



DURHAM YORK ENERGY CENTRE SOIL TESTING PLAN



July 10, 2020

Revision 4

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Durham York Energy Centre Soil Testing Plan

REVISION 4

1. INTRODUCTION

The Durham-York Energy Centre (DYEC) is a municipal solid waste to energy facility located in the Municipality of Clarington, Ontario. Owned by The Regional Municipality of Durham and The Regional Municipality of York (the “Regions”), the facility processes up to 140,000 tonnes of solid, non-hazardous, municipal solid waste per year. The facility is designed, built, and operated by Covanta Energy Corporation (Covanta) under a twenty-year contract with the Regions. The facility is located south of the 401 near Highway 401/418 interchange, as shown below in Figure 1. The Regions received approval for the facility from the Ministry of the Environment, Conservation and Parks (MECP) under the *Environmental Assessment Act* on November 3, 2010. Subsequently, an Environmental Compliance Approval (ECA) was issued by the MECP on June 28, 2011. The location of the DYEC relative to the surrounding area can be seen in Figure 1.

Figure 1: Location of Durham York Energy Centre



2. OBJECTIVE

The Soils Testing Plan was developed in accordance with Condition 7 (10a & 10b) and Condition 13 (4a & 4b) of the DYEC Certificate of Approval, as well as the Regional Council mandate to provide soil monitoring in the area of the DYEC for a minimum three-year period.

The purpose of the soil testing plan is to:

- a) Quantify background contaminant concentrations in the area
- b) Monitor emission dispersion of EFW-related soil contaminants
- c) Ensure ongoing environmental management of the site
- d) Quantify any measurable concentrations resulting from emissions from the DYEC, including validating the predicted concentrations from the Human Health and Ecological Risk Assessment (HHERA) conducted during the 2009 Residual Waste Environmental Assessment (EA) Study, for predicted soil contaminant loading over the life of the facility

2.1. Pre-construction Conditions

During the baseline study undertaken in the Environmental Assessment, 23 soil samples were collected at 17 sampling locations from areas surrounding the site. Samples were analyzed for metals, volatile organic compounds (VOC's), ammonia, formaldehyde, acetaldehyde, semi-volatile organic compounds (SVOC's), polycyclic aromatic hydrocarbons (PAH's), polychlorinated bi-phenols (PCB's) and dioxins and furans (PCDD/PCDF) and chlorophenols.

Results of the analysis showed that there were no soil metal contaminants of potential concern concentrations above the Table 1 of the Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act (Table 1 Standards). SVOC's were not detected in any of the samples. There were no soil chlorophenol concentrations above the Table 1 Standards. PCB's were not detected in any of the samples analyzed. PCDD/PCDF congeners were detected in 1 of the 13 samples analyzed. The location in which PCDD/PCDF were detected was from a sample taken from a field where previous intensive agriculture activities occurred. The detection of PCDD/PCDF is likely attributed to the earlier application of pesticides. The result was still below the contaminated site standard in Ontario for agricultural land use. In all other samples, no PCDD/PCDF congeners were detected above the Table 1 Standards. There were no PAH concentrations above the Table 1 Standards. VOC's were below the detection limit in each of the samples, however, some of the analytical detection limits were

greater than the Table 1 Standards. Formaldehyde and acetaldehyde were detected in all samples, however, there is no data in the Table 1 Standards for these parameters.

2.2. Potential Sources of Impacts

Soil was one of the most important media considered in the HHERA (Human Health and Ecological Risk Assessment) due to emissions outfall from the DYEC, the exposure pathway for human and ecological receptors and the natural environment, as well as the potential for chemical bioaccumulation over the life of the facility. The primary source of deposition to soil are the facility emissions. The main source of emissions is the 87.6 metre tall main stack.

Local human populations, visitors and ecological inhabitants to the area surrounding the facility may be directly exposed to soil. This testing program will provide an early warning if potential bio accumulative effects were to occur.

The HHERA assessed all chemicals based on the single highest annual soil concentrations throughout the operating lifetime of the DYEC. This typically occurs at the end of the operating period (i.e. 30 years of accumulation) at which point the concentration is assumed to have reached steady-state in the environment (and not degrade) over the next 70 years of a lifetime of human exposure.

The HHERA evaluated a broad range of chemical species identified as contaminants of potential concern (COPC) under normal operation and process upset scenarios. The HHERA concluded that after 30 years of operation, soil concentrations would increase less than 2% over baseline concentrations for all COPC except dioxins/furans and inorganic mercury. Soil concentrations of dioxins and furans were estimated to increase by 20% and 57% for the normal operation and process upset scenarios respectively. Inorganic mercury concentrations were estimated to increase by 4.6% and 6.7%.

3. SOIL TESTING LOCATIONS

3.1. DYEC Site Description

The DYEC is located at 1835 Energy Drive in Courtice Ontario. The Facility is situated north of a Canadian National rail corridor and the Courtice Water Pollution Control Plant, south of highway 401 and 418 interchange, and west of Darlington Energy Complex. The lands to the west are currently used for agricultural purposes.

The soil baseline study undertaken by Jacques Whitford during the Environmental Assessment (EA) study found that surface soils at the DYEC and in the surrounding area belong to the Darlington loam soil series having fair to good drainage and belonging to the hydrologic soil group 'C', with a typical curve number (CN) of 74. Underlying subsoil was characterized as Newmarket Till, a dense till comprised of clayey silt and sand.

3.2. Soil Testing Site Locations

The soil monitoring plan locations are linked to the ambient air monitoring locations as per section 13 (4) (a) of the Certificate of Approval. An upwind site is located at the Courtice Water Pollution Control Plant, approximately 1 km from the EFW site. This site optimizes siting criteria requirements and will act as a background monitoring station. This area is outside of the area of modeled maximum emissions outfall, is owned by the Region and will have very little potential for soil plot disturbance. A downwind site was selected on private property near Baseline and Rundle Road in Clarington, approximately 2.5 km from the EFW site. A property lease has been negotiated with the owner. This site is within the area of modeled maximum predicted emission outfall and is an ideal site for quantifying contaminant concentrations which may result from the DYEC facility emissions.

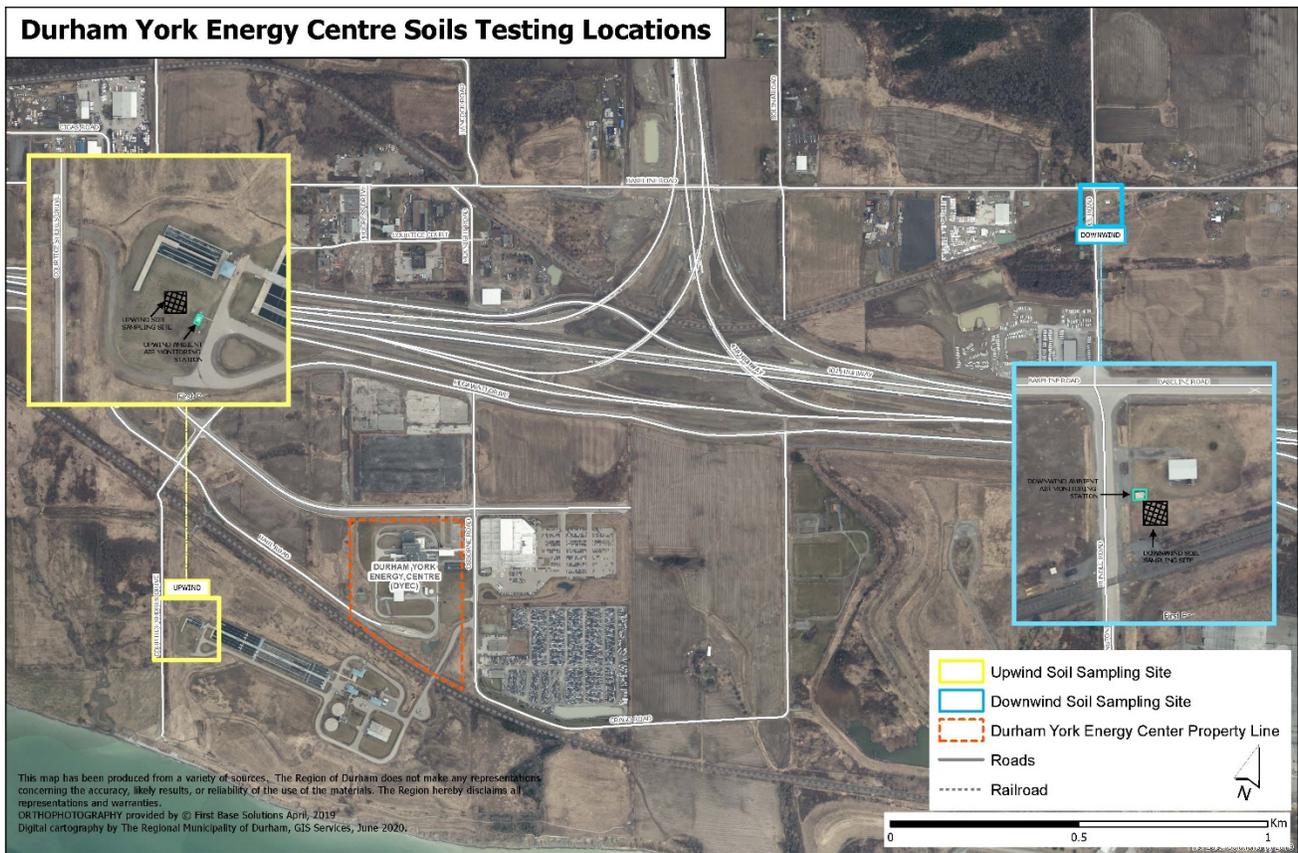
In late 2018, a temporary ambient air monitoring station, known as the fence line station, located in the northeast corner of the DYEC property was decommissioned. As ECA Condition 13 (4) (a) links ambient air monitoring to soil sampling, the soil sampling undertaken at this location was also discontinued. Soil testing reports completed prior to 2020 include results from the fence line station.

4. SOIL TESTING PLAN

4.1 Establishment of Soil Testing Site Location

In accordance with Certificate of Approval Condition 13 (4) (a), soil sampling locations are situated in the same location as the ambient air monitoring stations sited for the DYEC monitoring program. The Rundle Road and Baseline Road soil and ambient air sampling location occurs within the location of maximum predicted ground level concentration according to the dispersion modelling undertaken for the EA. A second sampling location, located at Courtice Water Pollution Control Plant, acts as a background monitoring station for comparison. The proposed locations for ambient air monitoring are based on the results of the air quality assessments, prevailing wind direction, locations of nearby residences, and the requirements outlined in the DYEC Ambient Air Monitoring Plan. In addition, dispersion model predictions are an aide in the siting of ambient air monitoring stations recommended by the United States Environmental Protection Agency (40 CFR, Part 58) (US EPA). A dispersion modeling study of emissions from the DYEC was completed as part of the approved EA for this project (Jacques Whitford, 2009). This study examined emissions of about 90 different contaminants of potential concern including criteria air contaminants, metals, PAHs, and dioxins/furans. The maximum off-property ground-level concentrations due to emissions from the DYEC were estimated using the CALPUFF dispersion model. The predicted maximum annual average concentration occurs approximately 1.5 km to the northeast of the DYEC, with another area of almost as high annual concentrations occurring about 1.5 km to the west-northwest of the DYEC. The soil and ambient air station locations are shown in Figure 2.

Figure 2: Soil Testing Locations



4.2. Soil Testing Frequency

The testing program commenced on August 22, 2013 (prior to commencement of facility operations) to monitor baseline soil quality in the absence of emissions from the DYEC (as per Certificate of Approval Condition 7 (10a)). Samples were collected annually during the first three years of facility operations, with samples being collected on August 25, 2015, August 17, 2016, and August 23, 2017.

In accordance with the approved Soil Testing Plan, soil testing has transitioned to sampling once every three years beginning in the 2020 operating year. Sampling is completed within the same season every three years or until notification is received from the MECP Regional Director advising that the monitoring is no longer required.

4.3. Surface Soils Field Sampling

Surface soil samples will be composite samples which are created in the field at the sampling location within a sampling grid.

Site field observations will be recorded during each sampling event. Geographical Positioning Systems (GPS) co-ordinates for each plot will be recorded and the plot locations will be marked with stakes to assist with the plot identification in future sampling events.

For each of the testing locations, one composite sample, comprised of a minimum of nine areas within an approximate 10 m by 10 m grid pattern, will be collected to a depth of 0-2 cm for the analysis of surface soil. Separate composite samples will be collected for inorganic analysis, dioxin and furan analysis and organics analysis. A sufficient quantity of sample must be collected to ensure proper analysis and quality control can be carried out at the laboratory. The laboratory should be contacted to ensure adequate quantity is collected.

4.4. Surface Soils Sample Retention

One sample from the initial sampling event will be retained for duplicate soil sample retention. Samples from each subsequent event must be retained until the soil testing report for those samples has been reviewed and accepted by the MECP in accordance with the following:

- a) Quantity of sample to be stored: A sufficient quantity shall be retained from the initial background sampling event to allow for at least one reanalysis for all the parameters that are being tested as per the plan.
- b) Containers for storage: Amber glass sample jars (typically about 180 to 225 ml).
- c) Method of storage: Cool dark and dry cupboard.

4.5. Sample Handling

Procedures that avoid cross-contamination of samples and degradation and loss of substances shall be used when soil is:

- (a) collected,
- (b) handled,
- (c) stored,
- (d) transported, and
- (e) analyzed.

Before any surface soil work begins, all equipment will be decontaminated in order to prevent cross contamination between sampling locations. Each piece of sampling equipment that comes into contact with soil during sampling will be decontaminated before work at each upwind and downwind sampling locations. Decontamination should include removing excess soil from equipment, washing with detergent to remove dirt, oils and grease, and rinsing with

de-ionized water to remove the detergent. For organic sampling the equipment should further be rinsed with acetone and hexane to eliminate the potential for cross contamination.

Sample handling, container requirements for parameter analysis, storage and preservations requirements must be carried out in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act.

4.6. Field Documentation

Documentation of observations and data acquired in the field will provide information on the proper acquisition of samples and also provide a permanent record of field activities. These observations and data will be recorded in the field notebook or on the sample collection data sheets. In addition, each surface soil sampling location will be photographed and a qualified consultant will produce a map identifying the grid pattern used and the plot location layout. A summary of field data will be included with the Soil Testing Reports.

Field documentation should include the following:

- site name and photograph
- GPS coordinates for sample plot locations
- field personnel's name
- date, time and location of sample collection
- sample number/ID
- whether QA/QC samples were collected
- type of containers used for collection
- whether samples were preserved, and type and quantity of preservative
- sampling method and composite collection pattern/map of test plot area
- unusual site conditions
- weather conditions

4.7. Sample Transportation and Labeling

1. All sample containers must be well sealed and placed into a cooler with ice cubes (or ice packs) and protective packing materials if required.
2. Sample identification, labeling, documentation, and quality control will be implemented.

3. Laboratory submission and/or chain of custody forms are to be appropriately completed and signed, and soil samples are to be submitted to the laboratory within 24 hours of sampling.

5. LABORATORY ANALYSIS

5.1. Laboratory Analysis Requirement

All samples will must be submitted to a laboratory that is accredited by an internationally recognized accreditation body, such as the Canadian Association for Laboratory Accreditation (CALA) or the Standards Council of Canada (SCC) in accordance with the International Standard ISO/IEC17025:2005 – General requirements for the Competence of Testing and Calibration Laboratories.

Samples will be analyzed in accordance with Standard Methods for Soil and Sediment and/or the Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act.

5.2. Analytical Parameters

A comprehensive list of analytical parameters were analyzed in the soil baseline sampling testing conducted by Jacques Whitford in 2009 for the HHERA which was completed for the EA. Based on those results, the predicted emissions, and Certificate of Approval Condition 13 (b) (ii), the parameters which will be tested will include Metals, Polycyclic Aromatic Hydrocarbons (PAH's), and Dioxins and Furans (PCDD/PCDF).

Table 1: Analytical Parameters for Soil Analysis

Metals	Polycyclic Aromatic Hydrocarbons (PAH's)	Dioxins and Furans (PCDD/PCDF)
Antimony	Anthracene	Total PCDD/PCDF (TEQ)
Arsenic	Benzo(a)fluorene	
Barium	Benzo(a)pyrene (TEQ)	
Beryllium	Benzo(b)fluorene	
Boron	Fluorene	
Cadmium		
Chromium (total)		
Chromium V1		
Cobalt		
Copper		
Lead		
Mercury		
Methyl Mercury		
Molybdenum		
Nickel		
Phosphorus		
Selenium		
Silver		
Thallium		
Tin		
Vanadium		
Zinc		

5.3. Analytical Parameters not Analyzed

VOC's were not chosen to be analyzed in soil, as ambient air emissions of these contaminants are expected to occur in trace amounts and predicted ambient concentrations of speciated VOCs are all well below method detection limits.

Ammonia (NH₃) was also not included for analysis in soil as the maximum predicted ambient air NH₃ concentration is less than the method detection limit.

5.4. Quality Assurance/Quality Control

Some or all of the following quality control measures will be performed during sample analysis for Quality Assurance/Quality Control purposes (QA/QC) in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act.

- a) lab duplicate sample
- b) certified reference material (where applicable)
- c) field/travel blanks (where applicable)
- d) method blanks
- e) laboratory control sample/blank spike analyses
- f) matrix spike analysis (where applicable)
- g) surrogate recoveries (where applicable)
- h) internal standards
- i) calibration verifications

Certificates of Analysis must be provided by the testing laboratory.

6. REGULATORY CRITERIA

The soil samples will be evaluated against Table 1 of the Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act (Table 1 Standards).

The Table 1 Standards are considered representative of upper limits of typical province-wide background concentrations in soils that are not contaminated by point sources and are the most conservative standards for which to evaluate data against.

7. CONTINGENCY PLAN

Where a sample collected and analysed exceeds a parameter in the Table 1 Standards, this sample area shall be re-sampled and analysed and noted in the testing report. If the resample parameter value is still in exceedance, the MECP shall be notified and the Regions will submit written recommendations regarding any corrective action that may be required within 90 days of the re-sampling event.

8. REPORTING

8.1. Soil Test Reporting

Within one month of completion of each soil testing event, the Regions will submit a soil testing report to the District Manager in accordance with Certificate of Approval Condition 15 (4). A letter dated January 28, 2014 from the MECP District Manager affirms the MECP considers the “soil testing event” to include completion of soil sample laboratory analysis.

Soil Testing Reports are kept on-site and be available for inspection by a Provincial Officer upon request. In addition, this testing plan and subsequent reports will be presented to the Energy from Waste Advisory Committee (EFWAC).

8.2. Posting to the Website

The Soil Testing Plan and the subsequent Soil Testing Reports shall be posted to the DYEC website.

9. REFERENCES

1. Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 15, 2011
2. Ontario Reg. 153/04 Records of Site Condition - Part XV.1 of the EPA
3. Ontario Reg. 179/11 EPA Amending Ontario. Reg. 153/04
4. Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act, Ministry of Environment Laboratory Services Branch, Amended July 1, 2011
5. DYEC Ambient Air Monitoring Plan (Stantec, 2012)
6. Human Health and Ecological Risk Assessment Technical Study Report (Jacques Whitford, 2009)
7. Natural Environment Technical Study Report (Jacques Whitford, July 31, 2009)
8. Geotechnical Investigation Technical Study Report (Jacques Whitford, July 31, 2009)
9. Canadian Council of Ministers of the Environment, A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines, 2006
10. EA Baseline Sampling Program (Jacques Whitford, 2008)