



**VERIFICATION REPORT OF THE PROJECT UNTITLED «DESTRUCTION OF OZONE
DEPLETING SUBSTANCES USED AS REFRIGERANTS REMOVED FROM
REFRIGERATION, FREEZER AND AIR-CONDITIONING» FOR THE PERIOD OF
2009 TO 2011**

For:

Recyclage ÉcoSolutions inc.

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January 25, 2017

Verification Statement

To the Management of:

RECYCLAGE ÉCOSOLUTIONS INC.

Enviro-accès inc. (Enviro-access) has been retained by Recyclage ÉcoSolutions inc. (RES) to verify, as an independent third party, the 2009-2011 GHG emission reductions report for the project entitled «*DESTRUCTION OF OZONE DEPLETING SUBSTANCES USED AS REFRIGERANTS REMOVED FROM REFRIGERATION, FREEZER AND AIR-CONDITIONING APPLIANCES*»(GHG Report). The GHG Report was prepared in accordance with the standard ISO 14064-2:2006, using a large part of the methodology of the *Protocol 3 Destruction of Ozone Depleting Substances Contained in Insulating Foam or Used as Refrigerants Removed From Refrigeration, Freezer and Airconditioning Appliances* of the *Regulation respecting a cap-and-trade system for greenhouse gas emission allowances (SPEDE)* of the Quebec Government. The total quantity of GHG emission reductions reported for the period beginning on August 11, 2009 and ending on February 3, 2011, is 244,248 tCO₂e. The yearly breakdown is presented below:

- ✓ 2009: 77,140 tCO₂e;
- ✓ 2010: 87,561 tCO₂e;
- ✓ 2011: 79,547 tCO₂e.

The verification was conducted according ISO 14064-3:2006 to reach a reasonable level of assurance. The scope of the verification includes the activities of the project (recycling facility of Recyclage Écosolutions inc. located in Laval, north of Montreal in Canada and incineration facility of Clean Harbor's, located in the town of Eldorado, Arkansas, United States), and the following GHG type: CFC-12.

The objectives of the verification are to express an opinion whether the GHG Report comply with the requirements of the standard ISO 14064-2:2006, and that the quantities of GHG emission reductions reported are reliable and free of material misstatement.

The verification team reviewed RES's GHG Report and performed the following procedures:

- ✓ Visual inspection of equipment and review of GHG emissions sources reported;
- ✓ Assessment of the baseline justification;

- ✓ Assessment of the sources, sinks and reservoirs (SSR) of the baseline and project scenarios;
- ✓ Assessment of the calculation methodologies used;
- ✓ Assessment of maintenance and calibration of measurement devices;
- ✓ Retracing data used for GHG emissions calculations;
- ✓ Recalculations of GHG emission reductions;
- ✓ Assessment of the quality control procedures on GHG data and calculations;
- ✓ Assessment of the data management systems;
- ✓ Assessment of the GHG report;
- ✓ Assessment of reporting and monitoring systems.

GHG data are based mainly on historical measurements and information.

Based upon verifiable evidences, Enviro-access concludes with a reasonable level of assurance that the GHG Report comply with all ISO 14064-2:2006 requirements and that the quantities of GHG emission reductions reported for 2009, 2010 and 2011 contain no material discrepancy.

Manon Laporte, B.Sc., M. B.A.
President and CEO
Enviro-access inc.

Standards Council of Canada accreditation number: 1009-7/2

Stéphanie Rondou-Pontbriand, Jr Eng., M. Sc.
Lead Verifier

Date: January 25, 2017

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1. INTRODUCTION

The greenhouse gas (GHG) project consists of the destruction of ozone depleting substances (ODS) used as refrigerants extracted from refrigeration, freezer and air-conditioning end-of-life appliances. The goal of the project is to safely and environmentally destroy ODS extracted from end-of-life appliances.

The GHG project was initially developed in order to apply to the Register of offset credit projects of the Quebec Government. The GHG project was therefore carried out following the information, than available on the *Protocol 3 of the draft Regulation respecting a cap and trade system for greenhouse gas emission allowances (SPEDE)*. Since the protocol entered into force in 2014, thus after the completion of the GHG Project, introducing significant changes regarding the monitoring requirements, only a portion of the GHG emission reductions generated by the GHG project was registered under the SPEDE for the period 2009 to 2011.

As a result, RES decided to submit to CSA CleanProject registry the remaining GHG emission reductions that were not registered under the SPEDE, using the same methodology than Protocol 3 of the SPEDE, except for the monitoring procedure. This verification report presents findings and conclusions of the verification activities undertaken by Enviro-access, as a third party auditor.

2. CONTACT INFORMATION

Table 1 : Contact Information of the Project Proponent and the Verification Body

Information on the Project Proponent	Recyclage ÉcoSolutions inc. 1000, rue du Haut-Bois, 1er étage Sherbrooke (Québec) J1N 3V4
Contact Person for the Project	Arnold Ross <i>Technical Director</i> 1000, rue du Haut-Bois, 1er étage Sherbrooke (Québec) J1N 3V4 aross986@gmail.com
Representative of the Verification Body	Manon Laporte <i>President and CEO</i> Enviro-access inc. 268, Aberdeen Street, Suite 204 Sherbrooke (Québec) J1H 1W5 T: (819) 823-2230, ext. 1 mlaporte@enviroaccess.ca
Verification Team	<u>Lead Verifier</u> Stéfanie Rondou-Pontbriand, Jr Eng., M. Sc. 410, St-Nicolas Street, Suite 236 Montreal (Quebec) H2Y 2P5 T: (514) 293-0165 srondoupontbriand@enviroaccess.ca <u>Verifier and Technical Expert</u> Mathieu Muir, Eng., M. Env., GHG-V 268, Aberdeen Street, Suite 204 Sherbrooke (Quebec) J1H 1W5 T: (819) 823-2230, ext. 2 mmuir@enviroaccess.ca <u>Internal Reviewer</u> Maude Lauzon-Gosselin, Eng., GHG-IQ 410, St-Nicolas Street, Suite 236 Montreal (Quebec) H2Y 2P5 T: (514) 293-0165 mlauzongosselin@enviroaccess.ca

3. VERIFICATION DETAILS

3.1 Objectives

The objectives of the verification are to express an opinion whether the GHG Report complies with the requirements of the standard ISO 14064-2:2006, and that the quantities of GHG emission reductions reported are reliable and free of material discrepancy.

3.2 Project title

The project title is “Destruction of ozone depleting substances used as refrigerants extracted from refrigeration, freezer and air-conditioning end-of-life appliances”.

3.3 Date when the project began

The appliances collection activities started in spring 2008 with the Recyc-Frigo program from Hydro-Quebec. The reporting period of the GHG project has started August 11, 2009.

3.4 Expected lifetime of the project

Initially, the project was expected to last for a period corresponding to the expected lifetime of the extraction equipments, which is approximately 15 years.

In 2016, RES sold the extraction equipments to another entity.

3.5 Latitude and longitude of the project

RES extraction facility was located at 3700 Francis-Hughes street, in Laval, Québec. The exact GPS coordinates are as follows:

- Latitude: 45° 35' 48.74''
- Longitude: - 73° 44' 44.04''

The destruction facility is located at 309 American Circle, El Dorado, Arkansas, USA. The exact GPS coordinates are as follows:

- Latitude : +33° 12' 24,20"
- Longitude : - 92° 37' 51,72

3.6 Ownership verification

Enviro-access assessed the evidences (e.g. letters, contracts, agreements) provided by RES in order to demonstrate its ownership of the project and its ownership of the GHG emission reductions.

Enviro-access concludes that the project and the GHG emission reductions belong to RES.

3.7 Project methodology selected by RES

The GHG project was initially developed in order to apply for offsets to be used to compensate large regulated emitters of Quebec and started before the details of the methodology indicated in the Protocol 3 of the SPEDE were available.

Previous verification of RES's Project under the SPEDE has confirmed that RES has followed the methodology indicated in the Protocol 3, except for one sampling analysis requirement. Indeed, the protocol 3 of the SPEDE requires a specific sampling analysis for each ODS container destroyed. RES has proceeded to the sampling analysis of some cylinders, but not all of them.

However, RES proposed an alternative methodology to confirm that the ODS content of the cylinders destroyed was CFC-12. Indeed, RES explained and provided evidence that all the ODS destroyed between 2009 and 2011 were extracted from appliances provided by the Quebec and Nova Scotia programs, which were governed by strict contractual requirements and aimed at the recovery of appliances over 10 years old and 15 years old respectively. Thus, the most recent devices collected in 2010, for which gases were destroyed in 2011 (last destruction in February 2011), were manufactured respectively before 2000 (Quebec) and 1995 (Nova Scotia). RES has demonstrated, through various studies and the Protocol of Montreal, that the use of CFC-12 in appliances built before 1995 was the standard. In addition, RES provided the report "Generation and Diversion of White Goods from Residential Sources in Canada" prepared by the Canadian Appliance Manufacturers Association for the Government of Canada. This report indicates that Canadian manufacturers have begun to use HFCs (including HFC- 134a) in 1994. This document also states that the manufacture of CFCs was no longer authorized since 1996. Based on these elements, RES has excluded appliances manufactured after 1995 from the actual GHG project. To confirm the exclusion of those appliances, Enviro-access, traced back the appliances that filled the cylinders. Cylinders storing other ODS than CFC-12 were removed from the project. This information was available through RES production registry. This registry contains various information, such as the origin of the appliance, serial number, year of manufacturing, and the extraction line (CFC-12 or other) used for the extraction of the ODS.

In addition and to be conservative, RES used in its calculations for all cylinders for which this information were not available, the lowest concentration of CFC-12, the highest mass of water, and the mass of water and high boiling residu (hbr), found among the analysed cylinders.

3.8 Verification Fundamentals

Table 2 : Verification Fundamentals

Level of assurance	Reasonable
Verification scope	Baseline scenario Refrigerant are released into the atmosphere
	Physical infrastructures, activities and technologies Extraction and destruction of ODS from refrigeration, freezer and air-conditioning end-of-life appliances
	Sources and/or Sinks ✓ Transportation of ODS from the point of origin to the destruction facility ✓ Leakage and maintenance during the continuous operation of equipment ✓ Incomplete destruction at the destruction facility ✓ Oxidation of carbon contained in the destroyed ODS ✓ Destruction of ODS in a destruction facility
	GHG Types CFC-12
	Time Period Covered August 11, 2009 to February 3, 2011
Materiality threshold	GHG emissions 5%
Criteria	ISO 14064-2:2006 — Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emissions reductions or removal enhancements

3.9 Accreditation Body

Enviro-access was accredited under ISO 14065 by the Standards Council of Canada (SCC) under the "Greenhouse Gas Accreditation Program (GHGAP)" on July 29, 2011. The scope of Enviro-access's accreditation includes the sector G3 SB – GHG emissions reductions from industrial processes (non-combustion, chemical reaction, chemical fugitive emissions, flare & venting from oil, and other). The SCC coordinates are shown below.

Standards Council of Canada	T : (613) 238-3222
55, Metcalfe, suite 600	F : (613) 569-7808
Ottawa (Ontario) K1P 6L5	E-mail : info@ccn.ca
Canada	

3.10 Methodology

The verification was conducted in accordance of *ISO 14064-3:2006 – Specification with guidance for the validation and verification of greenhouse gas assertions* principles and guidelines. The main steps of the verification are the following:

Table 3 : Schedule of the Verification Activities

Activity	Date
Service proposal	October 21, 2016
Engagement	October 24, 2016
Initial documentation review and preparation of verification and sampling plans	November 8 to 14, 2016
Site visit – destruction site	January 13, 2015
Site visit – extraction site	January 28, 2015
GHG data and information assessment	November 14 to 18, 2016
Draft report and Internal review	November 21 to December 22, 2016
Final report	December 23, 2016

The verification team reviewed RES's GHG Report and performed the following procedures:

- ✓ Visual inspection of equipment and review of GHG emissions sources reported;
- ✓ Assessment of the baseline justification;
- ✓ Assessment of the sources, sinks and reservoirs (SSR) of the baseline and project scenarios;
- ✓ Assessment of the calculation methodologies used;
- ✓ Assessment of maintenance and calibration of measurement devices;
- ✓ Retracing data used for GHG emissions calculations;
- ✓ Recalculations of GHG emission reductions;
- ✓ Assessment of the quality control procedures on GHG data and calculations;
- ✓ Assessment of the data management systems;
- ✓ Assessment of the GHG Report;
- ✓ Assessment of reporting and monitoring systems.

Following the review of the documents, the verification team can request clarifications (clarification requests) or request corrections to address noncompliances (corrective action requests).

A clarification request (CL) is made by Enviro-access to stakeholders involved in the preparation of the emissions reductions report when the documentation or information is not sufficient or complete. A corrective action request (CAR) is made by Enviro-access when a material discrepancy is found and must be addressed to allow Enviro-access to conclude positively.

A first version of the RES's GHG Report was submitted to the verification team on November 8, 2016. No CAR was made. One CL was made.

4. VERIFICATION FINDINGS

4.1 Remaining issues from last verification

This is the first verification of RES's Project under the application to CSA CleanProject registry. Therefore, there were no remaining issues from last verification.

4.2 Visual inspection of equipment and review of GHG emissions sources reported

A site visit was held during the verification of RES's Project submitted to the SPEDE. A review of the GHG emissions sources reported was made throughout that site visit.

No unreported source of emissions was identified by the verification team.

4.3 Assessment of the baseline scenario justification

RES performed a barrier analysis in order to identify the most plausible baseline scenario.

Enviro-access concludes that the baseline scenario used by RES is adequate.

4.4 Assessment of the sources, sinks and reservoirs (SSR) of the baseline and project scenarios

The identification of the SSRs of the baseline and project scenarios has been revised.

Enviro-access concludes that the SSRs used by RES for the baseline and project scenarios are adequate.

4.5 Assessment of the calculation methodologies used

All calculation methodologies, including emission factors and global warming potentials (GWP) used by RES were reviewed.

Enviro-access concludes that the calculation methodologies used by RES are adequate for quantification need and do not lead to material discrepancy.

4.6 Assessment of maintenance and calibration of measurement devices

Calibration and maintenance programs for measurement devices used to collect GHG data and information were assessed by the verification team.

Enviro-access concludes that equipment calibration and maintenance of measurement devices are sufficient.

4.7 Retracing data used for GHG emissions calculation

Enviro-access has retraced and confirmed adequacy of all raw data used to calculate the GHG emission reductions.

Findings are shown in the following table.

Table 4 : Findings from Verification Testing

Data Verified	Finding
Mass of cylinders	The quantity of ODS destroyed is determined with the masses of cylinders before and after destruction. The masses recorded by the destruction facility were compared to the masses used for the GHG emission reductions calculations. No deviation was found.
Concentration of ODS in cylinders	The concentration of CFC-12 in the cylinders is determined by sample analysis. As previously mentioned, RES has not proceeded to a sample analysis for each cylinder. To be conservative, RES used in its calculations, the lowest concentration of CFC-12 among the analysed cylinders for all cylinders for which concentrations were unknown. No discrepancy was found between the lowest concentration analysed and the value used for the calculations.
Mass of water and high boiling residu (hbr) in cylinders	The mass of water and high boiling residu (hbr) in the cylinders is determined by sample analysis. As previously mentioned, RES has not proceeded to a sample analysis for each cylinder. To be conservative, RES used in its calculations, the highest mass of water and hbr among the analysed cylinders for all cylinders whose concentrations were unknown. No discrepancy was found between the lowest concentration analysed and the value used in calculation.

Enviro-access concludes that the data used by RES contain no material discrepancy.

4.8 Recalculations of GHG emission reductions

Enviro-access recalculated the GHG emission reductions.

No discrepancy was found between the results of recalculation performed by the verification team and the GHG emission reductions reported by RES.

4.9 Review of quality control program and errors detection measures

The quality control program and errors detection measures were assessed throughout the verification activities.

Enviro-access concludes that the quality control program and errors detection measures in place are sufficient.

4.10 Assessment of the data management systems

The data management systems, including retention of documents and records were assessed throughout the verification activities.

Enviro-access concludes that the data management systems in place are sufficient for GHG emission reductions reporting according to ISO 14064-2 requirements.

4.11 Assessment of reporting and monitoring systems

Enviro-access reviewed the monitoring plan and its application. RES's Project was develop in accordance with the Protocol 3 of the SPEDE, except for the element discussed in section 3.7. RES followed the monitoring plan indicated in the Protocol 3 of the SPEDE, except for the sampling analysis of each cylinder. As previously explained, RES provide a alternative methodology to confirm the kind of ODS destroyed, and a conservative approach to determine its concentration.

Enviro-access concludes that the monitoring plan has been well followed and complies with the requirements of ISO 14064-2 standard.

4.1 Assessment of the GHG report

Enviro-access reviewed the GHG Report.

Enviro-access concludes that the GHG Report complies with the requirements of standard ISO 14064-2 and of CSA CleanProject registry.

5. SUMMARY OF DISCREPANCIES

No discrepancy was identified during the verification activities.

6. SUMMARY OF UNRESOLVED ISSUES

No unresolved issue was identified during the verification activities.

7. SUMMARY OF OPPORTUNITIES FOR IMPROVEMENT

No opportunity for improvement was identified during the verification activities.

8. IMPARTIALITY AND COMPETENCY

Impartiality risk and competency assessments were performed to assess conflicts of interests (real and potential) and how to manage them according to an internal procedure and assess Enviro-access' capability to conduct the verification. No conflict was identified. Further details can be found in appendix 2.

9. VERIFICATION RECORDS

All documents and evidence provided by RES or collected in the course of verification activities (copies of written documents, pictures, electronic files, emails, etc.) are stored in electronic format on a server with secured access or in a folder with restricted access. All these documents will be retained for a minimum of seven years by Enviro-access.

The verification records can be provided upon request on reasonable grounds with the permission of RES.

10. FACTS DISCOVERED AFTER THE VERIFICATION

If significant discrepancies are discovered after the verification, Enviro-access shall be notified in writing as soon as possible. Where appropriate, the quantification report and the verification report will be rectified and the updated verification report will be provided.

APPENDIX

APPENDIX 1 - CONFLICT OF INTEREST REVIEW CHECKLIST

The verifier and the verification team declare that they are truly independent from the project, project proponent(s), quantifier, and/or other agents related to the project. No actual or potential conflicts of interest with the project proponent and the intended users of the GHG information have been identified. Guiding principles for verification activities are reproduced below.

	Yes	No	Details
Independence Remain independent of the activity being verified, and free from bias and conflict of interest. Maintain objectivity throughout the verification to ensure that the findings and conclusions will be based on objective evidence generated during the verification.	☒	☐	
Ethical conduct Demonstrate ethical conduct through trust, integrity, confidentiality and discretion throughout the verification process.	☒	☐	
Fair presentation Reflect truthfully and accurately verification activities, findings, conclusions and reports. Report significant obstacles encountered during the verification process, as well as unresolved, diverging opinions among verifiers, the responsible party and the client.	☒	☐	
Due professional care Exercise due professional care and judgment in accordance with the importance of the task performed and the confidence placed by clients and intended users. Have the necessary skills and competences to undertake the verification.	☒	☐	

APPENDIX 2 – VERIFICATION PLAN



**VERIFICATION PLAN OF THE GHG PROJECT UNTITLED “DESTRUCTION OF
OZONE DEPLETING SUBSTANCES USED AS REFRIGERANTS REMOVED FROM
REFRIGERATION, FREEZER AND AIR-CONDITIONING” FOR THE PERIOD OF
2009 TO 2011**

Prepared for:

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November 8, 2016

MANDATE DETAILS:

The following table summarizes the information related to the verification mandate of the GHG project untitled “Destruction of ozone depleting substances used as refrigerants removed from refrigeration, freezer, and air-conditioning” (GHG Project) of Recyclage ÉcoSolutions (RES).

Table 1: General Information for the verification mandate

Client	Recyclage ÉcoSolutions (RES)
Preliminary GHG Assertion	Emissions to be verified: 244,248 tCO ₂ e
Objectives	➤ Evaluate whether the GHG Project complies with verification criteria ➤ Confirm that the reported quantity of GHG reductions is free from material discrepancy
Criteria	ISO 14064-2:2006 — Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
Level of Assurance	Reasonable
Verification Scope	Baseline scenario
	As stated in figures 6.1 to 6.3 of the Protocol 3 of the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances
	Project
	As stated in figures 6.1 to 6.3 of the Protocol 3 of the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances
	Physical infrastructures, activities and technologies
	Extraction and destruction of ODS from refrigeration, freezer and air-conditioning end-of-life appliances
	Sources and/or Sinks
	✓ Transportation of ODS from the point of origin to the destruction facility ✓ Leakage and maintenance during the continuous operation of equipment ✓ Incomplete destruction at the destruction facility ✓ Oxidation of carbon contained in the destroyed ODS ✓ Destruction of ODS in a destruction facility
	GHG Types
Materiality threshold	CFC-12
	Time Period Covered
	August 11, 2009 to February 3, 2011
Materiality threshold	GHG emissions
	5%
Verification Standard	ISO 14064-3:2006 — Specification with guidance for the validation and verification of greenhouse gas assertions

Note: The verification plan may be revised as needed in the course of the verification activities if any material error, omission or misrepresentation is found by the verification team. In such a case, sampling may be increased and the revised verification plan will be communicated to the client.

REQUESTED DOCUMENTS AND RECORDS

Here is a list of the evidences and documents necessary to complete the verification:

- ✓ GHG Project report (received);
- ✓ GHG reductions calculation spreadsheet(s) (received);
- ✓ GHG Project Monitoring plan;
- ✓ Destruction certificates;
- ✓ All weight tickets (before and after destruction);
- ✓ All analysis reports indicating the ODS concentration, the humidity and the boiler residues;
- ✓ List of all processed appliances included to the GHG Project;
- ✓ List of all appliances received by RES during the GHG Project period;
- ✓ Cylinder fill tracking Excel spreadsheet;
- ✓ Process diagram of ODS extraction (received);
- ✓ Specifications of the ODS extraction (received);
- ✓ Evidence of maintenance and calibration of measurement devices used to collect data;
- ✓ Evidence of application of quality control, quality assurance checks(received);
- ✓ Evidence concerning data conservation and storage(received).

VERIFICATION ACTIVITIES TO BE UNDERTAKEN DURING THE MANDATE

The following table presents the verification activities to be held during the mandate.

Table 2 : Verification activities

ACTIVITIES	PROCEDURES	VERIFIERS
Verification of the calculation methodologies used for the GHG assertion	Evaluation of the calculation methodologies used against indicated references	Stéfanie Rondou-Pontbriand Mathieu Muir
Verification of the accuracy of GHG emissions' calculations	Recalculations of GHG emissions from raw data presented in the evidences provided	Stéfanie Rondou-Pontbriand Mathieu Muir
Verification of the raw GHG data and information used for the GHG emissions' calculations	Retracing data used for the GHG emissions calculation from invoices, measurement devices records, etc.	Stéfanie Rondou-Pontbriand Mathieu Muir
Verification of the compliance of the GHG Project report and the monitoring plan	Evaluation of the GHG Project report and the monitoring plan against the standard ISO 14064-2 requirements and the CSA report template.	Stéfanie Rondou-Pontbriand Mathieu Muir
Verification of the SSR and GHG emissions quantified	Comparison of the SSR included to the calculations and those indicated in the Protocol 3 of the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances	Stéfanie Rondou-Pontbriand Mathieu Muir
Verification of the quality control program and errors detection measures mechanisms	Assessment that the quality controls mechanisms in place are adequate.	Stéfanie Rondou-Pontbriand Mathieu Muir
Verification of the data management systems	Assessment that the data management systems, including retention of documents and records, are sufficient.	Stéfanie Rondou-Pontbriand Mathieu Muir

APPENDIX 3 – VERIFICATION SAMPLING PLAN



Sampling Plan

Version

1

Date

November 8, 2016

C-SPLAN-01

GHG sources

2

GHG emissions reductions to be verified
(tCO₂e):

244 248

tCO₂e

Materiality (GHG Emissions):

12 212 tCO₂e

	SSR	GHG Emissions (in tCO ₂ e)	Contribution to the total GHG emissions reductions included in the scope	Cumulative contribution to GHG emissions reductions	Comments
1	Emissions to atmosphere R12 - Baseline Scenario	261 780	107,18%	107%	
2	Substitute Refrigerant R12 - Project Scenario	(17 532)	-7,18%	100%	
Total		244 248	100,00%		

Test #	Risk identification	Risk Level	Risk level explanation	Procedures (activities used to collect evidence)	Evidence to be collected (must be sufficient and appropriate)	Verifier (s)	Justification for changes
1	Erroneous calculation	Low	The equations are simple and seem well controlled by RES. Moreover, there is only one type of refrigerant, so there are few iterations of calculations.	- Recalculation of all GHG emissions reductions. - Comparison of the calculation methodologies used against indicated references, including GWP and emission factors.	- GHG Calculations spreadsheet(s).	Stéfanie Rondou-Pontbriand Mathieu Muir	
2	Compliance of the GHG Project report and the monitoring plan against the standard ISO 14064-2 requirements and the CSA report template.	Low	The GHG Project report is simple and they are not to many requirements.	- Evaluation of the GHG Project report and the monitoring plan against the standard ISO 14064-2 requirements and the CSA report template.	- GHG Project report including the monitoring plan. - CSA report Template.	Stéfanie Rondou-Pontbriand Mathieu Muir	
3a	ODS WEIGHT - Discrepancies between raw data and data used to quantify GHG emissions	Medium	Many data to verified. However, a large portion was previously verified for another verification of the GHG Project.	- Comparison of data used for the calculation and data indicated on the weight tickets.	- All weight tickets (before and after destruction). - GHG Calculations spreadsheet(s) from Test #1. - List of all processed appliances included to the GHG Project. - List of all appliances received by RES during the GHG Project period.	Stéfanie Rondou-Pontbriand Mathieu Muir	
3b	ODS CONCENTRATION AND HUMIDITY - Discrepancies between raw data and data used to quantify GHG emissions	Medium	Many data to verified. However, the standard requirements are more flexible than the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances.	- Comparison of data used for the calculation and data indicated on the analysis reports.	- All analysis reports indicating the ODS concentration, the humidity and the boiler residues. - GHG Calculations spreadsheet(s) from Test #1. - List of all processed appliances included to the GHG Project. - List of all appliances received by RES during the GHG Project period.	Stéfanie Rondou-Pontbriand Mathieu Muir	
4	Calibration and maintenance of equipment not sufficient for ensuring data quality	Low	Many data to verified. However, the calibration and maintenance of equipment used to measure data was assessed for a former verification of this GHG Project.	a. Evaluate calibration procedure in place and ensure they are sufficient and used b. Retrace proof of their application for scale(s) used before and after the destruction.	- Calibration/maintenance procedure; - Calibration/maintenance certificates for the scale(s) used before and after the destruction.	Stéfanie Rondou-Pontbriand Mathieu Muir	
5	QC checks not sufficient or not efficient	Low	The level of quality control seems high, as it was initially a project submitted to the Government of Quebec within the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances framework.	a. Evaluate the controls in place and their outputs and confirm that they are sufficient. b. Conduct interviews with personnel responsible for these controls to confirm they are competent to perform the control. c. Evaluate evidence of the controls performed to confirm.	- QC check procedure; - Evidence of application of procedure.	Stéfanie Rondou-Pontbriand Mathieu Muir	
6	Inadequate or unsecure storage of GHG data and information	Low	The project started in 2009, and all relevant information seems available (in the Appendix of the GHG Project report).	a. Evaluate the retention procedures in place for GHG data and information to ensure they are adequate and sufficient. b. Conduct interviews with personnel responsible for retention of GHG data and information. c. Evaluate evidence of the application of retention procedures.	- Retention and storage procedure; - Evidence of the application of procedure.	Stéfanie Rondou-Pontbriand Mathieu Muir	
7	Relevant SSR not reported	Low	The SSR are identified clearly and none seems missing.	- From the Excel calculations spreadsheets (Test #1) and GHG Project report Test #2), review of SSRs and GHGs to ensure that they are all included and quantified.	- GHG Calculations spreadsheet(s). - GHG Project report.	Stéfanie Rondou-Pontbriand Mathieu Muir	

APPENDIX 4 - RES'S GHG PROJECT REPORT



*GHG Report for
CSA Standards GHG CleanProjects® Registry*

Presented by Recyclage ÉcoSolutions inc.

*DESTRUCTION OF OZONE DEPLETING SUBSTANCES USED AS REFRIGERANTS REMOVED FROM
REFRIGERATION, FREEZER AND AIR-CONDITIONING APPLIANCES*

*Using Methodology adapted from Protocol 3 of the
Regulation respecting a cap-and-trade system for greenhouse gas emission allowances (SPEDE)*

*Revision 1
January 2017*

*GHG Report for CSA Standards GHG CleanProjects® Registry by Recyclage ÉcoSolutions inc. for
Destruction of ozone depleting substances used as refrigerants removed from refrigeration, freezer and air-
conditioning appliances*

Version 1, Revision 1 – January 2017

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1. INTRODUCTION

RES developed the proposed GHG emission reduction project during the years 2009, 2010 and 2011, aiming at the destruction of ozone depleting substances (ODS) contained in foams or used as refrigerant in end-of-life refrigeration appliances. The project was initially developed following the protocol 3 of the Regulation respecting a cap and trade system for greenhouse gas emission allowances (SPEDE)¹. However, since the protocol entered into force only in 2014, even though the project met all the eligibility requirements, RES could not meet all the monitoring requirements of the protocol. Consequently, only a portion of the emission reductions was registered under the SPEDE. RES submits to CSA CleanProject registry the remaining GHG emission reductions that were not registered under the SPEDE. The aim of this report is to obtain recognition for the GHG emission reductions associated with ODS destruction using the same protocol, but with a revised monitoring procedure.

The project activity aims at reducing greenhouse gas (GHG) emissions by recovering and destructing mainly one Ozone Depleting Substances (ODS) contained in refrigeration appliances: CFC-12 (dichlorodifluorométhane). Until 1995², CFC-12 (or R12) was used as a refrigerant. In the absence of enforced regulation, this substance is currently released to the atmosphere once the refrigeration appliances reach their end-of-life. R12 is a powerful GHG, with high global warming potentials (GWP) of 10,900 tCO₂e per tonne of ODS³. The recovery and destruction process will therefore contribute to reduce GHG emissions and will significantly reduce the impact on the ozone layer.

The proposed project includes multiple instances since the ODS recovery facility and the destruction facility are not located at the same place.

The ODS recovery process is carried out by Recyclage ÉcoSolutions inc.⁴ at its recycling facility located in Laval, north of Montréal, Canada. RES recycling plant (also referred to as “SEG plant”) is a unique automated process that dismantles refrigerators and separates its oil and refrigerant components (SEG-1). Once the ODS are recovered, RES sends it to Clean Harbor’s⁵ “Eldorado” incineration facility located in the town of Eldorado, Arkansas, United States⁶.

¹ <http://www.mdelcc.gouv.qc.ca/changements/carbone/Systeme-plafonnement-droits-GES.htm>

² 1995 corresponds to the last year of the CFC phase out as per the Protocol of Montreal.

http://ozone.unep.org/Publications/MP_Handbook/Section_1.2_Control_measures/Annex_A_-_Group_1.shtml

³ The term ODS is used generically throughout the Project Document and specifically refers to either CFC-11 (in the case of blowing agent) or CFC-12 (in the case of refrigerant).

⁴ Hereafter RES or the project proponent or project developer. <http://www.recyclageeco.com/>

⁵ http://www.cleanharbors.com/browse_by_service/waste_disposal_and_recycling/incineration.html

⁶ The regulatory documentation required to transport the recovered ODS into the United States are prepared by Clean Harbors Environmental Services located in Quebec who is contracted yearly by RES to assume the transportation services of the ODS to the destruction facility in El Dorado, Arkansas.

RES is a company specialized in the recycling of equipment containing ozone-depleting substances (ODS). RES was started after the launch of Hydro-Quebec's "Recyc-frigo"⁷ programme in 2008, which was a provincial programme aiming at the reduction of residential energy consumption through the collect of old, energy intensive refrigerators. Since then, RES has been positioned as a pioneer in the recycling of used refrigerators in North America and operates a first-of-its-kind facility in Canada.

RES recycling plant has the capacity to process approximately 160,000 appliances per year, which corresponds to the recovery and destruction of around 44.11 tonnes of CFC-11 (blowing agent) and 20.857 tonnes of CFC-12 per year (refrigerant). This project concerns only refrigerant and not the blowing agent removal. The total emission reduction for the proposed project is 244 248 tCO₂e, for the years 2009, 2010 and 2011.

2. ISO REQUIREMENTS

2.1. RELEVANCE

All GHG sources, GHG sinks, GHG reservoirs (GHG SSRs) that are appropriate and are consistent with the project have been considered, identified and quantified in section 5. In the same section, justification has been provided in the case where GHG source, sink or reservoir was deemed not applicable or not significant.

The methodology used to calculate emission reductions achieved by the project is the Protocol 3: Destruction of ozone depleting substance contained in insulating foam or used as refrigerants removed from refrigeration, freezer and air-conditioning appliance of the Regulation respecting the cap-and-trade system for greenhouse gas emission allowances⁸. This methodology has been selected because it is the methodology developed for Quebec province and is the most stringent.

The project:

- Covers the destruction of ODS used as refrigerants removed from refrigeration, freezer or air-conditioning appliances recovered in Canada only;
- Extracts refrigerants from appliances in Canada;
- Stores refrigerants in hermetically sealed containers;
- Destructs refrigerants in concentrated form in an authorized facility in the United States of America.

Since the Protocol 3 was effective as of October 2014 and the project activities have occurred before, some monitoring requirements could not have been met. As such, the Protocol needs to be adapted to meet some monitoring requirements. Table 1 describes all the requirements of the Protocol for this project, whether they have to be adapted or maintained, with explanations if required.

⁷ For more information: <http://www.recycfrigo.com/en/index.html>

⁸ Regulation respecting the cap-and-trade system for greenhouse gas emission allowances, Q-2 A. http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&file=/Q_2/Q2_A.html

Table 1: Adaptations to Protocol 3

Requirements	Adapted or maintained	Explanation for the project
<i>Eligible ODS</i>	<i>Maintained</i>	The project covers the destruction of ODS used as refrigerants removed from refrigeration, freezer or air-conditioning appliances recovered in Canada only. ODS refrigerants are extracts from appliances in Canada. ODS used as refrigerants are the following type: • CFC-11; • CFC-12; • CFC-13; • CFC-113; • CFC-114; • CFC-115. The project concerns the extraction and destruction of CFC-12 only.
<i>Duration</i>	<i>Maintained</i>	The project has a duration of 2 years, which is less than the maximum of 5 years required. The extraction and destruction locations and methods are the same throughout the project.
<i>Location</i>	<i>Maintained</i>	The project includes removal of the refrigerants from the appliances that was only carried out in Canada.
<i>Additionnality</i>	<i>Maintained</i>	The project goes beyond the current practices, since in the absence of the project, appliances are recycled for the metals. ODS are released into the atmosphere.
<i>Extraction and destruction</i>	<i>Maintained</i>	All ODS are collected, stored and transported in hermetically sealed container and destroyed in concentrated form in an ODS destruction facility meeting Protocol requirements.
<i>Data management</i>	<i>Adapted</i>	The project records the following information as per Protocol requirements: • Chain of traceability, from point of origin to point of destruction of the ODS; • Serial number or identification number of the containers used for

Requirements	Adapted or maintained	Explanation for the project
		ODS storage and transportation; • Documents identifying persons in possession of appliances, foam and ODS at each stage in the project, and showing the transfer of possession and ownership of the appliances, foam and ODS; • Information on ODS extraction, specifying the number of appliances containing refrigerants from which ODS have been extracted, the name and contact information of the facility where the ODS are extracted and where the appliances are recycled, and process, training, and quality assurance, quality control and extraction process management processes; • Certificate of destruction for all the ODS destroyed under the project, issued by the facility that destroyed the ODS, by destruction activity; • Surveillance plan. The following point to be recorded has been adapted, since each containers were not analyzed as per protocol requirements: • Each certificate of sampling results used in the statistical approach to determined refrigerants concentration; • List of appliances stating age of each and proof of CFC12 banishment
Project surveillance	Maintained	A surveillance plan has been established to measure and monitor project parameters.
Determination of each quantity in container	Maintained	For the proposed project, each ODS container has been weighed at the destruction facility using a single scale to generate both full and empty weight tickets. In fact, the cylinder was left on the scale during the whole destruction process. Consequently, it meets the 2 days before

<i>Requirements</i>	<i>Adapted or maintained</i>	<i>Explanation for the project</i>
		<i>and 2 days after weight requirements. The scale at the destruction facility is calibrated every month and goes beyond the 3 months requirements of the Protocol.</i>
<i>Circulation</i>	<i>Adapted</i>	<i>Based on statistical analysis, the circulation requirements were not required.</i>
<i>Sampling</i>	<i>Adapted</i>	<i>The Protocol requires each ODS container to be sampled.</i> <i>Because not all containers were analyzed, a list of appliances stating the age of each appliance and proof of CFC-12 banishment from 1995 can prove that appliances recycle for the project were mainly containing CFC-12.</i> <i>During and after these destructions, several analyses were performed on cylinders or containers containing CFC-12. Based on these, it was possible through a statistical approach to determine in a conservative way the concentration of ODS when analysis were missing.</i>
<i>Determination of the total quantity of refrigerant sent for destruction</i>	<i>Maintained</i>	<i>The mass balance using the statistical approach to determine each type of ODS was used in addition of weight before and after destruction. Humidity and Hbr were also calculated in the statistical approach and could be used adequately.</i>
<i>ODS Moisture level</i>	<i>Adapted</i>	<i>Water saturation in gas varies in function of the temperature. However the spatial and temporal variation between the gas collection facility and destruction facility is unpredictable. To take in account this variable, it has been applied at least a minimum water quantity of 3.8% by weight for each ODS destruction⁹.</i>
<i>Destruction facility</i>	<i>Maintained</i>	<i>Each stage in a project carried out in the United States was conducted in accordance with the requirements of the Compliance Offset Protocol Ozone Depleting Substances Projects: Destruction of U.S</i>

⁹ Results will be made available to the auditor

Requirements	Adapted or maintained	Explanation for the project
		Ozone Depleting Substances Banks in affect during the project by the California Air Resources Board and the California Environmental Protection Agency.

2.2. COMPLETENESS

In section 5, all relevant GHG SSRs have been properly quantified. The quantification methodology is detailed in section 6 and a table summarizing the quantification is available. Proper justification and rationale has been provided for all relevant and irrelevant GHG emissions in section 5 and 6.

All relevant SSR are quantified and included per figure 6.3 of the Protocol 3 from Regulation respecting a cap-and-trade system for greenhouse gas emission allowances.

Table 2: SSR quantification

SSR	Description	Emission type	Baseline or project scenario	Included or excluded
SSR1 Appliance collection	Fossil fuel emissions related to the collection and transportation of end-of-life appliances	CO ₂	B, P	Excluded
		CH ₄	B, P	Excluded
		N ₂ O	B, P	Excluded
SSR2 ODS extraction	Emissions of ODS related to the extraction and collection of refrigerants from end-of-life equipment or equipment undergoing maintenance	ODS	B, P	Excluded
	Fossil fuel emissions related to the extraction and collection of refrigerants from end-of-life equipment undergoing maintenance	CO ₂	B, P	Excluded
		CH ₄	B, P	Excluded
		N ₂ O	B, P	Excluded
SSR3 Industrial and commercial refrigeration	ODS emissions related to equipment leakage and maintenance	ODS	B, P	Excluded
	Fossil fuel emissions related to the operation of refrigeration and air conditioning equipment	CO ₂	B, P	Excluded
		CH ₄	B, P	Excluded
		N ₂ O	B, P	Excluded
SSR4 Production of substitute refrigerant	Substitute refrigerant emissions during production	CO ₂ e	P	Excluded
	Fossil fuel emissions during the production of substitute refrigerants	CO ₂	P	Excluded
		CH ₄	P	Excluded
		N ₂ O	P	Excluded
SSR5	Fossil fuel emissions related to the	CO ₂	P	Included

SSR	Description	Emission type	Baseline or project scenario	Included or excluded
Transportation to the destruction facility	transportation of ODS from the point of origin to the destruction facility	CH ₄	P	Excluded
		N ₂ O	P	Excluded
SSR6 Refrigeration	Emissions of ODS related to leakage and maintenance during the continuous operation of equipment	ODS	B	Included
	Substitute refrigerant emissions related to leakage and maintenance during the continuous operation of equipment	CO ₂	P	Included
	Indirect emissions related to the use of electricity	CO ₂	B, P	Excluded
		CH ₄	B, P	Excluded
		N ₂ O	B, P	Excluded
SSR7 Destruction	Emissions of ODS related to incomplete destruction at the destruction facility	ODS	P	Included
	Emissions from the oxidation of carbon contained in the destroyed ODS	CO ₂	P	Included
	Fossil fuel emissions related to the destruction facility	CO ₂	P	Included
		CH ₄	P	Excluded
		N ₂ O	P	Excluded
	Indirect emissions related to the use of electricity	CO ₂	P	Included
		CH ₄	P	Excluded
		N ₂ O	P	Excluded

2.3. CONSISTENCY

The baseline and project scenarios have demonstrated equivalent level of service. Indeed, the project and baseline emissions have both been quantified for end-of-life appliances, thus not affecting the level of service.

This methodology is accurate and appropriate for the project, since it covers ODS refrigerant extracted from appliances and the only deviation is in regard with analysis. RES was able to demonstrate the origin of the gas for old appliances based on a statistical approach.

Appliances for 2009-2011 destruction are from energy saving programs in Quebec and Nova Scotia that are governed by strict contractual requirements and aimed the recovery of old appliances with more than 10 years and 15 years respectively. Thus, the latest equipment collected in 2010 including gas were destroyed in 2011 (last destruction in February 2011) were built not later than in 2000 or in 1995. RES has demonstrated, through various studies, literature review and the analysis of the Montreal Protocol that the use of CFC-12 in the devices built

before 1995 was the norm and common practice¹⁰. Furthermore, RES has provided the report "Generation and Diversion of White Goods from Residential Sources in Canada prepared by the Canadian Appliance Manufacturers Association for the Government of Canada, which indicates that Canadian manufacturers have started using HFCs (including HFC 134a) as of 1994.¹¹ This document indicates that the production of CFCs was no longer allowed as of 1996.

RES has performed a statistical analysis with all containers analysed in the past, including with those that were not analysed by an AHRI accredited lab in order to increase the amount of data. The statistical approach reflects the CFC-12 concentration for JACO offset projects during the same period and the same type of ODS (refrigerants from appliances). Actually, the CFC-12 value from statistical (94.93%) approach is comparable to the more conservative values reported by JACO.

Table 3 : JACO offset project for appliances recycling and refrigerant recovery

Promoter	Registr ¹	Registry number	Carbon offset number	Type	Gas
EOS climate	Climate Action Reserve ¹	CAR-1021	67 490	ARB Compliance	98.96% CFC-12
EOS climate	Climate Action Reserve ¹	CAR-1000	126 155	ARB Compliance	98.8% CFC-12
EOS climate	Climate Action Reserve ¹	CAR-995	122 800	ARB Compliance	96.9% CFC-12
EOS climate	Climate Action Reserve ¹	CAR-992	107 542	ARB Compliance	94.2% CFC-12
EOS climate	American Carbon Registry ²	ACR-193	84 418	ARB Compliance	97.5% CFC-12
EOS climate	American Carbon	ACR-240	129 700	ARB Compliance	99.4% CFC-12

¹⁰ UNEP (2005). *Production and Consumption of Ozone Depleting Substances under the Montreal Protocol 1986-2004*.

¹¹ Canadian Appliance Manufacturers Association (2005). "Generation and Diversion of White Goods from Residential Sources in Canada préparé par notamment le Canadian Appliance Manufacturers Association". Document prepared for Environment Canada.
<https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/mineralsmetals/pdf/mms-smm/busi-indu/rad-rad/pdf/can-whit-goo-rec-05-eng.pdf>. 97 pages and 9 annexes.

	Registry ²				
EOS climate	American Carbon Registry ²	ACR-214	145 580	ARB Compliance	98.4% CFC-12
EOS climate	American Carbon Registry ²	ACR-213	127 664	ARB Compliance	98.6% CFC-12

1- <https://thereserve2.apx.com/myModule/rpt/myrpt.asp?r=210>

2- <https://acr2.apx.com/myModule/rpt/myrpt.asp?r=111>

2.4. ACCURACY

Bias and uncertainties on estimations have been reduced as far as practical. To ensure bias and uncertainties reduction, a conservative statistical approach has been used. The student law has been used, and the lowest values have been applied as proportion. Samples used in the statistical approach were all analysis available.

2.5. TRANSPARENCY

The project proponent has disclosed all sources of information, calculations, data, and assumptions in the present GHG Report as well as the GHG assertion. The project documentation includes references to data sources for each parameter and assumption.

2.6. CONSERVATIVENESS

The project uses conservative assumptions and values to ensure that GHG emission reductions are not over-estimated. The Protocol 3 from the regulation requires extreme precision and does not allow flexibility. The adaptation using a statistical analysis is conservative. The results of CFC-12 used in the calculations are comparable to other analyses from JACO project during the same period, and even more conservative. RES has applied a conservative approach to avoid overestimation of GHG emission reductions calculated for the project.

3. PROJECT DESCRIPTION

This section provides descriptive details regarding the project and its location.

3.1. PROJECT TITLE

Destruction of ozone depleting substances used as refrigerants extracted from refrigeration, freezer and air-conditioning end-of-life appliances.

3.2. THE PROJECT'S PURPOSE(S) AND OBJECTIVE(S) ARE:

The goal of the project is to safely and environmentally destroy ODS extracted from end-of-life appliances. The objectives are to reduce GHG emissions, in addition to recycle ferrous and non ferrous metals, plastics, polyurethane, mercury and oil.

3.3. EXPECTED LIFETIME OF THE PROJECT

The project is expected to last for a period corresponding to the expected lifetime of each individual system, which is approximately 15 years.

3.4. TYPE OF GREENHOUSE GAS EMISSION REDUCTION OR REMOVAL PROJECT

The project recovers and destroys ODS used as refrigerant. ODS are known as having a high GHG potential. By recovering these ODS and have them destroyed, it avoids their emission to the atmosphere. The project will destroy the following types of ODS: R-12.

3.5. LEGAL LAND DESCRIPTION OF THE PROJECT OR THE UNIQUE LATITUDE AND LONGITUDE

RES facility is located at 3700 Francis-Hughes street, in Laval, Québec. The exact GPS coordinates are as follows:

- Latitude: 45° 35' 48.74"
- Longitude: - 73° 44' 44.04"

The refrigerant ODS extraction always occurred at RES Laval site and the destruction always occur at Clean Harbors site. The following table identifies the exact location of each activity.

Table 4: Identification of each activity

Location	ODS type	Activity	Address	GPS coordinates
RES – Laval	Refrigerant	Recovery	3700 Francis-Hughes avenue Laval (Québec) H7L 5A9	Latitude: +45° 35' 48,74" Longitude: - 73° 44' 44,04"
Clean Harbors	Refrigerant	Destruction	309 American Circle, El Dorado, Arkansas, USA 71730	Latitude: +33° 12' 24,20" Longitude: - 92° 37' 51,72

RES extraction site is shown on figure 1 and 2. It occupied lots 1602748, 1602749 and 2379322 of the cadastre of Quebec. RES operated the plant under the authorization certificate No. 400509710, issued August 12, 2008 by the Ministry of Sustainable Development, Environment and Parks (MDDEP). The plant is located in the IB-75_03 industry where specifically authorized industrial activity to the extent that the regulations on parking, storage and nuisances (noise, dust, fumes, odors, gases, flashes of light, heat and vibrations) are respected and that the plant has a certificate of authorization from the MDDEP.



**Figure 1: Extraction site in Laval (RES) -Satellite
(From de Bing)**

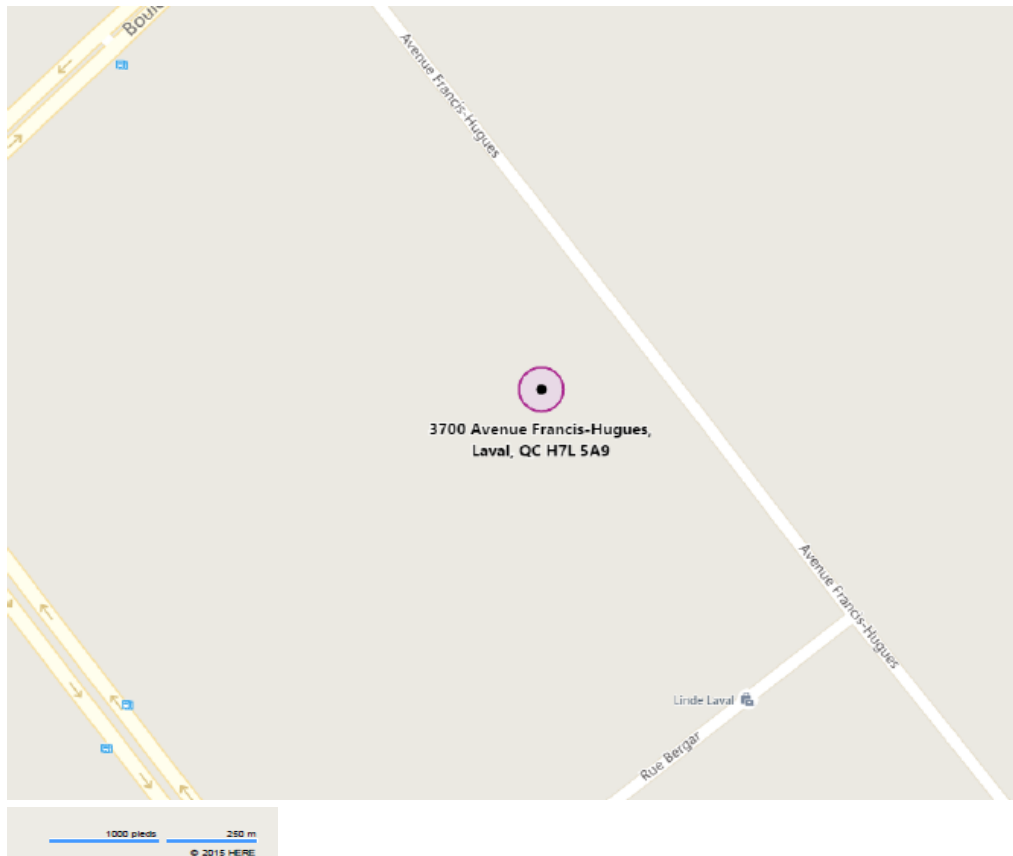


Figure 2: Extraction site in Laval (RES) - Map
(From Bing)

As shown on figures 3 and 4, Clean Harbors destruction site is located in an industrial area east of El Dorado, Arkansas, United States of America. The area is still devoted to heavy industry. And was once the site of an oil refinery.

Clean Harbors has the identification number EPA ARD069748192 and obtained the following permits (Clean Harbors, 2013)¹²

- RCRA (Resource Conservation and recovery act) Part B permit No. 10H-M018
- NPDES (National pollutant discharge elimination system) allowed no AR0037800
- ADEQ (Arkansas department of environmental quality) Air Operating Permit No. 1009-PDO-R1

¹² Clean Harbors (2013). Transportation & Disposal. In Clean Harbours. Facility Fact Sheet.
http://clark.cleanharbors.com/ttServerRoot/Download/12471_FINAL_El_Dorado_AR_Facility_FS_101107.pdf (webpage access in January 2014).

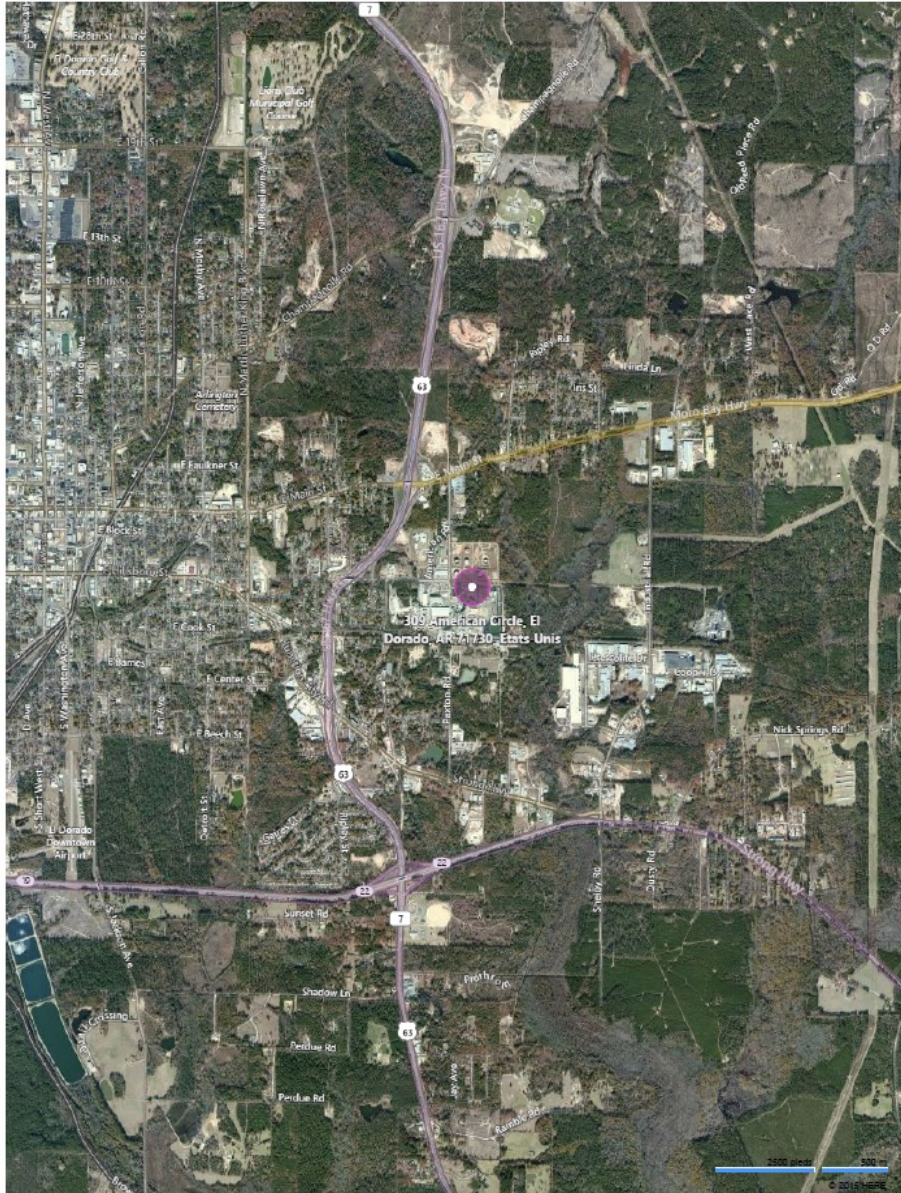


Figure 3: Location of the destruction site of Clean Harbors - Satellite
(From Bing)

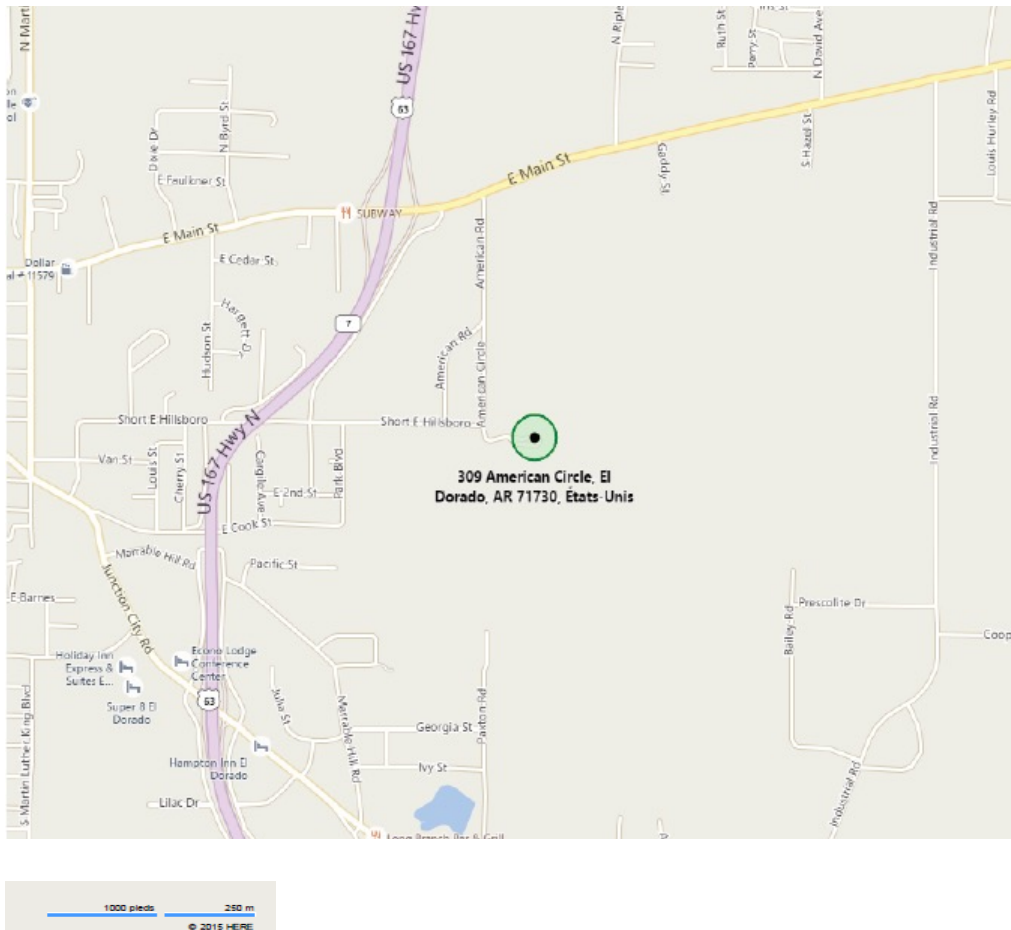


Figure 4: Location of the installation of destruction of Clean Harbors - Plan
(From Bing)

3.6. CONDITIONS PRIOR TO PROJECT INITIATION

The Regulation respecting halocarbons excludes the domestic sector. It only includes the commercial and industrial sectors, thus excluding domestic appliances. Consequently, before the proposed project, the domestic appliances were recycled exclusively for their metal components, while refrigerant were released into the atmosphere.

MDDELCC¹³ states in his website acknowledges that:

¹³ MDDELCC (2002). Quebec's strategy for managing ozone-depleting substances and their replacement products. In Gouvernement du Québec. Air – climate change. Atmospheric problem.
http://www.mddecc.gouv.qc.ca/air/saco_strategie-en/part-2.htm (Webpage accessed in March 2016).

"The domestic sector of ODS use is not covered by Québec's regulation, the scope of which is limited to the commercial and industrial sectors. It is illogical and unfair that the domestic sector should not be called upon to do its share to protect the ozone layer. This sector involves a multitude of small domestic refrigeration and freezer units containing small quantities of refrigerant (a few hundred grams). For the most part, the sector is made up of small family-run businesses having few employees. The craft and know-how are often handed down from generation to generation. It is imperative to make the labour force of this sector aware of the environmental considerations involved."

3.7. DESCRIPTION OF HOW THE PROJECT WILL ACHIEVE GHG EMISSION REDUCTIONS OR REMOVAL ENHANCEMENTS

The project will achieve GHG reduction by extracting and destroying ODS that would have otherwise been released to the atmosphere (in the absence of the proposed project). Once the halocarbons are extracted and destroyed, they won't be emitted to the atmosphere since the destruction is non-reversible.

3.8. PROJECT TECHNOLOGIES, PRODUCTS, SERVICES AND THE EXPECTED LEVEL OF ACTIVITY

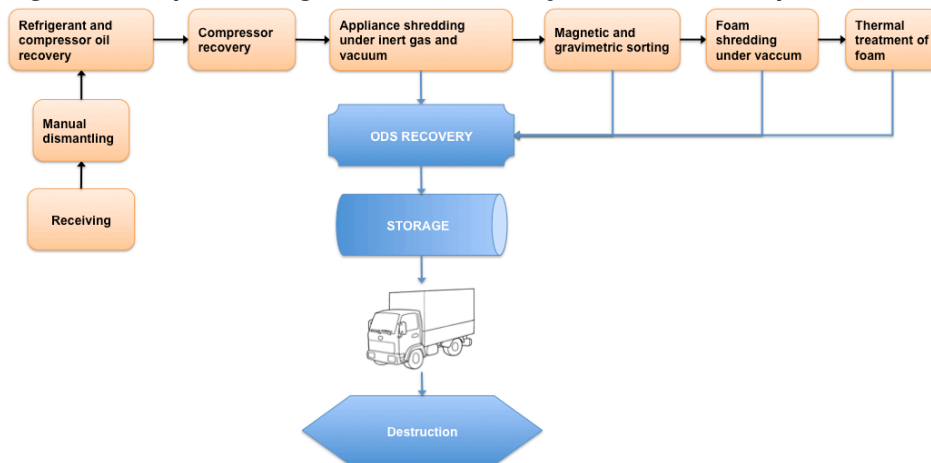
The specific technologies used, either for extraction and destruction, are described in the following section.

Recovery Technology (SEG)

IBW Engineering has developed the unique separation and extraction SEG technology used at RES facilities. It was successfully tried and proven in Europe during six years of operation. However, once implemented at RES' facility the technology has had to be adapted to North-American standards. Figure 5 summarizes the process that screens, separates, extracts, stores, transports and ultimately destroys the ODS.¹⁴

¹⁴ A detailed process diagram is available at Annex 2.

Figure 5: Simplified diagram of the recovery and destruction process



Refrigerator and freezer demanufacturing using SEG's recycling technology is the comprehensive environmental service for all those who want to implement a high-quality system for processing hazardous waste and reprocessing recyclable materials. The demanufacture of refrigerator and freezer appliances can be divided into four stages:

Collection and storage

The recycling process begins with the collection and storage of the end-of-life appliances. Careful handling and transportation is needed if damage to the appliances is to be avoided. In order to be able to provide accurate information on ODS recovery levels, the appliance type and the kind of insulation used must be scrupulously documented for every incoming unit.

Demanufacturing (pre-processing or SEG-1)

The actual demanufacturing process begins with the pre-processing stage known as Step 1 (or SEG-1). The pre-processing stage involves the evacuation and separation of the ODS/oil mixture from the appliance's cooling circuit. The ODS is filled into a compressed gas cylinder and is subsequently destroyed at an hazardous waste facility located in Arkansas¹⁵. The oil is collected and recycled. All components and modules containing contaminants or pollutants are removed from the appliance for separate processing.

To carry out Step 1 of the demanufacturing process, SEG has designed and developed its ODS evacuation facility. The equipment is designed to handle a wide range of practical recycling conditions and is capable of recovering other refrigerants such as ODS replacements and ammonia. Materials recovered during Step 1 include Oil, ODS/ammonia, Glass shelving, Capacitors, Mercury switches, Compressors.

¹⁵ The destruction activity may be undertaken in situ once feasibility is confirmed.

Demanufacturing (final processing or SEG-2)

Even if this project covers only refrigerant recovery, the blowing agent extraction process is presented. The recovery of ODS from the insulating material is the most significant aspect of any refrigerator/freezer appliance recycling process, as only about one third of the ODS in an appliance are in the cooling circuit. By far the largest fraction of these ozone-depleting substances is that which was used as the blowing agent to create the insulating foam.

In this processing stage, the pre-treated appliances are shredded and the various component materials are partially separated from one another. All ODS released during the shredding and separation operations are collected passing the gases over active carbon filters. The ODS are later desorbed from the filters, liquefied and stored.

This processing stage is generally referred to as Step 2 (SEG-2) of the demanufacturing process and SEG has developed Step 2 technology which can be used either in the form of a stationary installation or as a mobile processing plant. Which version is most suitable will depend on the customer's needs and the local conditions.

Materials recovered during Step 2 include steel, non-ferrous metal, plastics mixture, polyurethane granules, ODS. The mixture of non-ferrous metal and plastics is then sent for further processing to SEG's Materials Sorting and Production Centre where high-purity fractions of aluminum and polystyrene are retrieved.

Reprocessing and production of secondary raw materials

The final stage of SEG's refrigerator and freezer demanufacturing system covers the reprocessing of individual material flows from Step 2 and their marketing and resale. These materials include shredded aluminum, ferrous waste, polystyrene, ODS-free polyurethane foam, cabling, compressors, flat glass, and mercury.

A very small fraction of the shredded material (mixed plastics, rubber parts, cable waste, wood, etc.) cannot be usefully reprocessed and is used for energy recovery. The only components that are disposed of in landfill sites are capacitors. The ODS are dissociated in a high-temperature 'cracking' unit, generating hydrochloric and hydrofluoric acids. The refrigerant oil recovered from the appliances is sufficiently pure for the oil to be recycled.

For more detailed information about the SEG recycling technology, Annex 2 includes the complete recycling process flow diagram, which summarizes the main steps of the recovery (SEG) process. More details are also available online at:

http://www.seg-online.de/EN/techno/techno_index.html

Destruction Technology

Once the ODS are separated and recovered on-site, it is then destroyed in a high efficiency incinerator located at Clean Harbors' facility. The incinerator performance reaches an efficiency rate above 99.99%. There may be some GHG project emissions (PE) associated with the transportation and destruction process, such as transportation of ODS from the extraction unit to the destruction unit or the emissions associated with incomplete recovery and destruction. As per

the applicable methodology and in order to enhance conservativeness, these emissions will be accounted for as project emissions (PE).

Clean Harbors El Dorado is in charge of importing the dangerous good to Clean Harbors, Arkansas. They obtain permission from the authorities of the country before proceeding before any shipment of hazardous waste (in the US or in other countries signatory to the Basel Convention). This authorization is issued under the revised federal Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149). This authorization is issued following the process below:

- Export license application (notification) to Environment Canada and the Environmental Agency of the host country (United States Environmental Protection Agency or EPA). The application shall include the information on the material to be exported (type, classification, exact quantity), carrier, customs posts used, the receiver location and the method of destruction
- USEPA survey on demand and especially on the receiver location and gives its approval (non-objection notice) to Environment Canada after a rigorous verification process (permits and approvals including compliance);
- Environment Canada issues its export permits after receiving approval from the US EPA
- All papers must strictly follow each transport.

3.9. TOTAL GHG EMISSION REDUCTIONS AND REMOVAL ENHANCEMENTS, STATED IN TONNES OF CO₂ E, LIKELY TO OCCUR FROM THE GHG PROJECT (GHG ASSERTION)

Total GHG emission reductions are presented by year in the following table.

Table 5: GHG emission reductions

Year	PFC	HFC	SF ₆	CO ₂	CH ₄	N ₂ O	CFC-12		Total
	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(Kg)	(tCO ₂ e)	(tCO ₂ e)
2009	0	0	0	0	0	0	7 984	77 140	77 140
2010	0	0	0	0	0	0	9 063	87 561	87 561
2011	0	0	0	0	0	0	8 233	79 547	79 547

3.10. IDENTIFICATION OF RISKS

This GHG report covers destruction activities already performed, between 2009 and 2011. Emission reductions are permanent, since the destruction is sustainable and irreversible. Once destroyed, ODS cannot be released into atmosphere. Therefore no risk is associated to the proposed project.

3.11. ROLES AND RESPONSIBILITIES

This section presents the full contact information for the project participants.

<i>Project proponent:</i>	<i>Recyclage ÉcoSolutions (RES)</i>
<i>Address:</i>	<i>1000, rue du Haut-Bois Nord, 1er étage Sherbrooke (Québec) J1N 3V4</i>
<i>Phone:</i>	<i>819-829-1469</i>
<i>General email:</i>	<i>info@recyclageeco.com</i>
<i>URL:</i>	<i>http://www.recyclageeco.com/</i>

<i>Authorized project contact:</i>	<i>Groupe PureSphera inc</i>
<i>Address:</i>	<i>1000, rue du Haut-Bois Nord, 1er étage Sherbrooke (Québec) J1N 3V4</i>
<i>Phone:</i>	<i>(819) 822-9183 x223</i>
<i>General email:</i>	<i>info@puresphera.com</i>
<i>URL:</i>	<i>http://www.puresphera.com</i>
<i>Authorized project contact:</i>	<i>Arnold Ross</i>
<i>Title:</i>	<i>Technical director</i>
<i>Email:</i>	<i>Aross986@gmail.com</i>

<i>Project verifier:</i>	<i>Enviro-Accès</i>
<i>Address:</i>	<i>268, rue Aberdeen, Bureau 204, Sherbrooke (Québec) J1H 1W5</i>
<i>Phone:</i>	<i>(819) 823-2230</i>
<i>General email:</i>	<i>enviro@enviroaccess.ca</i>
<i>URL:</i>	<i>http://www.enviroaccess.ca/</i>
<i>Authorized project contact:</i>	<i>Manon Laporte</i>
<i>Title:</i>	<i>Présidente-directrice générale</i>
<i>Email:</i>	

3.12. ANY INFORMATION RELEVANT FOR THE ELIGIBILITY OF THE GHG PROJECT UNDER A

GHG PROGRAM AND QUANTIFICATION OF EMISSION REDUCTIONS

The project has a MDDELCC authorization certificate, showing that it complies with applicable regulations. RES operated the plant under the authorization certificate No. 400509710, issued August 12, 2008 by the MDDELCC.

Reducing emissions are verifiable, since the destruction took place and is documented in full, and sufficient detail. Indeed, reductions are measurable and certifiable because:

- Quantities of ODS extracted are measured precisely;*
- Quantities of ODS are measured precisely before destruction;*
- Quantities of ODS are precisely measured after the destruction;*
- Quantities of ODS destroyed are calculated by a mass balance;*
- A certificate of destruction is issued for each destruction.*

The project will be verified against a protocol adapted from the Protocol 3 of the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances and in accordance with the principles of ISO14064-2.

3.13. SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

This section is non applicable.

3.14. RELEVANT OUTCOMES FROM STAKEHOLDER CONSULTATIONS AND MECHANISMS FOR ON-GOING COMMUNICATION.

This section is non applicable.

3.15. DETAILED CHRONOLOGICAL PLAN

The appliances collection activities started in spring 2008 with the Recyc-Frigo program from Hydro-Quebec and with SEG technology commissioning. Recyc-Frigo is a provincial program aiming at the reduction of residential energy consumption by collecting old and inefficient appliances (end-of-life). As of spring 2008, RES started to recycle refrigerant in addition of blowing agent contained in insulation foams. All the GHG emission reductions associated with the destruction of blowing agent for this project are already included in a project approved by the ministry of environment (MDDELCC) in 2015. Even with the proof of origin of the refrigerant and the statistical approach, RES could not meet all the monitoring requirements of protocol 3. Three destructions have been deemed eligible. They all occurred at Clean Harbors Facility in El Dorado,

Arkansas. The first one occurred from August 11th to August 20th 2009, the second one occurred from April 28th to May 6th 2010 and the third one occurred from January 20th to February 3rd 2011.

RES project was initiated in 2008, following the launch of Recyc-Frigo program. The main stages of implementation of this project RES are:

- i) April 2008 to end of the project: Recyc-Frigo Hydro-Québec program. The program was the recovery of refrigerants and blowing agent from April 2008 to March 2012
- ii) April 2008: RES early operations in 3700 Francis-Hughes Laval;
- iii) August 2008: Obtaining the certificate of authorization for the installation and operation of the SEG-2 process;
- iv) August 11th to August 20th 2009: First destruction from cylinders at Clean Harbors Facility in El Dorado, Arkansas site (called destruction 1).
- v) June to December 2010: The pilot project of the program "Pull the Plug to Save" Nova Scotia Power. All appliances collected were transported to the RES plant in Laval, Quebec;
- vi) April 28th to May 6th 2010: Second destruction from cylinders at Clean Harbors Facility in El Dorado, Arkansas site (called destruction 2).
- vii) 2011: Following the pilot program "Pull the Plug to Save" Nova Scotia Power. Appliances collected were transported to the RES plant in Laval, Quebec.
- viii) January 20th to February 3rd 2011: Third destruction from cylinders at Clean Harbors Facility in El Dorado, Arkansas site (called destruction 3).

4. SELECTION AND JUSTIFICATION OF THE BASELINE SCENARIO

For the selection and justification of the baseline scenario, the "CDM Tool for the demonstration and assessment of additionality" version number 6.0.0. is used to identify all realistic and credible baseline alternatives. All plausible scenarios ("R" for refrigerant) are listed in the applicable methodology in the "Procedure for the selection of the most plausible baseline scenario". From the analysis, the most plausible baseline scenario will be identified.

The alternatives project activities are the following:

- R1 – The proposed project activity, but not performed as offset project
- R2 - Products are disposed into an incineration facility and thereby ODS refrigerants are destroyed
- R3 - Atmospheric release of the ODS refrigerant or partial capture and destruction
- R4 - Atmospheric release of the ODS refrigerant or partial capture and reuse in existing products

The following alternatives are not realistic and have been discarded from further analysis:

- *R2 is not a realistic alternative since there is no such incineration facility in Québec. No incinerator is properly equipped to directly incinerate refrigeration appliances without previous separation and extraction. Furthermore, the only three incinerator facilities in Quebec do not accept appliances as per municipal regulation¹⁶.*
- *R4 is not a possible alternative since the reuse in existing products (R12) goes against the provincial regulation. Indeed, the reuse of ODS has been banished since December 2004¹⁷.*

Consistency with laws and regulations

As previously mentioned, there is a regulation prohibiting the released of CFC-12 refrigerant to the atmosphere, therefore Alternative R3 does not comply with mandatory applicable legislation. However the regulation has several loopholes that make it ineffective and not systematically enforced. The Quebec Ministry of environment has extensively documented these loopholes and the common practices¹⁸. This documentation shows that there is no mechanism or infrastructure (such as monitoring procedures or provincial database) whatsoever that would allow the enforcement of the regulation. Based on an examination of current practice in the province of Quebec, the applicable regulatory requirements are systematically not enforced and noncompliance with those requirements is widespread in the province of Quebec.

Hence, there is no enforced regulation or law that can prevent the implementation of the retained scenarios R1 and R3). The MDDELCC has recognised this fact by putting in force an offset protocol for ODS destruction within the cap-and-trade regulation.

Technology barrier

Alternative R1 - the proposed project, but not performed as an offset project - faces significant technology-related barriers to its implementation. R1 scenario corresponds to the implementation of aforementioned technology (SEG1) not implemented as an offset project.

RES's technology was first imported from Europe (Germany) and commissioned at RES facility in Laval. However, the technology has had to be adapted to American refrigeration standards, which are very different from European standards. According to RAL standard¹⁹ European appliances have an average size of 280 litres and fall into three categories: 180 litres, 180-350 litres and up to 500 litres. As a comparison, the volume of the appliances received at RES facility is on average 650 litres and ranges between 283 and 708 litres²⁰.

¹⁶ See Waste Management Regulation for the agglomeration of the city of Quebec

<<http://reglements.ville.quebec.qc.ca/fr/ShowPdf/cr/R.A.V.Q.506.pdf>>

¹⁷ <http://www.mddep.gouv.qc.ca/air/halocarbuures/enbref.htm>

¹⁸ http://www.mddep.gouv.qc.ca/air/saco_strategie-en/part-2.htm#identification

¹⁹ RAL Quality Assurance and Test Specifications for the Demanufacture of Refrigeration Equipment (RAL GZ-728)

²⁰ <http://www.hydroquebec.com/residentiel/hydrocontact/janvier-fevrier-2010/recyc-frigo.html>

SEG-1 technology has had to be adapted given the difference in appliance size between Europe and America. Since refrigeration systems are larger, the gas and oil suction and storage capacity has been increased in order to recover and store all fluids. Furthermore, handling equipment and conveyor belts have had to be adapted and enlarged in order to allow the transportation of the units, support the additional load (additional supports and anchors) and also have the capacity to lift the appliances (increased hydraulic capacity). Besides, the European technology is equipped with low power shears and these were not able to ensure the production rate since American domestic appliances were built with more metal structures. Hence, original hydraulic shears have had to be replaced by new shears with greater capacity and power.

Infrastructure barrier

The proposed project not performed as offset project (R1) faces significant infrastructure barrier given the lack of existing infrastructure in the industry of appliances recycling. As many metal recycling industries, the recycling of appliances is very disaggregated and consists in multiple entities spread over the province of Québec: appliances owners, contractors, wholesalers, etc. While the ODS destruction activities are aggregated through the wholesalers and Refrigeration Management Canada Program (RMC), the ODS recovery activities are completely disaggregated and undertaken on an ad-hoc basis, per owner²¹.

As a result, RES had to put in place its own, adapted infrastructure. This infrastructure had to be designed in order to allow the aggregation of appliances from multiple origins over the province of Québec in one place. As a part of such infrastructure, RES had to design and implement a monitoring system, allowing the recording of input and output materials, thus measuring the efficiency of the recycling activities. Moreover, the monitoring system has to include procedures allowing the tracking of each appliance's origin all over Canada. Finally, being the unique appliance recovery plant in Québec province, the infrastructure brought by RES had to provide enough space to allow the accumulation of thousands of appliances but, at the same time, be located as close as possible to the city in order to minimize the distance for the transportation of appliances from the owner's home to RES' plant.

Financial barrier

Without carbon offset revenues, and in the absence of an enforced regulation covering the mandatory extraction and destruction of ODS in end-of-life appliances, there is no incentive whatsoever associated with the extraction and destruction of ODS. The high investment and operation costs associated with SEG technology cannot be justified in the absence of regulation and carbon revenues. Hence in R1 scenario, ODS would continue to be released into the atmosphere.

²¹ For a complete description of the existing disaggregated ODS recovery chain, visit <http://www.refrigerantmanagement.ca/the-program.php>

The identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

Alternative R3 (atmospheric release of the ODS refrigerator partial capture and destruction) consists in the continuation of the current practice in the industry (business-as-usual). This practice consists in sending the appliances to the automobile shredder/crusher, where the valuable materials (mainly ferrous & non-ferrous metals) are recovered and recycled. As for the refrigerant, most of the R12 is already released to the atmosphere prior to its arrival to the recycling facilities.

Alternative R3 (atmospheric release of the ODS refrigerant or partial capture and destruction) does not face any technological barrier since it consists in the continuation of the current practice in the industry, which no enforced regulation impedes. Hence R3 represents the most likely baseline scenario in the absence of the proposed project.

Common practice

SEG-1 component is not a first-of-its-kind per se, since small quantities of refrigerant ODS are already recovered and sent to RMC program²². The RMC Ozone Depleting Substances Destruction Project is registered in GHG Reductions Registry of CSA (identifier: R-AAA-0086). However, the recovery of these small quantities relies upon the owner of the appliance and is therefore undertaken on a disaggregated basis, which makes the recovery so challenging. There is no recovery facility comparable to RES' facility whatsoever in Québec, which allows such aggregation of appliances and such high recovery efficiency rates.

Based on the assessment and conclusions presented above, RES ODS recovery and destruction project is considered additional.

5. INVENTORY OF SOURCES, SINKS AND RESERVOIRS (SSRS) FOR THE PROJECT AND BASELINE

The SSR of the project and the baseline scenario for the refrigerant are extracted from Protocol 3 and shown in the following table.

²² See quantification of parameter DR, section 3.

Table 6: SSR description

Source		Description	Gas	Included?	Baseline (B) or project (P)	Controlled, Related or Affected ²³
1	Appliance collection	Fossil fuel emissions attributable to the collection and transportation of end-of-life appliances	CO ₂	Excluded	B, P	Controlled
			CH ₄	Excluded	B, P	
			NO ₂	Excluded	B, P	
2	ODS extraction	Emissions of ODS attributable to the extraction and collection of refrigerants from end-of-life equipment or equipment undergoing maintenance	ODS	Excluded	B, P	Controlled
		Fossil fuel emissions attributable to the extraction and collection of refrigerants from end-	CO ₂	Excluded	B, P	
			CH ₄	Excluded	B, P	

²³ Definitions are extracted from the ISO 14064-2 standard:

Controlled greenhouse gas source, sink or reservoir: GHG source, sink or reservoir whose operation is under the direction and influence of the greenhouse gas project proponent through financial, policy, management or other instruments

Related greenhouse gas source, sink or reservoir: GHG source, sink or reservoir that has material or energy flows into, out of, or within the project

Affected greenhouse gas source, sink or reservoir: GHG source, sink or reservoir influenced by a project activity, through changes in market demand or supply for associated products or services, or through physical displacement

Source		Description	Gas	Included?	Baseline (B) or project (P)	Controlled, Related or Affected ²³
		<i>of-life equipment or equipment undergoing maintenance</i>	<i>N₂O</i>	<i>Excluded</i>	<i>B, P</i>	
3	<i>Industrial and commercial refrigeration</i>	<i>ODS emissions attributable to equipment leakage and maintenance</i>	<i>ODS</i>	<i>Excluded</i>	<i>B, P</i>	<i>Related</i>
		<i>Fossil fuel emissions attributable to the operation of refrigeration and air conditioning equipment</i>	<i>CO₂</i>	<i>Excluded</i>	<i>B, P</i>	
			<i>CH₄</i>	<i>Excluded</i>	<i>B, P</i>	
			<i>N₂O</i>	<i>Excluded</i>	<i>B, P</i>	
4	<i>Production of refrigerant substitute</i>	<i>Substitute refrigerant</i>	<i>CO₂ e</i>	<i>Excluded</i>	<i>P</i>	<i>Affected</i>
		<i>Fossil fuel emissions during the production of substitute refrigerants</i>	<i>CO₂</i>	<i>Excluded</i>	<i>P</i>	
			<i>CH₄</i>	<i>Excluded</i>	<i>P</i>	
			<i>N₂O</i>	<i>Excluded</i>	<i>P</i>	
5	<i>Transportation to the destruction facility</i>	<i>Fossil fuel emissions attributable to the transportation of ODS from the point of origin to the destruction facility</i>	<i>CO₂</i>	<i>Included</i>	<i>P</i>	<i>Controlled</i>
			<i>CH₄</i>	<i>Excluded</i>	<i>P</i>	
			<i>N₂O</i>	<i>Excluded</i>	<i>P</i>	
6	<i>Refrigeration</i>	<i>Emissions of ODS attributable to leakage and maintenance during the continuous operation of equipment</i>	<i>ODS</i>	<i>Included</i>	<i>B</i>	<i>Related</i>
		<i>Substitute refrigerant emissions attributable to leakage and maintenance during the continuous operation of equipment</i>	<i>CO₂ e</i>	<i>Included</i>	<i>P</i>	
		<i>Indirect emissions attributable to the use of</i>	<i>CO₂</i>	<i>Excluded</i>		

Source		Description	Gas	Included?	Baseline (B) or project (P)	Controlled, Related or Affected ²³
		electricity	CH ₄	Excluded	P	
			NO ₂	Excluded	P	
7	Destruction	Emissions of ODS attributable to incomplete destruction at the destruction facility	ODS	Included	P	Controlled
		Emissions from the oxidation of carbon contained in the destroyed ODS	CO ₂	Included	P	
		Fossil fuel emissions attributable to the destruction of ODS in a destruction facility	CO ₂	Included	P	
			CH ₄	Excluded	P	
			N ₂ O	Excluded	P	
		Indirect emissions attributable to the use of electricity	CO ₂	Included	P	
			CH ₄	Excluded	P	
			N ₂ O	Excluded	P	

6. QUANTIFICATION AND CALCULATION OF GHG EMISSIONS/REMOVALS

Calculation methodologies used are those described in the Protocol 3 of the Regulation respecting a cap-and-trade system for greenhouse gas emission allowances.

The GHG emission reductions under a project for the destruction of ODS used as refrigerants are calculated using equation 6.2:

Equation 6.2

$$ER_R = BE_R - PE_R$$

Where:

ER_R = Total GHG emission reductions attributable to the project for the destruction of ODS used as refrigerants during the project reporting period, in metric tonnes CO₂ equivalent;

BE_R = Baseline emissions attributable to the destruction of ODS used as refrigerants during the project reporting period, calculated using equation 6.3, in metric tonnes CO₂ equivalent;

PE_R = GHG emissions under the project for the destruction of ODS used as refrigerants during the project reporting period, calculated using equation 6.4, in metric tonnes CO₂ equivalent.

The equation 6.2 corresponding for 2009, 2010 and 2011 is as follow:

2009: $ER_R = BE_R - PE_R = 82\,677 \text{ tCO}_2\text{eq} - 5\,537 \text{ tCO}_2\text{eq} = 77\,140 \text{ tCO}_2\text{eq}$

2010: $ER_R = BE_R - PE_R = 93\,846 \text{ tCO}_2\text{eq} - 6\,285 \text{ tCO}_2\text{eq} = 87\,561 \text{ tCO}_2\text{eq}$

2011: $ER_R = BE_R - PE_R = 85\,257 \text{ tCO}_2\text{eq} - 5\,710 \text{ tCO}_2\text{eq} = 79\,547 \text{ tCO}_2\text{eq}$

The GHG emissions under the baseline scenario under a project for the destruction of ODS used as refrigerants are calculated using equation 6.3:

Equation 6.3

$$BE_R = \sum_{i=1}^n (Q_i \times EF_{R,i} \times GWP_i)$$

Where:

BE_R = Emissions under the baseline scenario attributable to the destruction of ODS used as refrigerants during the project reporting period, in metric tonnes CO_2 equivalent;

i = Type of ODS;

n = Number of types of ODS;

Q_i = Total quantity of ODS of type i used as refrigerants recovered and sent for destruction, determined by the difference of container weight after (no more than 2 days after destruction) and before (no more than 2 days before destruction) destruction, in metric tonnes of ODS of type i ;

$EF_{R,i}$ = GHG emission factor for ODS of type i used as refrigerants, as indicated in the table in table 7;

GWP_i = Global warming potential of ODS of type i as indicated in the table in table 8, in metric tonnes CO_2 equivalent per metric tonne of ODS of type i ;

Table 7 : Emission factor for each type of ODS used as a refrigerant

Type of ODS	Emission factor for each type of ODS used as a refrigerant ($EF_{R,i}$)
CFC-11	0,89
CFC-12	0,95
CFC-13	0,61
CFC-113	0,89
CFC-114	0,78
CFC-115	0,61

GHG reductions are calculated by using the global warming potential (GWP). The GWP is specific to each substance and are shown in table 8.

Table 8 : GWP of ODS

Type of ODS	GWP ($\text{tCO}_2 \text{ e./t ODS}$)
CFC-11	4 750
CFC-12	10 900

CFC-13	14 400
CFC-113	6 130
CFC-114	10 000
CFC-115	7 370
HCFC-22	1 810
HCFC-141b	725

The equation 6.3 corresponding for 2009, 2010 and 2011 is as follow:

$$2009: BE_R = Q_{CFC12} \times EF_{RCFC12} \times GWP_{CFC12} = 7,98 \text{ tCFC12} \times 95\% \times 10\,900 \text{ tCO}_2\text{eq/tCFC12} \\ = 82\,677 \text{ tCO}_2\text{eq}$$

$$2010: BE_R = Q_{CFC12} \times EF_{RCFC12} \times GWP_{CFC12} = 9,06 \text{ tCFC12} \times 95\% \times 10\,900 \text{ tCO}_2\text{eq/tCFC12} \\ = 93\,846 \text{ tCO}_2\text{eq}$$

$$2011: BE_R = Q_{CFC12} \times EF_{RCFC12} \times GWP_{CFC12} = 8,23 \text{ tCFC12} \times 95\% \times 10\,900 \text{ tCO}_2\text{eq/tCFC12} \\ = 85\,257 \text{ tCO}_2\text{eq}$$

The GHG emissions under a project for the destruction of ODS used as refrigerants are calculated using equations 6.4 to 6.7:

Equation 6.4

$$PE_R = Sub + (Tr + Dest)_R$$

Where:

PE_R = GHG emissions under the project for the destruction of ODS used as refrigerants during the project reporting period, in metric tonnes CO₂ equivalent;

Sub = Total GHG emissions attributable to substitute refrigerants, calculated using equation 6.5, in metric tonnes CO₂ equivalent;

$(Tr + DEST)_R$ = GHG emissions attributable to the transportation and destruction of ODS used as refrigerants, calculated using equation 6.6, in metric tonnes CO₂ equivalent;

The equation 6.4 corresponding for 2009, 2010 and 2011 is as follow:

$$2009: PE_R = Sub + (Tr + Dest)_R = 5\,477 \text{ tCO}_2\text{eq} + 60 \text{ tCO}_2\text{eq} = 5\,537 \text{ tCO}_2\text{eq}$$

$$2010: PE_R = Sub + (Tr + Dest)_R = 6\,217 \text{ tCO}_2\text{eq} + 68 \text{ tCO}_2\text{eq} = 6\,285 \text{ tCO}_2\text{eq}$$

$$2011: PE_R = Sub + (Tr + Dest)_R = 5\,648 \text{ tCO}_2\text{eq} + 62 \text{ tCO}_2\text{eq} = 5\,710 \text{ tCO}_2\text{eq}$$

Equation 6.5

$$Sub = \sum_{i=1}^n (Q_i \times EFS_i)$$

Where:

Sub = Total GHG emissions attributable to substitute refrigerants, in metric tonnes CO₂ equivalent;

i = Type of ODS;

n = Number of types of ODS;

Q_i = Total quantity of ODS of type i used as refrigerants recovered and sent for destruction, determined by the difference of container weight after (no more than 2 days after destruction) and before (no more than 2 days before destruction) destruction, in metric tonnes of ODS of type i ;

EFS_i = Emission factor for substitutes for ODS of type i as indicated in the table 9, in metric tonnes CO₂ equivalent per metric tonne of ODS;

Table 9 : Emission factors for substitute refrigerant

ODS used as refrigerant	Emission factors for substitute refrigerant (EFS_i)
CFC-11	223
CFC-12	686
CFC-13	7144
CFC-113	220
CFC-114	659
CFC-115	1139

The equation 6.5 corresponding for 2009, 2010 and 2011 is as follow:

2009: $Sub = Q_{CFC12} \times EFS_{CFC12} = 7,98 \text{ tCFC12} \times 686 \text{ tCO}_2\text{eq/tCFC12} = 5\,477 \text{ tCO}_2\text{eq}$

2010: $Sub = Q_{CFC12} \times EFS_{CFC12} = 9,06 \text{ tCFC12} \times 686 \text{ tCO}_2\text{eq/tCFC12} = 6\,217 \text{ tCO}_2\text{eq}$

2011: $Sub = Q_{CFC12} \times EFS_{CFC12} = 8,23 \text{ tCFC12} \times 686 \text{ tCO}_2\text{eq/tCFC12} = 5\,648 \text{ tCO}_2\text{eq}$

Equation 6.6

$$(Tr + Dest)_R = Q \times 7.5$$

Where:

$(Tr + DEST)_R$ = GHG emissions attributable to the transportation and destruction of ODS used as refrigerants, in metric tonnes CO₂ equivalent;

Q = Total quantity of ODS used as refrigerants recovered and sent for destruction, calculated using equation 6.7, in metric tonnes of ODS;

7.5 = Default emission factor for ODS transportation and destruction, in metric tonnes CO₂ equivalent per metric tonne of ODS;

The equation 6.6 corresponding for 2009, 2010 and 2011 is as follow:

2009: $(Tr + Dest) = Q_{CFC12} \times 7,5 = 7,98 \text{ tCFC12} \times 7,5 = 60 \text{ tCO}_2\text{eq}$

2010: $(Tr + Dest) = Q_{CFC12} \times 7,5 = 9,06 \text{ tCFC12} \times 7,5 = 68 \text{ tCO}_2\text{eq}$

2011: $(Tr + Dest) = Q_{CFC12} \times 7,5 = 8,23 \text{ tCFC12} \times 7,5 = 62 \text{ tCO}_2\text{eq}$

Equation 6.7

$$Q = \sum_{i=1}^n Q_i$$

Where:

Q = Total quantity of ODS used as refrigerants recovered and sent for destruction, in metric tonnes of ODS;

i = Type of ODS;

n = Number of types of ODS;

Q_i = Total quantity of ODS of type i used as refrigerants recovered and sent for destruction, determined by the difference of container weight after (no more than 2 days after destruction) and before (no more than 2 days before destruction) destruction, in metric tonnes of ODS of type i .

The equation 6.7 corresponding for 2009, 2010 and 2011 is as follow:

2009: $Q = Q_{CFC12} = 7,98 \text{ tCFC12}$

2010: $Q = Q_{CFC12} = 9,06 \text{ tCFC12}$

2011: $Q = Q_{CFC12} = 8,23 \text{ tCFC12}$

As we consider only CFC12 in this project, Q_i is Q_{CFC12} . We calculate Q_{CFC12} according to the most conservative analytical results from the accredited laboratory (see section 7) and using the equation 6.8 to 6.10.

Equation 6.8

$$Q_{CFC12} = Q_{CFC12, t} - Q_{water} - Q_{hbr}$$

Where:

$Q_{CFC12, t}$ = Total quantity of CFC12 used as refrigerants recovered and sent for destruction, determined by the difference of container weight after (no more than 2 days after destruction) and before (no more than 2 days before destruction) destruction, in metric tonnes of CFC12;

Q_{water} = Total quantity of water contained in the refrigerants recovered and sent for destruction, in metric tonnes of water;

Q_{hbr} = Total quantity of high boiling residues contained in the refrigerants recovered and sent for destruction, in metric tonnes of hbr.

Q_{CFC12} corresponding for 2009, 2010 and 2011 is as follow:

$$\begin{aligned} 2009: Q_{CFC12} &= Q_{CFC12, t} - Q_{water} - Q_{hbr} = 8\,824 \text{ tCFC12} - 0,336 \text{ twater} - 0,077 \text{ thbr} \\ &= 7,98 \text{ tCFC12} \end{aligned}$$

$$\begin{aligned} 2010: Q_{CFC12} &= Q_{CFC12, t} - Q_{water} - Q_{hbr} = 10\,016 \text{ tCFC12} - 0,381 \text{ twater} - 0,087 \text{ thbr} \\ &= 9,06 \text{ tCFC12} \end{aligned}$$

$$\begin{aligned} 2011: Q_{CFC12} &= Q_{CFC12, t} - Q_{water} - Q_{hbr} = 9\,099 \text{ tCFC12} - 0,346 \text{ twater} - 0,079 \text{ thbr} \\ &= 8,23 \text{ tCFC12} \end{aligned}$$

Equation 6.9

$$Q_{water} = (3,8\% \times Q_{CFC12, t}) + (HUM/1\,000\,000\,000) \times Q_{CFC12, t}$$

Where:

$Q_{CFC12, t}$ = Total quantity of CFC12 used as refrigerants recovered and sent for destruction, determined by the difference of container weight after (no more than 2 days after destruction) and before (no more than 2 days before destruction) destruction, in metric tonnes of CFC12;

HUM = moisture content obtained from analysis, in mg/kg.

Q_{water} corresponding for 2009, 2010 and 2011 is as follow:

$$\begin{aligned}
 2009: Q_{water} &= (3,8\% \times Q_{CFC12, t}) + (HUM/1\ 000\ 000\ 000) \times Q_{CFC12, t} = (3,8\% \times 8\ 824\ tCFC12) + \\
 &\quad (80\ mg/kg/1\ 000\ 000\ 000) \times 8\ 824\ tCFC12 = 0,336\ twater \\
 2010: Q_{water} &= (3,8\% \times Q_{CFC12, t}) + (HUM/1\ 000\ 000\ 000) \times Q_{CFC12, t} = (3,8\% \times 10\ 016\ tCFC12) + \\
 &\quad (80\ mg/kg/1\ 000\ 000\ 000) \times 10\ 016\ tCFC12 = 0,381\ twater \\
 2011: Q_{water} &= (3,8\% \times Q_{CFC12, t}) + (HUM/1\ 000\ 000\ 000) \times Q_{CFC12, t} = (3,8\% \times 9\ 099\ tCFC12) + \\
 &\quad (80\ mg/kg/1\ 000\ 000\ 000) \times 9\ 099\ tCFC12 = 0,346\ twater
 \end{aligned}$$

Equation 6.10

$$Q_{hbr} = Q_{CFC12, t} \times HBR$$

Where:

$Q_{CFC12, t}$ = Total quantity of CFC12 used as refrigerants recovered and sent for destruction, determined by the difference of container weight after (no more than 2 days after destruction) and before (no more than 2 days before destruction) destruction, in metric tonnes of CFC12;
HBR = High Boiling Residues content obtained from analysis, in %.

Q_{hbr} corresponding for 2009, 2010 and 2011 is as follow:

$$\begin{aligned}
 2009: Q_{hbr} &= Q_{CFC12, t} \times HBR = 8\ 824\ tCFC12 \times 0,87\% = 0,077\ thbr \\
 2010: Q_{hbr} &= Q_{CFC12, t} \times HBR = 10\ 016\ tCFC12 \times 0,87\% = 0,087\ thbr \\
 2011: Q_{hbr} &= Q_{CFC12, t} \times HBR = 9\ 099\ tCFC12 \times 0,87\% = 0,079\ thbr
 \end{aligned}$$

7. MONITORING THE DATA INFORMATION MANAGEMENT SYSTEM AND DATA CONTROLS

RES records the following information in a register:

- Information on the chain of traceability, from point of origin to point of destruction of the ODS for each cylinder;
- The serial number or identification number of the containers used for ODS storage and transportation;
- Any document identifying persons in possession of appliances and ODS at each stage in the project, and showing the transfer of possession and ownership of the appliances and ODS;
- Information on ODS extraction, specifying:
 - The number of appliances containing refrigerants from which ODS have been extracted;
 - The name and contact information of the facility where the ODS are extracted;
 - The name and contact information of the facility where the appliances are recycled, if any; and
 - Processes, training, and quality assurance, quality control and extraction process management processes;

- A certificate of destruction for all the ODS destroyed under the project, issued by the facility that destroyed the ODS, by destruction activity, specifying
 - The name of the project promoter;
 - The name and contact information of the destruction facilities;
 - The name and signature of the person responsible for the destruction operations;
 - The identification number on the certificate of destruction;
 - The serial, tracking or identification number of all containers for which ODS destruction occurred;
 - The weight and type of ODS destroyed for each container, including the weigh tickets generated in accordance with Division 9.1;
 - The destruction start date and time; and
 - The destruction end date and time;
- The monitoring plan as described in table 9;
- The certificate of sampling used for the statistical analysis including the traceability to the laboratory when the analysis used in the statistical analysis is from NRI lab;
- Finally, the appendix 1 presents specific information required in Protocol 3 that were not presented as per CSA requirements in previous sections.

Table 10: Monitoring plan

Parameter:	Q
Units of parameter:	Metric tons of ODS
Description:	Total quantity of ODS used as refrigerants recovered and sent for destruction
Source of data:	Qi
Monitoring and recording frequency :	For each container.
QA/QC process:	As per Qi
Methodology:	Q is calculated by the quantity of each type of ODS in each container, by deducting the weight of the water if the moisture content is above 75% of the saturation point and the ODS has not been dried, and deducting the weight of the high boiling residue. Q is calculated by adding together the quantities of each type of ODS in each container.
Parameter:	Qi
Units of parameter:	Metric tons of ODS type i
Description:	Total quantity of ODS of type i used as refrigerants recovered and sent for destruction, determined by the difference of container weight after (no more than 2 days after destruction) and before (no more than 2 days before destruction) destruction, in metric tonnes of ODS of type i;
Source of data:	Weight ticket before and after destruction Statistical analysis (Concentration of each ODS of type i,

	<i>water content and high boiling residue)</i>
<i>Monitoring and recording frequency :</i>	<i>For each container.</i>
<i>QA/QC process:</i>	<i>The quantity of ODS destroyed must be determined at the destruction facility by an authorized person, by weighing each container when it is full of ODS prior to destruction and after it has been emptied and its contents have been destroyed. Weighing the full container not more than 2 days prior to commencing the destruction of the ODS. Weighing the empty container not more than 2 days after the destruction of the ODS. The quantity of ODS is equal to the difference between the mass of the container when full and when empty.</i> <i>Each ODS container must be weighed at the destruction facility using a single scale to generate both full and empty weight tickets. The scale has been calibrated by the manufacturer or by a third person certified for that purpose less than 3 months before the weighing, to an accuracy of $\pm 5\%$. In fact, the installation of destruction calibrates their scale every month (refer to Clean Harbors procedure "Standard Operating Procedure for Receiving and Sampling Criteria of CFC Materials Subject to the CAR ODS Destruction Protocol" in annex 3 (confidential). An explicative note from Clean Harbors is also presented in Annex 4, stating the weighing process at Clean Harbors. The difference between weighing before and after destruction is used on the certificate of destruction.</i>
<i>Methodology:</i>	<i>Q_i is calculated with the mass of the ODS in each container sent for destruction, by deducting the weight of the water if the moisture content is above 75% of the saturation point and the ODS has not been dried, and deducting the weight of the high boiling residue.</i>
<i>Parameter:</i>	<i>Sub</i>
<i>Units of parameter:</i>	<i>Metric tons of CO₂ equivalent</i>
<i>Description:</i>	<i>Total GHG emissions attributable to substitute refrigerants.</i>
<i>Source of data:</i>	Q_i <i>Reference values EFS_i from table 5</i>
<i>Monitoring and recording frequency : :</i>	<i>Before and after each destruction.</i>
<i>QA/QC process:</i>	<i>As per Q_i.</i>
<i>Methodology:</i>	<i>Calculated with equation 6.5.</i>
<i>Parameter:</i>	<i>$(T_R + Dest)_R$</i>

Units of parameter:	Metric tons in CO ₂ equivalent
Description:	$(Tr + DEST)_R$ = GHG emissions attributable to the transportation and destruction of ODS used as refrigerants.
Source of data:	Q
Monitoring and recording frequency : :	Before and after each destruction
QA/QC process:	As per Qi.
Methodology:	Calculated with equation 6.6.
Parameter:	Mass of each container filled with ODS no more than 2 days prior to commencing the destruction of the ODS and mass of each empty container for project used to destroy ODS no more than 2 days after destruction
Units of parameter:	t or kg
Description:	Mass of each container filled with ODS no more than 2 days prior to commencing the destruction of the ODS and mass of each empty container for project used to destroy ODS no more than 2 days after destruction.
Source of data:	Weight certificate
Monitoring and recording frequency:	Before and after each destruction for each container
QA/QC process:	Each ODS container must be weighed at the destruction facility using a single scale to generate both full and empty weight tickets. The scale has been calibrated by the manufacturer or by a third person certified for that purpose less than 3 months before the weighing, to an accuracy of $\pm 5\%$. In fact, the installation of destruction calibrates their scale every month (refer to Clean Harbors procedure "Standard Operating Procedure for Receiving and Sampling Criteria of CFC Materials Subject to the CAR ODS Destruction Protocol" in annex 3 (confidential). An explicative note from Clean Harbors is also presented in Annex 4, stating the weighing process at Clean Harbors. The difference between weighing before and after destruction is used on the certificate of destruction.
Methodology:	Measured by weighing on the same scale that has been calibrated by the manufacturer or by a third person certified for that purpose to an accuracy of $\pm 5\%$
Parameter:	Concentration of each ODS type contained in each container to be destroyed
Units of parameter:	%
Description:	Concentration of each type of ODS used as refrigerant, in each container
Source of data:	This parameter is extracted from statistical analysis.
Monitoring and recording	For each cylinder used for statistical analysis.

frequency :	
QA/QC process:	Samples must be taken by a person who is independent of the promoter and of the destruction facility and has the necessary training to carry out this task. Analysis to be performed by a laboratory that is independent of the promoter and of the destruction facility and accredited for analysis of ODS by the Air-Conditioning, Heating and Refrigeration Institute in accordance with the most recent version of AHRI 700 of that organization, or using this method and ISO accredited. Samples that are taken at an installation of destruction located in the United States of America can be taken by someone working at the installation of destructions since it respects the most recent version of the protocol entitled "Compliance Offset Protocol Ozone Depleting Substances Projects: Destruction of U.S. Ozone Depleting Substances Banks" and published by the California Air Resources Board and the California Environmental Protection Agency
Methodology:	Measured
Parameter:	Moisture content
Units of parameter:	ppm
Description:	Moisture content of each container to be destructed.
Source of data:	This parameter is extracted from statistical analysis.
Monitoring and recording frequency :	For each cylinder used for statistical analysis.
QA/QC process:	Samples must be taken by a person who is independent of the promoter and of the destruction facility and has the necessary training to carry out this task. Analysis to be performed by a laboratory that is independent of the promoter and of the destruction facility and accredited for analysis of ODS by the Air-Conditioning, Heating and Refrigeration Institute in accordance with the most recent version of AHRI 700 of that organization, or using this method and ISO accredited. Samples that are taken at an installation of destruction located in the United States of America can be taken by someone working at the installation of destructions since it respects the most recent version of the protocol entitled "Compliance Offset Protocol Ozone Depleting Substances Projects: Destruction of U.S. Ozone Depleting Substances Banks" and published by the California Air Resources Board and the California Environmental Protection Agency.
Methodology:	Measured

<i>Parameter:</i>	<i>High boiling residue</i>
<i>Units of parameter:</i>	<i>%</i>
<i>Description:</i>	<i>Fraction of high boiling residue from statistical analysis</i>
<i>Source of data:</i>	<i>This parameter is extracted from statistical analysis.</i>
<i>Monitoring and recording frequency :</i>	<i>For each cylinder used for statistical analysis.</i>
<i>QA/QC process:</i>	<i>Samples must be taken by a person who is independent of the promoter and of the destruction facility and has the necessary training to carry out this task.</i> <i>Analysis to be performed by a laboratory that is independent of the promoter and of the destruction facility and accredited for analysis of ODS by the Air-Conditioning, Heating and Refrigeration Institute in accordance with the most recent version of AHRI 700 of that organization, or using this method and ISO accredited.</i> <i>Samples that are taken at an installation of destruction located in the United States of America can be taken by someone working at the installation of destructions since it respects the most recent version of the protocol entitled "Compliance Offset Protocol Ozone Depleting Substances Projects: Destruction of U.S. Ozone Depleting Substances Banks" and published by the California Air Resources Board and the California Environmental Protection Agency.</i>
<i>Methodology:</i>	<i>Measured</i>

The main uncertainty related to the project is the fact that not all the containers were analysed. In order to manage this uncertainty, it was demonstrated the content of cylinder with RES distinct extraction process (CFC-12 vs HFC-134a), year of fabrication stated in database and the date of CFC-12 use interdiction, and statistical analysis of CFC-12 contains in the analysed cylinders. To prove that most of the ODS contained in the non-analysed containers were CFC-12, RES clearly shows that appliances collected that contains CFC-12 or HFC-134a are treated on a separate line. Consequently, halocarbons are stored in different cylinders. On several occasions since 2008, gas samples were taken from gas cylinders generated on SEG1 or R12 Isotank. The results demonstrate that the management of the separate gas recovery lines is reliable since the concentration of R134 is low in the R12 cylinders with an average of 0,65% and a maximum concentration of R134 of 2,6%.

The alternative refrigerants have been used since 1993 (see document Plan d'action national pour le recyclage et la régénération des CFC, octobre 1992, CCME). The regulation prohibiting the use of CFCs came into effect on January 1st 1996. Consequently, manufacturers had until 31 December 1995 to sell devices containing CFC. The years 1993, 1994 and 1995 are transition years during which the year of the device is not necessarily indicative of the type of gas it contained. From the database, RES has considered that all devices from 1995 and younger as containing HFC-134. Those from 1994 and older have been considered containing CFC-12. Their proportion, 98,4 %, is in line with the statistical analysis performed.

All analyses of CFC-12 from the CFC-12 recovery line since the beginning of our operations up to 2013 are always the same concentrations, about 92 to 97%, regardless of the period in which the sample was taken. RES did a statistical analysis based on all analysis on cylinder and isotank containing CFC-12. If RES had 2 different laboratories (Fielding and National Institute Refrigerant) performing the same analysis on the container, RES used the results from the approved laboratory (National Institute Refrigerant) as per Protocol 3 requirements. When two analyzes of the same cylinder were carried out by the same laboratory, RES used the most conservative result, which is the one giving a smaller concentration of R12. When two cylinders of 450 liters were connected together and homogenized by recirculation before sampling for analysis (cylinder 71 & 73), RES weighted the analysis results by considering 2 times the results.

Finally, several analyses on R12 Isotank were performed. It has a capacity of about 14 000 kg of CFC and contained at the time of sampling halocarbons from 51 cylinders. Mixing was performed in accordance with Protocol 3 and sampling took place in October 2013. For calculation purposes, RES has considered the results of analysis before halocarbons were pulled out from the isotank for destruction. Since two samples were pulled out, RES has again considered the most conservative results, i.e. those for which the proportion of R12 was lowest and has weighted the analysis results by 48.

For the statistical calculations, the Student Law with 99% of confidence interval was used to determine the lower limits of the allowable detected eligible gas for refrigerant. The analyses were performed by selecting cylinders randomly. For CFC-12 cylinders destroyed that were not analysed, the following values determined by the statistical analysis were obtained:

- Moisture content: 73.8 ppm
- % HBR : 0.49 %
- R12 : 95.40 %
- R11 : 0.59 %
- R114 : 0 %
- R115 : 0.07 %

RES believes these results are representatives, since they represent 18 128 kg and 61 cylinders over a total of 41 661 kg (43,5%). However, even though this statistical analysis has been developed, the most conservative results from the accredited laboratory (National Refrigerant Institute) have finally been used for calculations purpose:

- Water content: 80 ppm at 13.3 °C (NRI cylinder 23, destruction 2)
- % HBR: 0.873 % (NRI cylinder 27, destruction 3)
- R11: 0 % (NRI cylinder 39, destruction 1; cylinder 27, destruction 3; cylinder 62, destruction 3)
- R12: 94.93 % (NRI cylinder 23, destruction 2)
- R13: 0 % (all NRI)
- R113: 0 % (all NRI)
- R114: 0 % (NRI cylinder 39, destruction 1; cylinder 23, destruction 1)
- R115: 0 % (all NRI)

8. REPORTING AND VERIFICATION DETAILS

This report is prepared in accordance with ISO 14064-2 and GHG-Clean Project™ requirements. The verifier, Enviro-Accès, is an independent third party accredited ISO14065. This report will then be accompanied by a verification report. The auditor was not solicited as a consultant for the development of the project and to calculate offset credits.

The verifier is agreeable to include the following elements in the verification scope:

- *Conformity to ISO 14064-3,*
- *Verification Statement,*
- *Declaration of independent third-party,*
- *Details on how conflict of interest issues are managed or mitigated,*
- *Demonstration that the verification body is competent to perform the verification of the GHG project that includes the GHG Report, GHG Assertion(s), and the calculations of the GHG emission reductions or removal enhancements,*
- *Conformity to the requirements of ISO 14064-2, and*
- *Ensure a reasonable level of assurance, including all GHG Assertion(s) and calculations of GHG emission reductions or removal enhancements.*

SIGNATURE OF PROMOTER

NAME OF PROMOTER: Recyclage ÉcoSolutions inc.

NAME OF PROMOTER RESPONSIBLE: Arnold Ross

SIGNATURE:  _____

DATE: _____ January 22, 2017 _____

APPENDIX 1 SPECIFIC REQUIREMENTS OF PROTOCOL 3

This section present specific information required in Protocol 3 that were not presented as per CSA requirements in previous sections.

1) Involved parties in the project

The parties involved in the project are the stakeholders of the project, meaning those concerned by the development or the implementation of the project. In addition of RES, the unique involve party is Clean Harbors, the destruction site.

Table 1: Involved parties in the offset project

Coordonnées Clean Harbors	
Full name	Treasa Evans
Adress	309 American Circle
Town	El Dorado
Province	Arkansas
Country	États-Unis d'Amérique
Code postal	71730
Numéro de téléphone	870-864-3680
Adresse de courriel	evans.treasa@cleanharbors.com
Fonction ou rôle	REM, CEM, Facility Operations Manager II, Laboratory Manager

2) Project offset

This is a unique project and it obtained reductions of GHG emissions through recovery and destruction of refrigerants during the crediting period. ODS recovered are only domestic refrigeration and air conditioning appliances collected through different organizations or public service providers programs:

- RECYC-FRIGO program of Hydro-Québec²⁴,

²⁴ <http://www.hydroquebec.com/residential/recyc-frigo/criteres.html>

- *Ménage Faible Revenu (MFR) of Hydro-Québec;*
- *Recycling appliance of Efficiency Nova Scotia²⁵.*

RES dismantles the devices from these programs, then recovered and destroyed ODS devices from the provinces of Quebec and Nova Scotia.

3) Project start date

There were 3 destructions lot of cylinders under this project.

Destruction 1 occurred from August 11th 2009 to August 20th 2009.

Destruction 2 occurred from April 28th 2010 to May 6th 2010.

Destruction 3 occurred from January 20th 2011 to February 3rd 2011.

Then, the project start date is August 11th 2009.

4) GHG emissions reductions from the boundaries of the project and SPR

The GHG reductions resulting from the project is not wholly or partly compensated by increases in GHG emissions occurring outside the boundaries of the project. The project has no influence on GHG emissions outside its boundaries since domestic appliances are somehow recovered and sent to a metal recycling center. The transport operation and recovery would be equivalent if the project did not take place. The emission reductions take place only within the boundaries of the project site.

4) Estimate of the ODS amount

For the 3 destructions, the quantity of ODS is known and is exact. The information is shown in table 2.

Table 2: Exact ODS quantity recovered for the project

Parameters	Value	Unit
Q R11	0,0	tR11
Q R12	25.3	tR12
Q R13	0,0	tR13
Q R113	0,0	tR113
Q R114	0,0	tR114
Q R115	0,0	tR115
Q	25.3	tODS

5) Additionality of the GHG emission reductions

To meet additionality requirements of the Protocol 3, the project is considered to go beyond practice if it meets the conditions in Divisions 1 to 3 of this protocol. The project covers eligible ODS. They are all ODS used as refrigerants and removed from refrigeration, freezer or air-conditioning appliances recovered in Canada. They are all removed from equipment, systems or appliances from industrial, commercial, institutional or residential sources. The project covers a

²⁵ <http://www.efficiencyns.ca/energy-solutions/appliance-retirement/>

maximum of 5 years, the extraction and destruction locations and methods are the same, the types of appliances from which ODS are extracted are the same and there were at least one destruction per year during the project period. The ODS have been destroyed in a facility located in United States and removal of refrigerants from the appliances has been carried out in Canada. The project goes beyond the current practice, since before this project, appliances were solely recycled for the metals and not to recover ODS.

6) Permanency of GHG emission reductions

Emission reductions are permanent, since the destruction is sustainable and irreversible. Once destroyed, ODS cannot be released again into atmosphere.

7) Leak

The project does not generate GHG outside the project boundary since it has no influence on the peripheral activities such as transportation and collection of old appliances or with the sale of new appliances.

8) Action or decision resulting from the promoter

RES received MDDEP authorization in 2008 to perform ODS recovery used as refrigerant and extraction of ODS used as blowing agents in Laval. RES also paid to have the ODS destroy in authorized destruction site. Then, GHG emission reductions are directly resulting from RES action.

9) Verifiable reductions

The reductions is fully documented and with sufficient level of details. Reductions are quantifiable and can be certified, because:

- The extracted quantities of ODS are measured precisely;*
- The quantities of ODS are measured precisely before destruction;*
- The quantities of ODS are measured precisely after the destruction;*
- The quantities of ODS destroyed are calculated by a mass balance;*
- A certificate of destruction is issued for each destruction.*

10) Exclusive property of GHG emission reductions

RES is the only project participant and the sole owner of the extraction plant located in Laval, Quebec. Ownership was clearly established with different customers and partners. RES has the unique rights-related devices collected in accordance with what is legally specified at the time of collection of the appliance. RES is the only participant in the project and owns the sole rights to carbon credits generated under this project. Please see Annex 5 to access the promoter declaration and the agreements with the parties involved.

The project for these specific reductions has not been registered under any other GHG program. RES also ensured that verified emission reductions were recorded in a single GHG program. GHG credits obtained through a program have not been monetized again as rights GHG or sold to multiple buyers.

11) Financial help

No funding was received for this project under a GHG reduction program

12) Eligible ODS

The project covers eligible ODS according to the Protocol 3. They are all CFC used as refrigerants and removed from refrigeration, freezer or air-conditioning appliances recovered in Canada. They are all removed from equipment, systems or appliances from industrial, commercial, institutional or residential sources.

13) Project duration

The project covers a maximum of 5 years as per the protocol 3, the extraction and destruction locations and methods are the same, the types of appliances from which ODS are extracted are the same and there were at least one destruction per year during the project period.

14) Project location

The ODS have been destroyed in a facility located in United States and removal of refrigerants from the appliances has been carried out in Canada.

15) Extraction and destruction

All ODS have been collected, stored and transported in hermetically sealed containers. All ODS has been destroyed in concentrated form in an ODS facility destruction that meets the Protocol requirements.

16) Data collection plan

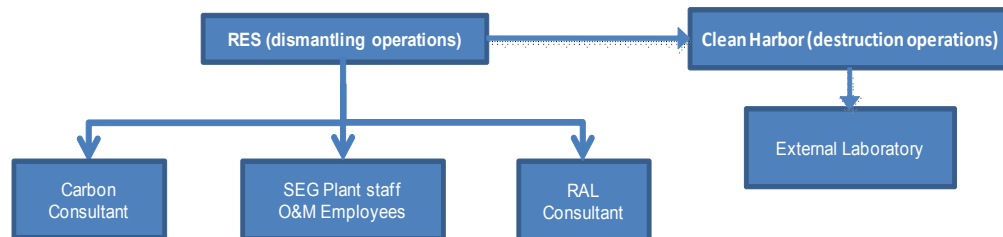
The following section describes the data collection plan implemented by RES to monitor the emissions reductions associated with the refrigerant and foam ODS recovery activities and the destruction activities.

The sections are divided into 6 sections, per procedure, as follows:

a. Monitoring structure

Table 10, section 6, shows the monitoring method for each parameter. RES monitoring team will be composed of the SEG plant supervisor, the laboratory technicians, the O&M employees and other consultants (e.g. RAL) as well as the corresponding representative at the destruction facility. RES is responsible of obtaining the appropriate documentation required to monitor the required parameters at the destruction plant. RES is the focal point for the communications and data transfer to external consultants. The team is the authority that is responsible for the management and operation of the monitoring plan, which defines the procedures for the monitoring of the parameters required to complete the emission reduction calculation. Figure 1 outlines the monitoring plan participants.

Figure 1: Monitoring plan participants



RES is responsible of the dismantling and extraction operations at the Laval, Québec facility ensuring that the appropriate procedures are followed. RES will also be responsible of transferring the monitoring data to the Carbon consultant and coordinating the RAL test with the RAL consultant (for blowing agent extraction).

Clean Harbor operates the destruction activities at their El Dorado, Arkansas facility and provide RES with all the necessary documentation required in the monitoring plan including the quantity, the composition and concentration of the ODS destroyed.

b. Staff training

RES will conduct an annual internal training session addressed to all employees that perform operation activities at the RES facility. The SEG plant supervisor will conduct an hour session to thoroughly explain the following procedures:

- *Data and recordkeeping,*
- *Data quality assurance and quality control,*
- *Equipment calibration.*

c. Data QA/QC

- *Data QA/QC Extraction Facility*

Refer to the Quality Assurance / Quality Control plan version 1.1 dated September 2nd, 2011 elaborated by RES in Annex 6. There is also a process diagram (in French) that explains the process.

- *Data QA/QC Destruction facility*

Refer to Annex 3 (confidential) of Clean Harbors' Hazardous Waste Combustor National Emissions Standards for Hazardous Air Pollutants (HWC NESHAP) Continuous Monitoring Systems Performance Evaluation Plan.

d. Quantity and concentration

The mass of ODS destroyed is determined by the destruction facility procedure's.

For the ODS destruction from cylinders, Clean Harbors has left each cylinder on the balance during destruction, recording the weight before destruction starts and recording the weight after destruction. Consequently, CHES:

- *Has used the same scale;*
- *Calibrate the scale as per CHES procedures every month;*

CHES has performed sampling on specific cylinder, not all, for each destruction. The concentration of ODS has been analysed by an accredited AHRI 700-2006 laboratory NRI in United States, which is independent of the promoter and the installation of destruction. The results from this lab have been used for the statistical analysis. In addition, Fielding has been used for the statistical analysis. These laboratories are all independent of the promoter. Even though if Fielding is not an accepted laboratory by the protocol, this is an ISO 14001 and ISO 9001 accredited laboratory and it follows AHRI Methodology. For a long time, this was the only lab to perform refrigerant analysis in Canada.

In addition, RES can confirm the following requirements regarding analysis were respected:

- *The samples have been taken by a person who is independent of the promoter and of the destruction facility and has the necessary training to carry out this task. Samples that are taken at an installation of destruction located in the United States of America can be taken by someone working at the installation of destructions since it respects the most recent version of the protocol entitled "Compliance Offset Protocol Ozone Depleting Substances Projects: Destruction of U.S. Ozone Depleting Substances Banks" and published by the California Air Resources Board and the California Environmental Protection Agency;*
- *The samples have been taken with a clean, fully evacuated sample bottle with a minimum capacity of 0.454 kg;*
- *Each sample has been taken in a liquid state;*
- *A minimum sample size of 0.454 kg has been drawn for each sample or enough material to ensure full analysis to be performed;*
- *Each sample has been individually labeled and tracked according to the container from which it was taken. The following information is tracked for each sample for statistical analysis:*
 - *The time and date of the sample;*
 - *Project promoter's name;*
 - *The name and contact information of the technician who took the sample, and of the technician's employer;*
 - *The volume of the container from which the sample was drawn;*
 - *The ambient air temperature at the time of sampling only for NRI;*
 - *The chain of traceability of each sample, from the point of sampling to the accredited laboratory for NRI.*

All the samples used in the statistical analysis have been analysed to confirm the type and concentration of ODS. The analysis determines the following:

- *Each ODS type;*
- *The quantity, in metric tonnes, and concentration, in metric tonnes of ODS of type i per metric tonne of gas, in each type of ODS in the gas, using gas chromatography;*
- *The moisture content of each sample;*

- The high boiling residue from the ODS sample, which must be below 10% of the total mass of the sample

e. Installation of destruction requirements

The operating parameters for the facility during ODS destruction has been monitored and recorded in accordance with the Code of Good Housekeeping approved by the Montréal Protocol. The facility was operating in conditions that met the requirements of any authorization necessary to pursue activities at that facility during the destruction activities of this project.

The following parameters are monitored during the destruction:

- The ODS feed rate;
- The operating temperature and pressure of the destruction facility during ODS destruction;
- The effluent discharges measured in terms of water and pH levels;
- The carbon monoxide emissions.

Since the project carried out in the United States, it has been conducted in accordance with the requirements of the most recent version of the protocol entitled “Compliance Offset Protocol Ozone Depleting Substances Projects: Destruction of U.S. Ozone Depleting Substances Banks” and published by the California Air Resources Board and the California Environmental Protection Agency.

f. Data Management (Register)

A register is kept to record the following information.

Information on the chain of traceability, from point of origin to point of destruction of the ODS
The promoter of the project set in a register all information concerning the origin and traceability of ODS from point of origin to the point of destruction.

Information on the point of origin

The point of origin is the first place of storage of recovered devices. As part of this project, the first place of the locations is exclusively RES Laval. The exact address is shown in table 3.

Table 3: Point of origin

RES – Laval	3700, avenue Francis-Hugues Laval (Québec) H7L 5A9
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All cylinders used for storage and transports are traceable through their own identification number or serial number. The following table list all the cylinder identification number for each container sent for each destruction.

Table 4: Cylinders identification number and number of appliances

	Destruction 1	Destruction 2	Destruction 3
Identification number of cylinders	2	2	61
	5	3	64

	25	4	63
	35	5	65
	11	10	60
	12	12	6
	13	13	21
	16	15	2
	31	16	48
	38	17	13
	27	18	51
	32	24	25
	42	25	35
	47	27	34
	53	28	23
	55	31	31
	20	32	26
	3	34	19
	44	35	33
	19	36	53
	52	37	12
	29	41	49
	50	47	47
	40	48	16
	48	49	15
	58	51	41
	6	53	45
		55	50
		56	57
		58	
Number of appliances	65 256	78 715	77 069
Total number of appliances	220 040		

Any document identifying persons in possession of appliances and ODS at each stage in the project, and showing the transfer of possession and ownership of the appliances. These information have been kept in a register. In addition, the number of appliances containing refrigerants from which ODS have been extracted is followed, which is a total of 220 040 as stated in table 4.

ODS information on ODS extraction

The name and contact information of RES, the facility where the ODS are extracted and where the appliances are recycled, is kept in the register and is RES in Laval. The process is presented in section 2.9 and the training in point 2 above in this section.

Certificate of destruction

The certificates of destruction, as well as weight ticket and scale calibration proof are kept in the register.

Certificate of sampling results

The certificates of sampling, as long as chain of traceability of the sampling from NRI, are kept in the register.

17) Equipment maintenance

The extraction equipment of ODS, SEG, is subject to frequent maintenance by RES or by SEG employees through the maintenance program provided by SEG. In the event of equipment failure, RES stops operations until repairs are completed.

CHES staff provides the maintenance of equipment to the destruction facility.

For recovered halocarbons, they are first stored in approved cylinders whose certification is made every 5 years. Leak detections and regular visual inspections of stored cylinders (every day or 2 days) are carried out to ensure their tightness and to detect the presence of rust.

18) Measuring equipment

The calibration procedure of weight measurement devices to install Clean Harbors is documented in Section 4.2 of HWC NESHP standards Clean Harbors, as the performance evaluation plan of the monitoring systems. CHES calibrate their CEMS every day and their scale every month.