATED | ONTARIO POWER GENERATION | Figure 4.4