Durham York Energy Centre

Energy-from-Waste Facility
Abatement Plan

Prepared for the
Ministry of the Environment and Climate Change

COVANTA DURHAM YORK RENEWABLE ENERGY LIMITED PARTNERSHIP

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Powering Today. Protecting Tomorrow.

Durham York Energy Centre

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Executive Summary

Between May 2nd and May 11th, 2016 Covanta Durham York Renewable Energy Limited Partnership (Covanta) conducted a voluntary source testing (VST) program by independent contractors approved by the Regions of Durham and York (Regions). On May, 26th, 2016, the Ministry of the Environment and Climate Change (MOECC) was notified by the Regions, as per Section 13 of the Environmental Protection Act, that preliminary Unit #1 results from the VST program identified an exceedance of the in-stack dioxin and furan (D&F) performance standard established by the Durham York Energy Centre (DYEC)'s Environmental Compliance Approval (ECA).

Immediately following receipt of these preliminary results, and after careful consideration and discussions with the Regions and their consultants, Covanta made the decision to voluntarily shut down Unit #1 to conduct a comprehensive system-wide equipment inspection and diagnostic evaluation. Emissions of all other parameters were also tested from Unit #1 during this period and confirmed to be in compliance with ECA performance requirements. In addition, emissions of all parameters for Unit #2 were also confirmed to be in compliance with the ECA.

The focus of this abatement plan is to: 1) identify the scope and execute the full diagnostic inspection of Unit #1 while it was off line (Phase I), and 2) identify key findings and actions required from that diagnostic inspection before a restart of Unit #1, 3) restart Unit #1 in accordance with the findings, and 4) execute on line equipment inspections and ongoing evaluations and diagnostic projects (Phase II) for Unit #1 while in an attempt to comprehensively review the rationale for the exceedance of the D&F ECA performance standard. The combination of Phase I and Phase II diagnostic evaluations during the conduct of this abatement plan are expected to identify specific recommendations that will be shared with the MOECC on a weekly basis to proactively address the current incident and prevent a re-occurrence of future exceedances.

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Appendices

1.0 Introduction

This Abatement Plan has been prepared by Covanta Durham York Renewable Energy, Limited Partnership (Covanta) due to elevated dioxin and furan (D&F) emissions from Unit #1 during the conduct of a voluntary source testing (VST) program, between May 2 and May 11, 2016. The incident involves the discharge of contaminants to air in excess of an in-stack performance standard (Schedule "C"), that is required by the Environmental Compliance Approval (ECA) of the Durham York Energy Centre (DYEC). Emissions of all other parameters from Unit #1 were also tested during this program and confirmed to be in compliance with ECA performance requirements. In addition, emissions of all parameters for Unit #2 were also tested and confirmed to be in compliance with the ECA.

This Abatement Plan was prepared in response to a request received by the Ontario Ministry of the Environment and Climate Change (MOECC) dated May 31, 2016 and published guidance from the MOECC entitled, "Compliance Policy Applying Abatement and Enforcement Tools", dated May 2007. It represents the proposed outline of activities being pursued to ensure that the DYEC operates within the requirements set forth by the ECA.

Covanta, as operator of the DYEC, who seeks to conduct business in a manner that is always protective of human health and the environment, voluntarily shut down Unit #1 on May 26th, 2016 following a discussion regarding the preliminary laboratory reporting with the Regional Municipality of Durham. This shutdown allows for a complete Phase I investigation of the incident, including diagnostic inspection activities that can only be completed during a shutdown. This will be followed by a subsequent Phase II diagnostic evaluation process which requires Unit #1 to be operational, followed by a restart of Unit #1 with a mutual understanding of scope and schedule.

The Regions of Durham and York (Regions and/or Owners) operate three (3) ambient monitoring stations offsite from the DYEC that were located in consultation with the MOECC. These stations have been operational since May 2013. The ambient monitoring program continues to be conducted in accordance with the MOECC approved plan. The most recent ambient sampling event for dioxins and furans was conducted on May 12, 2016. These results were reported to the MOECC on June 7, 2016. Measurements were well below the MOECC criteria and fall towards the lower end of the range (maximum to minimum) measured by the stations between 2013 and 2016.An additional soil sampling event was conducted on May 26, 2016. Once the laboratory results have been received they will be reported to the MOECC.

MOECC comments received on June 3, 2016 on the draft Abatement Plan, have been incorporated herein and an email response was provided on June 7th, 2016.

2.0 Schedule of Activities

2.1 Specific Dates and Activities

The following schedule outlines the major milestones for Phase I and II activities, inspections and evaluations of Unit #1. As investigative activities are executed, the proposed schedule below may be adjusted to accommodate additional work that was not anticipated at the time the Abatement Plan was developed. MOECC will continue to be updated on a weekly basis throughout the execution of the Abatement Plan.

PHASE I

May 27th-June 10th:

- Preparation and submittal of the Abatement Plan.
- Conduct Phase I (offline activities) of the Abatement Plan.
- Undertake investigative activities with Unit #1 offline, including but not limited to:
  - Grate and Furnace (ash discharger, riddlings, feed chute and feed table, grates, over air fire, under air fire, internal gas recirculation system & SNCR, furnace walls and water wall tubes, furnace auxiliary systems).
  - Boiler (hoppers, Plattco flap valves, boiler ash conveyors).
  - Air Pollution Control Plant (reagent delivery, clean nozzles, install/modify air lances, CEM system inspection).
  - Operating Parameters and Reagent Addition Rates (reagent injection rates confirmed, dry recirculation system, baghouse pressure and pulsing system).
  - Testing (baghouse, outlet sample filters, activated carbon properties, carbon feed system).
- A summary of initial findings are enumerated in Section 4.1 and Appendix C from Phase I activities and includes possible changes needed to facility design and operations. Updates on the potential solutions outlined in Appendix C will be reported to MOECC on a weekly basis along with updated standard operating and training procedures.
- The Regions will submit a memo prepared by the Owner's consultant which recommends and accepts the Abatement Plan by Covanta, and
- The Regions will submit a technical report prepared by the Owner's consultant which verifies the completion of Phase I activities to the MOECC.

PHASE II

June 13th:

Target date to initiate Phase II (Re-start Unit #1) of the Abatement Plan

June 13th - 27th :

- Initial 2 week period of Phase II to undertake investigations during the operation of Unit #1, including but not limited to:
  - Testing samples of APC residual ash, raw carbon, hydrated lime, quenching tower spray water, wetting mixer)
  - Operational considerations (combustion, ash discharger, furnace draft, slag, bed thickness, stable operation, ash hoppers, flop gates, rotary valves, soot blowing, personnel communications)

PHASE II DIAGNOSTIC TESTING

June 27th:

- Diagnostic source testing subsequent to this initial evaluation period is contingent on operating conditions and results with testing being subject to the availability of the source testing contractor.

July 18th:

- Target date to receive data tables from diagnostic testing and begin data evaluation to determine if additional evaluation activities are required and consideration of executing a full source test.

SOURCE TESTING

Mid-Late Summer

- Source testing (done in full compliance with source test protocol consistent with ECA requirements), based on the implementation of the Abatement Plan and ongoing diagnostic testing

2.2 Post Compliance Test Period

All diagnostic and compliance test results will be used to assess future operating conditions including set points and if warranted, changes to equipment and/or the need for additional testing. Two examples are baghouse leak detection systems to evaluate baghouse performance and traverses to study flue gas flow characteristics. Test results from diagnostic and/or other tests may also trigger interest in additional diagnostic testing. Results from diagnostic source tests will be compiled and analyzed with compliance results and recommendations for discussion with the MOECC.

3.0 DYEC Air Emissions

Regulatory air emission limits for the DYEC are contained within Schedule "C" of the facility's ECA, which details the performance requirements for in-stack emission limits. Within the ECA, D&F in-stack emissions are limited to 60 pg-TEQ/Rm^3 (dry, as adjusted to 11% O_2), with the verification of compliance listed as results of source testing, expressed as I-TEQ. Preliminary results from the voluntary source test undertaken in May 2016 indicated an exceedance of the ECA limit for D&F from Unit #1.

Appendix A includes two tables that are provided to describe the performance of Unit #1 and #2. Table A.1 is a summary of all results from the VST in May 2016 whereas Table A.2 is a summary of D&F test results since startup. All results are presented as dry adjusted concentrations (as pg-TEQ/Rm^3) using the NATO/CEMS (1989) TEFS for direct comparison with the ECA performance standard of 60 pg-TEQ/Rm^3.

The stack D&F result from Unit #1 was 818 pg-TEQ/Rm^3 during the May 2016 VST program exceeds the ECA performance standard. All other test results were well within the ECA performance specfications. Therefore, this Abatement Plan is limited to efforts to examine elevated D&F emissions from Unit #1.

4.0 Operational and Systems Investigations

The DYEC represents a collection of complex and advanced equipment and control systems to efficiently and effectively combust municipal solid waste. Careful consideration and discussion of the information available at the time the draft D&F results were obtained resulted in the response by Covanta to voluntarily shut down Unit #1 in order to conduct a comprehensive system-wide equipment inspection and evaluation. The comprehensive evaluation is conducted in two phases, first, offline and subsequently online as noted in the following sections.

4.1 Phase I Evaluation (Unit #1 Offline)

Unit #1 initiated an equipment inspection and diagnostic evaluation on Thursday May 26th and completed that inspection and initial diagnostic evaluation on Friday June 3rd. The results of these inspections and diagnostic evaluations are summarized in Appendix B to provide MOECC an update of findings and identify any corrective actions, as required. The checklist was also updated and annotated to reflect the development of Standard Operating Procedures (SOPs) and other work completed as a result of required inspections. Prior to the conduct of Phase II activities, concurrence with the MOECC will be obtained regarding Phase I activities, including but not limited to the resolution of mechanical issues identified in these inspections.

Phase I inspections, conducted in accordance with Appendix B, did identify several preliminary indications of equipment and/or operating conditions that could be related to D&F formation and control as enumerated in Table 1, below:

TABLE 1: INITIAL PHASE I FINDINGS:

Finding	Issue
A review of DCS operational data and CEMS data indicates consistent operating conditions during the VST program and the preceding diagnostic tests.	Need to focus on other equipment investigations which will lead to operational revisions.
Buildup of residue in superheater hopper and/or the blasting of residue in the superheater.	The nature, schedule and extent are unknown during the exact test dates, however, this material could be related to downstream gas phase reactions that form D&F.
Buildup of residue between bags in the baghouse.	93 bags and 15 cages were removed to address potential bag failure or degraded performance. The cause of the pluggage is unknown but would adversely impact abatement of D&F in the baghouse. One plausible cause of pluggage is that Unit #1 was used to evaluate alternative baghouse pulsing frequencies prior to the conduct of the VST with the high range potentially causing the noted pluggage.

4.2 Phase II Evaluation (Unit #1 Online)

As noted above, a comprehensive system-wide equipment inspection and evaluation also requires the conduct of equipment inspections while the unit is online. The focus of these online inspections involves evaluating equipment performance which impact operating parameters commonly understood to be related to D&F formation which typically includes: combustion temperatures, carbon monoxide as an indicator of combustion efficiency, ash buildup on tubes and walls, flue gas temperature monitoring, differential pressure drop across the acid gas scrubber and fabric filter, and carbon injection rates. As a result, a summary of operational checks and testing will be conducted in accordance with the checklist in Appendix C. The Phase I evaluation has also identified a list of projects as well as additional training plans for facility personnel required to be undertaken during Phase II operations. Phase II activities, including the restart of Unit #1, are identified in Appendix C, but will not be undertaken until receiving concurrence from the MOECC to proceed with this phase.

It is important to note that Appendix C projects may or may not be related to the elevated D&F test results, however, they are being raised because future operations will be amended to address these findings. The range of Potential Solutions is not a conclusive or binding list with any final adjustments to facility design or operation being reflective of operating observations and evaluations conducted during Phase II.

5.0 Communications Protocol

The preparation and submission of this Abatement Plan to the MOECC fulfills the requirements set out by the EPA and the ECA, as well as the MOECC request to prepare such a plan by correspondence received on May 31, 2016. Covanta is committed in being transparent on the progress made throughout the implementation of the Abatement Plan to the MOECC to ensure DYEC operation continues to occur in a manner that is protective of human health and the environment.

Throughout the execution of this Abatement Plan weekly updates of the investigations will be provided to the MOECC until no longer required.

6.0 Summary

The activities of the Phase I and Phase II investigations outlined in Section 4.0 of this Abatement Plan and enumerated further in Appendix B and C, respectively, are intended to return Unit #1 to successfully compliant stable operations, in accordance with the performance standards set forth by the DYEC ECA. Once Unit #1 is online, it will be operated in accordance with industry standard practices and procedures and those identified by this Abatement Plan.

Covanta will continue to strive to find operational improvements and efficiencies in the operation of the Durham York Energy Centre.

Appendix A

Durham York Energy Centre Emissions Summary

TABLE A.1: SUMMARY OF MAY 2016 VST RESULTS

Reference Information				Test 6	Test 6
Parameter	**Abbreviation**	**Units (a)**	**Limit**	**Unit #1 Average**	**Unit #2 Average**
Particulate[1]	PM	mg/Rm^3	9	<0.62	<0.48
Mercury[1]	Hg	µg/Rm^3	15	0.44	0.27
Cadmium[1]	Cd	µg/Rm^3	7	<0.043	<0.043
Lead[1]	Pb	µg/Rm^3	50	0.27	0.22
Dioxins and Furans[2]	D&F	pg-TEQ/Rm^3	60	<818	<12.1
Hydrochloric Acid[34]	HCl	mg/Rm^3	9	5.6	5.4
Sulphur Dioxide[3]	SO_2	mg/Rm^3	35	0.2	0.0
Nitrogen Oxides[3]	NOX	mg/Rm^3	121	111	111
Total Hydrocarbons[4]	THC	ppm	50	0.8	0.9
Carbon Monoxide[5]	CO	mg/Rm^3	40	22.5	29.8

(1) Dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(2) Calculated using the NATO/CCMS (1989) toxicity equivalence factors and the detection limit for those isomers below the analytical detection limit, dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(3) Maximum calculated rolling arithmetic average of 24 hours of data measured by the DYEC CEMS, dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(4) Average of six half-hour tests conducted by ORTECH between April 19 and April 20, 2016 measured at an undiluted location, reported on a dry basis expressed as equivalent methane

(5) Maximum calculated rolling arithmetic average of 4 hours of data measured by the DYEC CEMS, dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

TABLE A.2: SUMMARY OF ALL IN-STACK DYEC D&F TESTING (PG-TEQ/RM^3)

Test #[c]	1	2[a]	3[a][b]	4[a][b]	5	6
Date	Sept 10, 2015	Oct 1-2, 2015	Oct 21-22, 2015	Oct 27-28, 2015	Apr 19-20, 2016	May 2016
Type [d]	DIAG	COMP	COMP	COMP	DIAG	VST
Unit #1	---	233	36	27	32	< 818
Unit #2	30	105	32	22	8	< 12.1

(a) Test report identifed interference which is known to create artificially elevated values. The MOECC rejected these results in their compliance assessment due to sample integrity and additional testing was conducted to further assess the overall influence of this interference.

(b) Test samples were subject to an additional laboratory cleanup step in an attempt to remove interference. Certain D&F isomers continued to exhibit interference.

(c) Dry, adjusted to 11% O_2 using NATO/CCMS (1989) toxicity equivalence factors and the detection limit for those isomers below the analytical limit.

(d) Type:

- DIAG represents results from diagnostic testing
- COMP represnts reults from cpmpliance testing
- VST represents results from Voluntary Stack Test

Observations:

- Dioxin test results from the initial source testing program, Test #2 were determined not to be representative of DYEC emissions due to sample integrity concerns from sample preparation but subsequent dioxin testing did indicate DYEC emissions previous to the current incident has been below the ECA in-stack standard.
- That factual evidence helps to understand the scope and nature of the exceedance, however, emission data by itself does not identify the cause of the stack value.
- The stack data from diagnostic testing in April demonstrated that both Unit #1 and #2 were below the limit, however, the May VST for Unit #1 was not. This suggests that something may have happened within Unit #1 but not Unit #2 which had consistent and passing results.

Appendix B
Inspection Checklist for Phase I Activities

Phase I: Unit #1 Inspection Checklist

	TASK	RESPONSIBLE	STATUS	START DATE	DUE DATE	% COMPLETE	DONE?	NOTES
	PHASE 1 - Pre-Start Checks							
	GRATE AND FURNACE							
	Ash discharger							
1	Clean and inspect ash discharger	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	cleared (including back side of ram)
2	Stroke ash discharger ram to ensure correct operation	Maintenance Sup	Complete	May 30, 2016	June 3, 2016	100%	✓	complete- ok
3	Inspect water level control mechanism	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	fill discharger and perform final checks; complete
	Riddlings							
4	Riddlings system clear and functional, no stuck flaps, no evidence of excessive riddlings	Shift Supervisor	Complete	June 2, 2016	June 3, 2016	100%	✓	Complete - good.
	Feed Chute and Feed Table							
5	Internal surfaces of feed chute, feed table, and sidewalls in feeder area - no loose wear strips, missing bricks, or any other issues which may impede waste flow	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	No issues; complete
6	No water leakage from feed chute or transition piece	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	complete
7	Verify feed rams and brake plates are in good condition	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	complete
8	Feed ram speeds consistent between rams and within Martin specs	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	complete
	Grate							
9	Visually inspect that all grate bars in good condition (i.e., no broken or missing grate bars)	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	complete
10	All grate runs making complete strokes	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	complete
11	Grate speeds consistent between runs and within Martin specs	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	complete
	Over Fire Air							
12	Inspect over fire air system (secondary air) for leakage	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	complete
13	Inspect and verify proper damper operation/orientation	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	complete
14	visually inspect nozzles for evidence of pluggage	Maintenance Sup	Complete	May 31, 2016	June 3, 2016	100%	✓	complete
15	Clean combustion air intake screen from tipping haul	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	complete
	Under Fire Air							
16	Inspect under fire air hoppers for pluggage	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	inspected and verified clear; complete
17	stroke zone dampers and ensure correct operation;	Maintenance Sup	Complete	May 30, 2016	June 3, 2016	100%	✓	zone 4 damper operation confirmed ok.
18	ensure correct orifice plates installed in all compartments;	Maintenance Sup	Complete	May 30, 2016	June 3, 2016	100%	✓	Complete
19	all pressure lines clear and transmitters correctly calibrated;	Maintenance Sup	Complete	May 30, 2016	June 3, 2016	100%	✓	complete
20	Verify opening between zone 4 and 5 is clear	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	verified clear
21	Clean under fire steam heating coils	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	Washed out; complete
	Internal Gas Recirculation System (IGR) & SNCR							
22	Inspect mechanical condition of fan and ducting;	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	complete
23	stroke dampers to ensure correct operation;	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	complete
24	remove IGR nozzle elbows and ensure nozzles are clear;	Maintenance Sup	Complete	May 31, 2016	June 3, 2016	100%	✓	2 blocked nozzles found on west side (#2 and #3); both were unplugged
25	verify correct IGR orifice plates are installed	Maintenance Sup	Complete	May 30, 2016	June 3, 2016	100%	✓	40mm/55mm alternating and interlaced; verified correct
26	Vacuum ash out of ductwork	Maintenance Sup	Complete	May 31, 2016	June 3, 2016	100%	✓	complete. Significant amount of dust removed.
27	Inspect ammonia lances and ensure tip in good mechanical condition and lance properly oriented	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	Check tip and heat shield; confirm proper lance orientation
	Furnace Walls and Water Wall Tube							
28	Visually inspect furnace walls and screen tubes for excessive slagging	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	small clinker in 1st pass was removed; complete
	Furnace Auxilliary Systems							
29	Perform burner PM's	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	cleaned scanner; complete
30	Perform furnace purge and test fire burner	Shift Supervisor	Complete	June 3, 2016	June 3, 2016	100%	✓	Complete
31	Perform MICC camera system PM's	Maintenance Sup	Complete	May 31, 2016	June 3, 2016	100%	✓	camera removed while blasting; re-installed - ok; complete
32	Perform furnace compliance IR thermometer PM's	Maintenance Sup	Complete	May 30, 2016	June 3, 2016	100%	✓	complete
	BOILER							
	Hoppers							
33	Inspect 2nd/3rd (convection) hopper is clear	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	Front wall hard build-up noted; blasting completed June 1
34	Inspect Super Heater #1 (SH-1) hopper/chute is clear	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	cleared hopper, drop chutes and conveyor
35	Inspect Super Heater #2 (SH-2) hopper / chute is clear	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	cleared hopper, drop chutes and conveyor
36	Inspect Super Heater #3 (SH-3) hopper /chute is clear	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	cleared hopper, drop chutes and conveyor
37	Inspect Economizer hopper is clear	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	cleared hopper
	Plattco (Ash) Flap Valves							
38	Inspect 2nd/3rd (convection) Plattco	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	door removed; confirmed sealing.
39	Inspect Super Heater #1 (SH-1) Plattco	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	door removed; confirmed sealing.
40	Inspect Super Heater #2 (SH-2) Plattco	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	door removed; confirmed sealing.
41	Inspect Super Heater #3 (SH-3) Plattco	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	tightened loose seat; door removed; confirmed sealing.
42	Inspect Back Draft Plattco on Collection Conveyor	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	door removed; confirmed sealing.
43	Inspect Economizer Plattco A1	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	door removed; confirmed sealing.
44	Inspect Economizer Plattco A2	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	door removed; confirmed sealing.
	Boiler Ash Conveyors							
45	Inspect boiler ash collection conveyors for proper operation - covers in place and sealed							
46	Boiler Collection Conveyor AH-CV-101	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	hanger bearing connector to flight bolt replaced; removed inspection ports and confirmed conveyor clear
47	Boiler Collection Conveyor AH-CV-102	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	Removed inspection ports and confirmed conveyor clear
48	Economizer Collection Conveyor AH-CV-103	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	Removed inspection ports and confirmed conveyor clear
49	Transfer Conveyor AH-CV-104	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	Removed inspection ports and confirmed conveyor clear
	Sootblowers							
50	run in retractable blowers and verify proper alignment	Maintenance Sup	Complete	June 1, 2016	June 3, 2016	100%	✓	complete

51	run rotary blowers and verify alignment	Maintenance Sup	Complete	June 2, 2016	June 3, 2016	100%	✓	repaired broken lances on economizer SB's 122 and 123; SB 129 broken drive; parts expected 2 wks (SB129 will have no effect on facility operations or emissions
	General							
52	Confirm that there are no known tube leaks	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	Confirmed tight
53	All lower furnace doors closed and sealed - ignition ports, rear doors	Shift Supervisor	Complete	June 2, 2016	June 3, 2016	100%	✓	closed and sealed
54	Furnace observation viewports closed & sealed, glass in good condition	Shift Supervisor	Complete	June 2, 2016	June 3, 2016	100%	✓	closed and sealed
55	Furnace access doors closed and sealed; ensure door refractory in convection and SH hoppers is secure	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	confirmed that SH hopper door refractory secure (prevent falling into Plattco); complete
	AIR POLLUTION CONTROL PLANT (APC)							
56	Inspect carbon silo (loss in weight feeders, gate valves, eductor, blowers) to ensure accurate flow of carbon reagent to #1 Boiler air pollution control plant	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	timed weight samples taken (10 min and 15 min samples); correct feed confirmed.
57	Test carbon delivery piping with clean air to ensure free flow of carbon from the feeder to the addition point; the addition point on the flue gas duckwork will be inspected for pluggage	Shift Supervisor	Complete	June 2, 2016	June 3, 2016	100%	✓	Confirmed clear
58	Remove Quench tower spray lance; inspect and clean nozzles	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	2 of 5 nozzles found plugged; swapped with spare spray lance assembly; complete
59	Open upper Quench tower hatch and inspect diffuser baffle plate	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	observed through alternate door; confirmed clear
60	Open new Quench tower hatch (elevation 5.6) and inspect above and below lower diffuser plate; remove any accumulated material	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	confirmed clear
61	Open door to Quench tower crusher; inspect diffuser plate from below; clean crusher; Inspect and clean ducting from bottom of Quench tower to the conditioner	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	deposits cleaned; confirmed clear
62	Recycle surge bin hopper – verify no bridges or build-ups exist	Shift Supervisor	Complete	May 30, 2016	June 3, 2016	100%	✓	deposits cleaned; confirmed clear
63	Verify all heat tracing is operational	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	complete
64	Open conditioner and clean surface of reactor barrel; observe condition of reactor balls and remove any internal build-up	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	complete
65	Verify position and integrity of Reactor bypass damper	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	verified OK. Picture taken
66	Double Shaft Mixers – Inspect water nozzles for damage/pluggage	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	cleaned; complete
67	Visolite baghouse to ensure bags are tight and sealed	Shift Supervisor	Complete	June 2, 2016	June 3, 2016	100%	✓	baghouse confirmed tight
68	Recirc hoppers and rotary valve vanes-open up and clean	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	complete
69	Clear baghouse hoppers; clear inlet dampers	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	final verifcation; level indicators confirmed functional; reduce hopper vibrator throw; complete
70	Inspect fabric filter bags and change out as required	Shift Supervisor	Complete	May 31, 2016	June 3, 2016	100%	✓	93 bags changed and 15 cages; Kuttner rep on site June 1 to assess baghouse; observed some pluggage in bags; see map.
71	Continuous emissions monitoring system (CEMS) will be inspected	Shift Supervisor	Complete	June 1, 2016	June 3, 2016	100%	✓	change inlet/outlet filters; cleared ash build-up in inlet sampling nozzle. Complete
75	2nd pass hopper Air Cannon - Develop SOP for Usage	Chief Engineer	Complete	June 7, 2016	June 9, 2016	100%	✓	Complete - DYEC-BLR-034 "2nd Pass Hopper Air Cannon Operation" developed. Current setting is: 100 psi, timer set at 2 min. An operator initiates the cycle, which will continue at 2 min intervals until the operator shuts off cannon. The cannons are run once per 12 hr shift, or as necessary to assist clearing blockage. Air cannon usage will be logged on a checksheet. Future cycle time settings will be based on operational experience
78	2nd Pass Hopper Level- Develop SOP to Monitor levels	Chief Engineer	Complete	June 7, 2016	June 9, 2016	100%	✓	Complete - DYEC-BLR-035 "Checking 2nd Pass Hopper Level and Temperature" developed. Monitor the hopper level via observation of an ash flow/embers noted through the collection conveyor inspection port. Draft through the plattco and up into the hopper will also be observed by opening the conveyor inspection port and observing draft when the plattco valve cycles. This will be done twice per 12 hour shift. The measurement will be logged on a checksheet. Timing/Frequency of measurements will be adjusted as required
81	Hopper Plattco Temp - Develop SOP for measurement	Chief Engineer	Complete	June 7, 2016	June 9, 2016	100%	✓	Complete - DYEC-BLR-035 "Checking 2nd Pass Hopper Level and Temperature" developed. The plattco ash valves on the second pass hoppers will be monitored with an infra-red temperature gun twice per 12 hour shift. The measurement will be logged on a checksheet. Timing/Frequency of measurements will be adjusted as required. Examine moving to an on-line thermocouple based measurement once appropriate measurement locations are finalized.
84	IGR Air Nozzle Pluggage Monitoring - Develop SOP	Chief Engineer	Complete	June 7, 2016	June 9, 2016	100%	✓	Complete - DYEC-BLR-036 "IGR Nozzle Pluggage Monitoring" developed. The flex hoses immediately before the IGR port elbows will be monitored with an infra-red temperature gun once per day. The measurement will be logged on a checksheet. Timing/Frequency of measurements will be adjusted as required.
87	Plugged Nozzles in Evaporator Tower - Develop PM	Maintenance Sup	Complete	June 7, 2016	June 9, 2016	100%	✓	A weekly preventative Maintenance job was developed in the Facilities Computerized Maintenance Management System to inspect and check that the spray nozzles on each boilers quench tower are unplugged (ref PM ID 475 and 476); Complete
89	Hopper Cleaning - Develop SOP for Blast Cleaning	Chief Engineer	Complete	June 7, 2016	June 9, 2016	100%	✓	Complete - DYEC-BLR-037 "2nd Pass Hopper Blast Cleaning" developed. This procedure will minimize downstream carryover of ash.
92	Baghouse Operation - Develop Enhanced SOPS for Start-Up/Shutdown and Offline Operation	Chief Engineer	Complete	June 7, 2016	June 9, 2016	100%	✓	Complete - DYEC-APC-018 "Baghouse Startup Shutdown and Offline Operation" developed. SOP will result in the avoidance of build-up in hoppers and between bags; SOP will include more frequent visual inspections and enhanced monitoring of baghouse differential pressure
95	Baghouse High Hopper Alarm Response - Develop SOP	Chief Engineer	Complete	June 7, 2016	June 9, 2016	100%	✓	Complete - DYEC-APC-019 "High Baghouse Hopper Alarm" developed. Immediately inspect hopper for pluggage and clear if necessary. High level stops baghouse pulsing which can lead to plugging

Appendix C

Phase II Activities: Inspection Checklist, Observations and Potential Solutions

Phase II: Unit #1 Inspection Checklist

TASK	RESPONSIBLE	STATUS	START DATE	DUE DATE	% COMPLETE	DONE?	NOTES
PHASE 2 - Post-Start Up Checks							
OPERATING PARAMETERS AND REAGENT ADDITION RATES							
Review selective non-catalytic reduction system and ammonia injection rate	Technical	Not Started	May 30, 2016	June 10, 2016	0%		
Review fresh lime rate addition rates and controls	Technical	In Progress	May 30, 2016	June 10, 2016	50%		
Review fresh carbon rate addition rates and controls	Technical	In Progress	May 30, 2016	June 10, 2016	100%	✓	run at 5.1 kg/hr; diagnostic test at 7.5 kg/hr
Review fly ash recirculation system rate and amount of recirculated residue	Technical	In Progress	May 30, 2016	June 10, 2016	75%		
Review baghouse differential pressure and pulsing system settings	Technical	In Progress	May 30, 2016	June 10, 2016	25%		
Review and verify sootblower operating schedule to optimize boiler cleanliness	Technical	Not Started	May 30, 2016	June 10, 2016	0%		
TESTING					0%		
Outlet sample filters will be examined for particulate loading during the diagnostic testing to ensure	Technical	Not Started	June 27, 2016		0%		
A sample of powdered activated carbon will be tested to ensure that it exhibits properties consistent with purchase specification	Env. Spec	In Progress	May 30, 2016	June 15, 2016	50%		sample sent for offline lab testing on June 3; results expected by mid June.
Samples of APC residual ash will tested once per shift during the seasoning phase of the boiler re-start	Shift Supervisor	Not Started	June 10, 2016	June 10, 2016	0%		
Samples of raw carbon, hydrated lime, quench tower spray water, wetting mixer water and APC residual ash will be collected during both the diagnostic and source testing periods	Shift Supervisor	Not Started	June 27, 2016		0%		environmental spec to co-ordinate
OPERATIONAL CONSIDERATIONS					0%		
Sootblowers in good working order, no steam leakage into boiler;	Shift Supervisor	Not Started	June 10, 2016		0%		on start up
verify blower steam pressure (once unit re-started)	Shift Supervisor	Not Started	June 10, 2016		0%		on start-up
Combustion appearance good – proper UFA flow & distribution, no evidence of fuel piling, appropriate bed depth	Shift Supervisor	Not Started	June 10, 2016		0%		
Ash discharger running at appropriate speed; good seal and level control; ensure good transition chute door seal	Shift Supervisor	Not Started	June 10, 2016		0%		
Proper furnace draft – minimal setting to avoid going positive and minimize in leakage	Shift Supervisor	Not Started	June 10, 2016		0%		
No excessive slag in furnace	Shift Supervisor	Not Started	June 10, 2016		0%		
Stable operation – consistent crane operations, consistent bed depth, good fuel mix	Shift Supervisor	Not Started	June 10, 2016		0%		
Proper bed thickness	Shift Supervisor	Not Started	June 10, 2016		0%		
Low and stable CO means (low products of incomplete combustion)	Shift Supervisor	Not Started	June 10, 2016		0%		
All ash hoppers flowing properly	Shift Supervisor	Not Started	June 10, 2016		0%		
All Plattco flop gates and rotary valves operating correctly	Shift Supervisor	Not Started	June 10, 2016		0%		
Ensure fuel is well mixed and pit management SOP is adhered to	Shift Supervisor	Not Started	June 10, 2016		0%		
Confirm sootblowing schedule	Shift Supervisor	Not Started	June 10, 2016		0%		
Ensure good communication within Shift personnel	Shift Supervisor	Not Started	June 10, 2016		0%		
Track boiler ash hopper temperatures (as measured at the Plattco valves) as a predictive measure for plugging	Shift Supervisor	Not Started	June 10, 2016		0%		Implement upon start-up for Unit 1; develop SOP - open inspection port, wait for plattco to cycle and check draft
SOP VERIFICATION AND TRAINING SIGN-OFF					0%		
2nd pass hopper Air Cannon - Train Operators on SOP	Shift Supervisor	Not Started	June 7, 2016		0%		Of Shift Operators will be trained and signed off prior to starting 1st shift on #1 Boiler after re-start
2nd pass hopper Air Cannon - Verify SOP and Training	Owners Engineer	Not Started	June 7, 2016		0%		
2nd Pass Hopper Level - Train Operators on SOP	Shift Supervisor	Not Started	June 7, 2016		0%		Of Shift Operators will be trained and signed off prior to starting 1st shift on #1 Boiler after re-start
2nd pass hopper Level - Verify SOP and Training	Owners Engineer	Not Started	June 7, 2016		0%		
Hopper Plattco Temp - Train Operators on SOP	Shift Supervisor	Not Started	June 7, 2016		0%		Of Shift Operators will be trained and signed off prior to starting 1st shift on #1 Boiler after re-start
Hopper Platcco Temp - Verify SOP and Training	Owners Engineer	Not Started	June 7, 2016		0%		
IGR Air Nozzle Pluggage Monitoring - Train Operators on SOP	Shift Supervisor	Not Started	June 7, 2016		0%		Of Shift Operators will be trained and signed off prior to starting 1st shift on #1 Boiler after re-start
IGR Air Nozzle Pluggage Monitoring - Verify SOP and Training	Owners Engineer	Not Started	June 7, 2016		0%		
Plugged Nozzles in Evaporator Tower - Verify PM & Schedule	Owners Engineer	Not Started	June 7, 2016		0%		
Hopper Cleaning - Train Operators on SOP	Shift Supervisor	Not Started	June 7, 2016		0%		Of Shift Operators will be trained and signed off prior to starting 1st shift on #1 Boiler after re-start
Hopper Cleaning - Verify SOP and Training	Owners Engineer	Not Started	June 7, 2016		0%		
Baghouse Operation - Train Operators on SOP	Shift Supervisor	Not Started	June 7, 2016		0%		Of Shift Operators will be trained and signed off prior to starting 1st shift on #1 Boiler after re-start
Baghouse Operation - Verify SOP and Training	Owners Engineer	Not Started	June 7, 2016		0%		
Baghouse High Hopper Alarm Response - Train Operators on SOP	Shift Supervisor	Not Started	June 7, 2016		0%		Of Shift Operators will be trained and signed off prior to starting 1st shift on #1 Boiler after re-start
Baghouse High Hopper Alarm Response - Verify SOP and Training	Owners Engineer	Not Started	June 7, 2016		0%		
TRAINING CONSIDERATIONS							
Train 3 Auxiliary Operators to the point where they can relieve for CRO vacancies	Chief Engineer	In Progress	June 7, 2016	September 30, 2016	30%		Using Covanta OQP program + Specialized emissions mitigation training

Phase II: Unit #1 Inspection Checklist

Train Shift Supervisors to the point where they can relieve for CRO vacancies	Chief Engineer	In Progress	June 7, 2016	September 30, 2016	0%	Using Covanta OQP program + Specialized emissions mitigation training
Implement and complete Operator Training Program (OQP)	Chief Engineer	In Progress	May 1, 2016	December 31, 2016	15%	Continue implementation of "Operator Qualification Program" (OQP) specific for Durham York. Scope includes specific modules that address safety, environmental (with specific training on emissions mitigation), boiler and auxiliary system training. This training is highly tailored to Waste to Energy facilities, and incorporates learnings from Covanta's fleet of 41 North American facilities. Advance individual training plan for each Operator that is tracked on a comprehensive database with oversight by the Corporate Training Group. Plan includes for both technical training modules and field experience using a pre-qualified pool of personnel. In addition to OQP, the Operators are required to study for, achieve and maintain provincially mandated Steam Engineer licenses. This is administered by the Technical Standards and Safety Authority (TSSA). **All Operators have tickets appropriate for their position**
MAINTENANCE CONSIDERATIONS						
Baghouse hoppers - evaluate best combination of hopper vibrators and level probes	Maintenance Sup	In Progress	June 1, 2016		10%	Prevent false positive high level alarms
Change out Roof and Sidewall thermocouples	Maintenance Sup	In Progress	June 1, 2016	June 3, 2016	75%	Sidewall thermocouples changed out. 2 of 3 roof thermocouples changed out. Remaining one will be done in Fall, 2016 outage.
Evaluate options for clearing IGR nozzles on the run	Maintenance Sup	In Progress	October 15, 2016	October 30, 2016	0%	Will require a Boiler outage in Fall, 2016
Review 2nd pass hopper platform and rod out ports	Maintenance Sup	In Progress	June 1, 2016		50%	Review current access platforms and rod out port locations (including cannon location). Determine if additional upgrades are required.

Appendix C: Observations and Potential Solutions

PART C.1 SPECIFIC PROJECTS IDENTIFIED FOR UNIT #1

The following table identifies Covanta observations from Phase I and potential solutions from the inspection of Unit #1 when it was off line. The Findings in Column A represent the specific observation with Column B being the Mitigation which is the general goal of the potential solutions identified in Column C. The projected schedule for addressing the proposed solution(s) is provided in Column D with the understanding that many of these tasks will be works in progress.

These findings may or may not be related to the elevated D&F test results, however, they are being raised because future operations will be amended to address these findings. The range of Potential Solutions is not a conclusive or binding list with any final adjustments to facility design or operation being reflective of operating observations when Unit #1 returns to service.

Item	(A) Findings	(B) Mitigation	(C) Potential Solutions	(D) Schedule
1	Elevated level of residue in 2nd/3rd pass hopper	Control level of residue in hopper	Adjust air cannon operation – pressure/ frequency	June 2016
			Review recent hopper access and cleaning upgrades (i.e., platforms and poke holes) to determine if additional access is required.	June 2016
			Modify SOP to monitor level more frequently	June 9, 2016
			Temporarily instrument the system with thermocouples to determine potential benefits as an early warning indication for hopper plugs.	June –July 2016
2	On line blasting of buildup in hopper may have carried residue downstream in the process	Modify cleaning procedure	Item 1 should minimize need for blasting, however, if blasting is required, develop SOP for hopper cleaning with goal of minimizing downstream carryover.	June 9, 2016
3			Avoid excessive residue buildup in hoppers that could	

	Ash buildup between bags in baghouse	Improved monitoring and inspection	cause material to collect between bags.	June 9, 2016
			Implement enhanced start-up, shutdown and off line operation SOP's.	
			Adjust procedures to include more frequent visual inspections and enhanced monitoring of baghouse differential pressure	
4	Hi hopper level deactivates baghouse pulsing in a module	Avoid false indication of elevated residue in hopper	Evaluate best combination of hopper vibrators and level detectors to prevent false positive hi level alarms	June - July 2016
			If hi level annunciated – immediate inspection to re-engage pulse system implement with SOP	June 9th, 2016
5	Roof and sidewall thermocouples were not operating as planned	Fix roof TC and replace side wall TC will new design	Provides effective trending of key parameter relevant to dioxin formation mechanisms.	June-July 2016
6	Several IGR air ports plugged	Prevent pluggage and/or improve visual assessment of port status	Improve on line visual monitoring	Q3 2016
			Evaluate options for monitoring plugged nozzles and/or unplugging the nozzles while on line	June-July 2016
7	Plugged nozzles in evaporation tower	Avoid pluggage	Increase inspection frequency and frequency of lance/nozzle maintenance	June-July 2016

PART C.2 ADDITIONAL DURHAM YORK TRAINING

As a result of the Phase I findings, several Standard Operating Procedures (SOPs) have been developed to prevent a re-occurrence of the issues identified. The specific issues that are addressed by each respective SOP are identified in the notes section of the Phase I checklist provided in Appendix B. New SOPs and revised routines now include:

- 2nd pass Hopper Air Cannon Usage SOP
- 2nd Pass Hopper SOP to Monitor Levels
- 2nd Pass Hopper Plattco Temperature Measurement SOP
- IGR Air Nozzle Pluggage Monitoring SOP
- Plugged Nozzles in Evaporator Tower Preventative Maintenance Routine
- 2nd Pass Hopper Blast Cleaning SOP
- Baghouse Operation Start-Up/Shutdown and Offline Operation SOP
- Baghouse High Hopper Alarm Response SOP

All shift operators will be trained and signed off on all new and/or revised SOPs prior to starting their first shift which follows Unit #1 re-start. These training records and SOP's are available at the DYEC site for inspections by the Regions and MOECC. Additional long term training is also planned as noted below:

Control Room Operator Training (Target Timing September 2016)

- Train 3 Auxiliary Operators to the point where they can relieve for CRO vacancies
- Develop Shift Supervisors to a point where they can relieve for CRO vacancies
- This includes specialized environmental emissions mitigation training

Operator Training – General (Target Timing Q4-2016)

- Continue implementation of the "Operator Qualification Program" (OQP) specific for Durham York. Scope includes specific modules that address safety, environmental (with specific training on emissions mitigation), boiler and auxiliary system training. This training is highly tailored to Waste to Energy facilities, and incorporates learnings from Covanta's fleet of 41 North American facilities
- Advance individual training plans for each Operator that are tracked on a comprehensive database with oversight by the Corporate Training Group.
- Plan includes for both technical training modules and field experience using a pre-qualified pool of personnel
- In addition to OQP, the Operators are required to study for, achieve and maintain provincially mandated Steam Engineer licenses. This is administered by the Technical Standards and Safety Authority (TSSA).