



Thermostat Recovery Program Annual Report to the Director 2016 Calendar Year

Submitted to: Director, Extended Producer Responsibility Programs
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This annual report is issued by the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) in accordance with the British Columbia Recycling Regulation (Reg. 449/2004). The 2015 annual report documents the Thermostat Recovery Program's activities and results in British Columbia from January 1 to December 31, 2016.

Any questions or comments about this report as well as the Thermostat Recovery Program operations should be directed to HRAI at:

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A handwritten signature in black ink, appearing to read "Warren Heeley", with a stylized, cursive script.

Warren Heeley
President
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Date: June 23, 2017

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1. Executive Summary

Products within plan	Thermostats (electronic and mercury-containing)
Program website	During first half of 2016 was www.switchthestat.ca ; changed to www.hrai.ca/trp in Summer 2016

Recycling Regulation Reference	Topic	Summary (5-bullet maximum)
Part 2, section 8(2)(a)	Public Education Materials and Strategies	<ul style="list-style-type: none"> • Outreach through HRAI, the Mechanical Contractors Association of Canada (MCAC) & Mechanical Service Contractors of Canada (MSCC) • Print ads and eblasts with the Municipal Leader, and the HPAC and Sustainable Building & Design magazines; ads in regional district recycling calendars • Collaboration through Stewardship Agencies of BC (SABC) • Recycling Council of British Columbia (RCBC) hotline and Recyclepedia • In person engagement at RCBC annual conference and Coast Waste Management Association (CWMA) annual conference
Part 2, section 8(2)(b)	Collection System and Facilities	<ul style="list-style-type: none"> • 9 new collection points • 6 new drop-off locations • 371 total collection points • Collection points in 27 regional districts • 1 main collection facility (1 to be fully phased out by 2017) • See Section 4 for details
Part 2, section 8(2)(c)	Product Environmental Impact Reduction, Reusability and Recyclability	<ul style="list-style-type: none"> • 5,052 mercury-containing vessels collected (there can be anywhere between 1 to 4 mercury vessels contained in each thermostat)** • 78.31 kilograms of metals recycled • 245.33 kilograms of plastics recycled • 0 new mercury-containing thermostats sold into the market • See Section 5
Part 2, section 8(2)(d)	Pollution Prevention Hierarchy and Product / Component Management	<ul style="list-style-type: none"> • New thermostats do not contain mercury, and also help reduce energy consumption • Recovered thermostats are not suitable for re-use • Greater than 99% of plastic and metal components are recycled, with a high degree of certainty • Mercury vessels are sent for retort and mercury is either put into long-term storage or reused in CFL and fluorescent production (depending on market demand) • Since greater than 99% of all components are recycled, along with there being no better option in the pollution prevention hierarchy, no targets are in place

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Recycling Regulation Reference	Topic	Summary (5-bullet maximum)
Part 2, section 8(2)(e)	Product Sold and Collected and Recovery Rate *	<ul style="list-style-type: none"> Collected 3,280 mercury containing thermostats, 426 electronic thermostats, and 467 loose mercury vessels Adjusted total: 3,614 mercury containing thermostats and 426 electronic thermostats, for a total of 4,040 collected 2% improvement from 2015 collection results
Part 2, section 8(2)(e.1)		See Section 9 for breakdown per regional district
Part 2, section 8(2)(f)	Summary of Deposits, Refunds, Revenues and Expenses	N/A

* As of summer 2016 the Switch the 'Stat (S.T.S.) program transitioned over to full management and delivery by HRAI from Scout Environmental. The name of the program changed from S.T.S. to the Thermostat Recovery Program (TRP); it was fully re-branded and the new program website is www.hrai.ca/trp. For the purposes of this report the program will be referred to by its new name Thermostat Recovery Program (TRP).

*Thermostat Recovery Program does not report on Product Sold or Recovery Rate; see [Section 7](#) for details.

**The industry standard measurement of 1 – 4 switches per thermostat (or average 1.4 mercury switches per vessel) is substantiated by sampling of thermostats conducted by Veolia on behalf of the U.S.'s Thermostat Recycling Corporation, which is a statewide thermostat collection program. Based on their sampling they have concluded that the number of mercury switches per stat ranged from 1.41 to 1.46; therefore, averaging 1.44 (rounded off to 1.4) mercury switches per stat.

Comparison of Key Performance Targets		
Part 2 section 8(2)(g); See full list of targets in Plan Performance		
Priority Stewardship Plan Targets* (as agreed with ministry file lead)	Performance	Strategies for Improvement
1. Collection: 3,357 thermostats	4,040 thermostats collected (20% over target)	<ul style="list-style-type: none"> Increase number of public drop-off locations Increase number of collection points** Improve communication with wholesalers so that all staff can effectively market the program at their location Improve communication with contractors throughout BC to increase awareness of the program.

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Comparison of Key Performance Targets		
Part 2 section 8(2)(g); See full list of targets in Plan Performance		
Priority Stewardship Plan Targets* (as agreed with ministry file lead)	Performance	Strategies for Improvement
2. Collection points/Participants: 420	371 participants (88% of target)	<ul style="list-style-type: none"> • Increase outreach to wholesaler locations, especially those with multiple locations in the province. • Continue face-to-face communication at trade shows • Explore new recruitment options (eg. new marketing plan, and increased targeted outreach in regions with poor coverage, increased utilization of municipality outreach) • Increase outreach to HVAC contractor training facilities/schools for participation to increase awareness & education with new technicians who will be responsible for old thermostat removal.

** targets are calculated based on the calendar year rather than the previously used program year in order to align it with the calendar year reporting. **see [Section 4](#) for descriptions of drop-off locations versus collection points*

Tri-Arrow

In 2016 the secondary collection facility Tri-Arrow Industrial Recovery historically used for the TRP, collected 6.9% (243) of the total number of mercury thermostats, 0% electronic thermostats, 8.0% (400 or 1.00 kg) of the total Hg vessels; 7% (18.1 kg) of total plastics collected; and 15 % (13.7 kg) of metals collected. However, since the TRP did not contract with Tri-Arrow as an on-going attempt to phase them out (please refer to [Section 4](#) for full details), all product collected from Tri-Arrow will not be calculated in the 2016 TRP Annual Report's Plan Performance, since the auditable information is not available. Therefore, all reporting on downstream, collections rates and targets excludes the collection numbers provided by Tri-Arrow.

Tri-Arrow's collection numbers in relation to the total numbers collected by Aevitas (the primary collection facility used for the program) are outlined in the chart below:

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	Aevitas (Audited)	Tri-Arrow (Not Audited)	TOTAL	Materiality Non Assured
Hg Thermostats (Intact)	3,280	243	3,523	7%
Electronic Thermostats	426	-	426	
Total intact Thermostats (Hg and Electronic)	3,706	243	3,949	6%
Vessels (Part of Hg Thermostats)	4,585	400	4,985	8%
Loose vessels	467	-	467	
Total Vessels	5,052	400	5,452	7%
Total equivalent Hg thermostats (total vessels/1.4)	3,614	243	3,857	6%
Total equivalent thermostats (including electronic)	4,040	243	4,283	6%
Plastics (kg)	245.3	18.1	263.4	7%
Metals (kg)	78.3	13.7	92.0	15%
Glass	5.05	0.40	5.45	7%
Mercury	12.63	1.00	13.63	7%

2. Program Outline

The Thermostat Recovery Program is the designated program for managing thermostats in British Columbia, both electromechanical (mercury-containing) and electronic models. The British Columbia Stewardship Plan for Thermostats is the five year plan for recovering these products, and spans a timeline of July 1, 2015 to June 30, 2020.

- Electromechanical thermostats(also referred to as "mercury-containing thermostats"), which contain internal mercury switches (mercury in a sealed glass bulb) or snap switches to control the flow of electrical current; and,
- Electronic thermostats, which use sensors instead of switches to detect temperature levels and electronically control the flow of electrical current."

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Thermostat Recovery Program is funded by thermostat manufacturers who have sold thermostats into Canada and a complete list of manufacturers is available online at www.hrai.ca/trp. As stated earlier, during the first half of 2016 the program was being delivered by Scout Environmental on behalf of the manufacturers and the Heating, Refrigeration, and Air Conditioning Institute of Canada (HRAI). However, as of summer 2016 it was being fully administered and delivered by HRAI. Additionally, the program is supported by the Canadian Institute of Plumbing and Heating (CIPH).

In accordance with the program plan, the Thermostat Recovery Program collects thermostats in the province of British Columbia through one main collection channel (HVAC contractors/wholesalers & municipal/regional district collection) and two secondary collection channels (drop-off locations and a send-back option).

Based on estimates that 85 to 90 percent of thermostats sold in British Columbia are sold through contractors and wholesalers in the heating, ventilation and air-conditioning (HVAC) industry, this group logically makes up the primary channel through which to recover all types of thermostats. In order to support this channel and make the program more accessible to members of the public, any participating collection point can also register to be a drop-off location (typical drop-off locations are wholesalers, regional districts, and municipal locations). An up-to-date list of drop-off locations, searchable by postal code, is always available on the Thermostat Recovery Program website. Finally, the send-back option provides access to the program to individuals who are not close to a drop-off location. A small pail and a pre-paid waybill addressed to the collection facility are shipped to the individual's home (or desired location), making the program accessible to individuals in remote areas. Together these channels comprise all of the program participants, or "collection points" as they shall be identified throughout this report. See [Section 3](#) below for a definition of "collection points" as distinct from "collection facilities."

As per the requirements under the British Columbia Recycling Regulation, this report has been prepared to summarize the program activities undertaken during the calendar year of 2016, and will be posted on the program website at www.hrai.ca/trp.

3. Public Education Materials and Strategies

Initiatives

Thermostat Recovery Program operates by collecting thermostats through existing businesses and infrastructure, referred to in the program plan as "collection channels." As described in [Section 2](#), the program uses one main collection channel (HVAC contractors/wholesalers) and two secondary collection channels (drop-off locations and send-back option) to recover mercury-containing and electronic thermostats. In 2016 the focus of the program continued to be on increasing registrations, particularly in the contractor/wholesaler channel, also on increasing collection in order to meet the participation and collection targets, as well as ensuring that the program is as accessible as possible.

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In 2016, the program continued to build on the foundation laid in previous years to broaden the audience that is reached by Thermostat Recovery Program messaging. Key areas of focus in 2016 were:

- Increased communication with participants (to keep them engaged and informed, especially due to the program administration, name and branding changes in 2016)
- Increased marketing and outreach efforts to non-participants (particularly contractors and wholesalers)
- Increased public outreach (info about the program and how to participate)

To achieve these goals, the following initiatives were undertaken:

Initiative	Details	Audience/ Channel Reached	Type of Outreach
Ongoing outreach with HRAI national office	<ul style="list-style-type: none"> Information about the re-branded program and a call to register were included in the HRAI Spring & Fall review newsletters, sent to all HRAI members. Information about the re-branded Thermostat Recovery Program (TRP) and accomplishments was included in the HRAI Accomplishment List, accompanying renewal letters sent to all HRAI members 	Contractors/wholesalers	<ul style="list-style-type: none"> Industry outreach (print)
Ongoing outreach with Canadian Institute for Plumbing and Heating (CIPH) national office <ul style="list-style-type: none"> CIPHEX West Roadshow 	<ul style="list-style-type: none"> CIPH provided TRP with a free booth at the CIPH Exhibition (CIPHEX) Roadshow in Vancouver. This is an important industry event that attracts attendees from BC and nearby provinces. 	CIPH	<ul style="list-style-type: none"> Contractors/wholesalers
Partnership with Mechanical Contractors Association of Canada (MCAC) & Mechanical Service Contractors of Canada (MSCC)	<ul style="list-style-type: none"> MSCC has offered its full support to the TRP program and has promoted the program to its members TRP promoted on the MCAC website. 	Contractors	<ul style="list-style-type: none"> Industry outreach

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BC Stewards/Stewardship Agencies of BC (SABC)	<ul style="list-style-type: none"> Formalized association of all BC stewardship associations allows all stewards to present a united front, and to collaborate on communicating to various stakeholder groups Website (bcstewards.com) provides an overview of each of the programs (including Thermostat Recovery Program) Recycling Handbook provides an overview of each of the programs (including Thermostat Recovery Program) Action Plan developed by SABC to ensure the success of all programs, investigate potential gaps, and address feedback from BC Ministry of the Environment. 	General Public	<ul style="list-style-type: none"> Print media Online
Regional District waste calendars/brochures: <ul style="list-style-type: none"> Okanagan Valley District District of Mission on the Fraser Fraser Valley Regional District East Kootenay Region Peace River Regional District 	<ul style="list-style-type: none"> Program ad and link to drop off locations in calendar 	General Public	<ul style="list-style-type: none"> Print media
Recycling Council of British Columbia (RCBC)	<ul style="list-style-type: none"> Info about the program (materials accepted at nearest drop-off locations) made available to the public through a hotline and online tool (the Recyclepedia) <ul style="list-style-type: none"> 70 hotline inquiries 379 Recyclepedia searches 	General Public; BC waste management industry	<ul style="list-style-type: none"> Online Phone
Coast Waste	<ul style="list-style-type: none"> Attendance at the Coast 	BC waste management	<ul style="list-style-type: none"> In person outreach

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Management Association	Waste Management Association annual conference, which provides an opportunity to conduct face-to-face outreach and engagement with representatives from Regional Districts, recycling depots, and other relevant stakeholders.	industry	
Sustainable Building & Design Magazine	<ul style="list-style-type: none"> • Key TRP program info, logo and URL posted on magazine's website. 	Contractors/General Public	<ul style="list-style-type: none"> • Online
HPAC/Canadian Contractor ads & eblasts	<ul style="list-style-type: none"> • Print ads appeared in all 7 issues of HPAC magazine (with a readership of approximately 20,000) • Eblasts to BC, MB, and ON subscribers of HPAC in September had a reach of 8,240 viewers • Newsletter article regarding program re-branding and key information featured in August 2016 issue reaching 13,500 subscribers. 	Contractors/wholesalers	<ul style="list-style-type: none"> • Business-to-business print media

In addition to the efforts listed above, the program was promoted through numerous voluntary channels. See examples in [Appendix B](#).

Resources

To support these initiatives, a variety of educational and marketing materials were used. These materials are described below.

1. **Program Website (New website in 2016):** The program's website, www.switchthestat.ca changed to www.hrai.ca/trp during summer 2016 and is the primary educational tool, and features content directed at educating contractors and wholesalers as well as the general public. This site provides a comprehensive overview of the program, the benefits of participation, education about mercury and the dangers it presents. It has a list of drop-off locations that is searchable by postal code and it is updated in real time as participants join the program. The site has a convenient online registration form, which is particularly useful for residents who want to return a thermostat using the send-back option. The site is also kept up-to-date with cumulative totals of thermostats and mercury vessels that have been collected and the weight in kilograms of the mercury that has been recovered. The program website was re-designed in

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2016 to reflect the new program name and branding, as well as to make it more eye-catching and appealing to users.

2. **Introduction letters (Updated in 2016):** Each collection kit issued to a newly registered collection point contains an outreach letter that includes educational information about the program and about mercury. They act as important educational tools that help develop commitment from newly recruited participants. These letters also help new participants with their future outreach to the public, by providing them with information about the importance of recycling mercury-containing and electronic thermostats. These letters were re-designed to include the new program name and branding in 2016.
3. **Posters (Updated in 2016):** Promotional posters are continually available for participants to use in displays on-site at the collection locations. In 2016 the posters were redesigned to include the new program name and branding, as well they are more eye-catching to increase their effectiveness as a tool for drop-off locations.
4. **Brochures (Updated in 2016):** There are two different program brochures available; separate industry-facing and public-facing versions with tailored messaging. A stack of printed brochures was provided to participating collection points for distribution to their customers (in the case of contractors/wholesalers) or at public events, throughout 2016. These brochures include facts about mercury and information about the Thermostat Recovery Program that is used to educate customers and the public. Both versions were re-designed with the new program name and branding in 2016.
5. **Monthly Newsletter:** In order to remain in communication with existing participants, an e-newsletter on program milestones, collection sweeps and other news is published and sent to participants monthly. The goal of the newsletter is to keep participants up to date with program happenings; to keep the program on participants' minds; to keep participant satisfaction high; and ultimately to increase collection results. As of December 31, 2016, the newsletter had 739 subscribers nationally, approximately 26% of who are in BC.
6. **Collection sweep postcards:** As part of our bi-annual collection sweep, reminder postcards were sent to all active collection points in May and September. Participants were asked to return their pail if it was at least half full, and given the opportunity to request new program materials.
7. **Print ads and eblasts:** Print ads were published in all 7 issues of HPAC magazine, which has a readership of approximately 20,000 HVAC and plumbing contractors. As part of a marketing strategy, an e-blast was sent to HPAC's online base of 2,600 subscribers in BC during the month of September 2016. An article was also placed in HPAC magazine's August 2016 Newsletter. Ads were also developed for the Fraser Valley Regional District, District of Mission on the Fraser, Okanagan Valley District, East Kootenay Region and Peace River Regional District recycling calendars.
8. **Banner stands (Re-vamped in 2016):** To support in-person events such as trade shows, banner stands are used to be versatile and eye catching. These banners support site-specific signage,

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and were used throughout 2016. Due to the program's new name and re-branding, these banner stands were also re-designed for 2016 to be even more attention grabbing.

4. Collection System and Facilities

Collection System Overview

The Thermostat Recovery Program collection system is comprised of the following:

1. Collection points (participants)
 - made up of the 3 collection channels described above
 - use collection containers to collect thermostats and send them to the collection facility
2. Collection facilities
 - Aevitas Inc. (the primary facility) receives the collection containers from various collection points and process the thermostats (count, dismantle).
 - The use of Tri-Arrow Industrial Recovery (the secondary facility) began to be phased out in 2016 (See *"Collection Facilities" section below*).
3. Consolidation points
 - In previous years Tri-Arrow Industrial Recovery was contracted as a secondary consolidation point for the program; however, in 2016, Aevitas Inc. was contracted as the sole consolidation point (See *"Collection Facilities" section below*).
 - All vessels are shipped to a retort facility at least once a year
4. Retort facility
 - Final processing of Hg vessels

The relationship between these facilities is demonstrated in the flow chart below:

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*Notes:

-thermostats can contain 1 to 4 Hg vessels, and participants occasionally include loose vessels that they have removed from thermostats in the collection pails, so we track both total number of thermostats and total number of Hg vessels.

-Tri-Arrow's downstream processors' information was not available to be audited (See [Section 1](#)).

Collection Facilities

As described above, historically the Thermostat Recovery Program has used two collection facilities: Aevitas Inc. located in Ayr, Ontario and Tri-Arrow Industrial Recovery located in Surrey, BC. However, in order to tighten up processes, such as processor reporting, and streamline program operations, the program has been transitioning to use only Aevitas (who has always been the primary collection facility used). In 2016, TRP set out to use Aevitas as the sole collection facility for the program. Unfortunately, due to the issue of participants still possessing old Tri-Arrow shipping waybills sent to them in the past for shipping their collection containers, throughout 2016 some BC participants continued to use them (See [Section 1](#) for full Tri-Arrow collection details).

Aevitas receives collection containers full of intact thermostats directly from all collection points in BC, and begin processing the thermostats. Aevitas acted as the primary consolidation point for the thermostat vessels from BC, as well they operate the only approved mercury retort in Canada (Aevitas' website: <http://aevitasweb.wixsite.com/aevitas1/mercury-recovery>). However, since the TRP did not have a formal contract with Tri-Arrow in 2016, they consolidated the small volume of thermostat vessels they collected for the program in-house.

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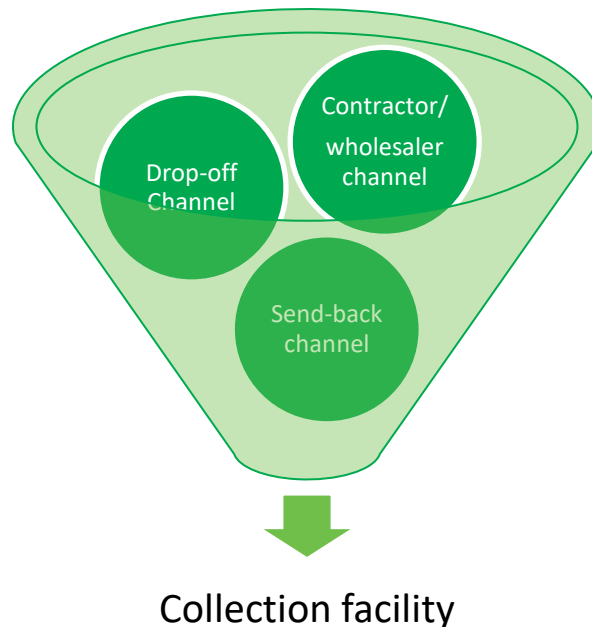
The shipper of each pail is recorded in a monthly tracking sheet by Aevitas and Tri-Arrow, as are the number of thermostats per pail (in total, and broken down by brand), the number of mercury vessels contained, the weight of the plastic and metal components, and any off-spec materials included in the collection containers (See [Section 1](#) regarding Tri-Arrow's collection details).

Collection Points

As described in section 3 above, Thermostat Recovery Program uses 3 main collection channels: the contractor/wholesaler channel, public drop-off locations, and the send-back channel. The individual participants in each of the collection channels are referred to as "collection points" or "participants."

These collection points are a key part of the collection system, as they recover end-of-life thermostats and send them to the collection facility.

Participants use the collection containers provided by the Thermostat Recovery Program to collect end-of-life thermostats, and when the container is full, they use their pre-paid Purolator waybill to return the thermostats to the collection facility. All new Purolator waybills are only addressed to Aevitas, continuing TRP's efforts to phase out returns to Tri-Arrow as participants use their older waybills. At the collection facility, the thermostats are processed. This process is illustrated below.



According to the stewardship plan, the goal was to have 420*registered collection points in 2016. Through outreach initiatives described above, 9 new businesses registered as collection points for end-of-life thermostats in 2016, 6 of which elected to act as drop-off locations and 2 of which registered as a send back participant (see description in [Section 2](#)).

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The following chart provides information regarding the businesses registered, including the types of businesses registered, if they have opted to be a drop-off location and the city where the business is located.

Company Name	Type	Drop Off	City
Bartle & Gibson	Wholesaler	Yes	Whistler
Noble BC	Wholesaler	Yes	Mission
Snowball Ventures	Contractor	Yes	Grand Forks
Denman Recycling Centre	Recycling Centre	Yes	Denman Island
Campbell River Waste Management Centre	Recycling Centre	Yes	Campbell River
Chris Farsky	Send Back	No	Hope
Tervita Corporation	Recycling Centre	No	Richmond
District of Kitimat	Send Back	No	Kitimat
Hornby Island Recycling Depot	Recycling Centre	Yes	Hornby Island

** targets are calculated based on the calendar year rather than the previously used program year in order to align it with the calendar year reporting. See explanation in [Section 9](#), below.*

Coverage in Regional Districts

In 2016 there were no changes to any existing collection points.

Combining the new participants with existing collection points as of December 31, 2016 there were 371 collection points in British Columbia.

These collection points are located in the following regional districts:

Region	Number of Collection Points
Alberni–Clayoquot Regional District	2
Capital Regional District	38
Cariboo Regional District	5
Columbia–Shuswap Regional District	19
Comox Valley Regional District	11
Cowichan Valley Regional District	9
Fraser Valley Regional District	34
Metro Vancouver (Greater Vancouver Regional District)	124
Northern Rockies Regional District	1
Peace River Regional District	12
Powell River Regional District	3
Regional District of Bulkley–Nechako	6
Regional District of Central Kootenay	5
Regional District of Central Okanagan	17
Regional District of East Kootenay	6
Regional District of Fraser – Fort George	9
Regional District of Kitimat–Stikine	8

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Regional District of Kootenay Boundary	5
Regional District of Mount Waddington	2
Regional District of Nanaimo	11
Regional District of North Okanagan	9
Regional District of Okanagan–Similkameen	6
Skeena – Queen Charlotte Regional District	3
Squamish–Lillooet Regional District	5
Strathcona Regional District	5
Sunshine Coast Regional District	6
Thompson–Nicola Regional District	10

As this list demonstrates, there are collection points in 27 of British Columbia's 29 regions. The regions in which we do not yet have participants are as follows:

- Central Coast Regional District
- Stikine Region

Throughout 2017, we will continue to make efforts to register participants in the remaining 2 regional districts. However, please note that all people throughout the entire province of BC can participate in the program by taking advantage of our free send-back channel even if there is not a registered collection point in their region.

5. Product Environmental Impact Reduction, Reusability and Recyclability

Through the Thermostat Recovery Program, all components of the recovered thermostats are sent for recycling, including the plastics, metals, glass, mercury and any electronics associated with the thermostat. Taking into account that occasional commingling of the materials may occur greater than 99% of materials are recycled. In 2016, the breakdown of materials recovered and recycled from the province of British Columbia included:

- 5,052 mercury-containing vessels (there can be anywhere between 1 to 4 mercury vessels contained in each thermostat)
- 12.63 Kg of mercury (calculated based on 2.5 grams of Hg per vessel)
- 5.05 Kg of glass (calculated based on 1 gram of glass per vessel)
- 78.3 kilograms of metals
- 245.33 kilograms of plastics

The recyclability of mercury-containing thermostats cannot be improved, nor can the reusability of these products because they are obsolete. As compared to older set-back models, new programmable thermostats are more environmentally responsible as they do not contain mercury and are much more energy efficient. Further, it is dangerous to attempt to reuse mercury-containing thermostats due to potential incompatibility with newer HVAC systems, thus replacing them with newer thermostats and recycling the older models is the best choice for reducing the environmental impact of these products.

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Because the Thermostat Recovery Program is already able to recycle greater than 99% of materials recovered through the program with a high level of certainty, efforts to continually reduce environmental impacts have centered on improving the program's collection processes. One area of focus has been the reduction of non-thermostat materials which are sometimes sent back in collection pails. Efforts have included communications with participants, and the development of new pail stickers including the wording "thermostats only" (as described in [Section 3](#)) for the sides of the collection pails to act as a reminder for participants.

As the program expands and matures, additional reductions in environmental impact will continue to be sought in order to ensure the program is effective in having a positive outcome for the environment and the citizens of British Columbia.

6. Pollution Prevention Hierarchy and Product / Component Management

As per the stewardship plan for thermostats, pollution prevention efforts have focused on recycling, rather than reduce/redesign or reuse. The breakdown as to why recycling is the preferred management technique out of the four "Rs" is provided below.

Reduce/redesign: The main environmental concern with thermostats is the mercury contained in many older models. While many of these thermostats may still be in use, they are no longer made by the major manufacturers and are no longer sold in Canada. New thermostats have been redesigned to eliminate mercury and to be more energy efficient, therefore reducing energy consumption.

Reuse: The plan does not encourage the reuse of old thermostats collected through this program for the reasons outlined below:

- Our primary goal is to collect old mercury-containing thermostats and ensure that the mercury and other component parts are properly managed, not to see them in continued use.
- Old non-mercury-containing thermostats may not meet the technical/safety specifications of new HVAC systems and do not have the same ability to reduce energy use that new programmable thermostats do, and therefore we recommend that these be recycled rather than reused.

Recycle: As per the program plan, the thermostats recovered from the province of British Columbia are counted, documented, dismantled and recycled. The components from the thermostats are separated for recycling as follows:

- The plastic components recovered are of mixed types; these are consolidated, at the collection facility, with other plastics from the facility and then sent to the downstream recycler. Currently, Aevitas sends them to Durham Shred and Recycle. Once at the recyclers the plastics are baled and then sold as a commodity.
- The metals collected are a mix of iron, nickel and aluminum which all have high reuse/recycling value. The metals are consolidated with other metals at the collection facility and then sent to

Thermostat Recovery Program 2016 Report to Director, Waste Management

the downstream processor. Aevitas sends them to Triple M Metals (a.k.a. M Metals). Once at the processors the metals are shredded, baled and then sold as a commodity.

- The glass vials containing the mercury are consolidated at the collection facility Aevitas (See [Section 4](#) regarding Tri-Arrow details) until a large volume has been collected. Aevitas acts as the primary consolidation point for all glass vials collected for the program.

At Aevitas these vessels are consolidated with vessels collected across Canada and then sent to an appropriate retort facility; this year they were sent to Veolia. Since TRP did not have a contract with Tri-Arrow in 2016, the vials they collected for the program were not shipped to Aevitas as they have been in the past, but were instead consolidated and sent to their own downstream processors, whose information was not available to be audited (See [Section 1](#) and [Section 4](#) for details).

During the retort process at Veolia, the glass vials are crushed and glass and mercury are separated. The mercury is triple distilled and sent for resale/reuse in products and processes or put into long term storage (sequestered), depending on market demand. The glass is crushed, distilled and sent for recycling in fibreglass applications. The latest shipment representing 92% of the mercury-containing vessels collected was sent to Veolia on December 22, 2016. [Appendix C](#) contains the manifest for this shipment.

The following table describes the acceptable end fates for each of the components of a thermostat:

Component	Reuse	Recycle	Energy Recovery	Landfill	Other
Plastics	X	Preferred	X	X	NA
Metals	X	Preferred	X	X	NA
Mercury Vessels (glass)	X	Preferred	X	X	NA
Mercury Vessels (mercury)	Optional	X	X	X	Retort process and then long-term storage

For plastics, metals, and the glass components, greater than 99% of the materials collected by the program are recyclable and were managed in accordance with the program plan and the principles of pollution prevention. The percentage of mercury that is sold for re-use versus how much is put into long-term storage varies greatly depending on market demand in the US (their mercury export ban, enacted in January 2014 prohibits any mercury from being exported; since the US market for mercury is relatively small, increasingly large percentages are being put into long-term storage, though specific percentages are not available).

The following table describes processing pathways and criteria used to assess product end fate by product component:

Thermostat Recovery Program 2016 Report to Director, Waste Management

Nature of Processing						
	Transfer to direct processor (BC or ON)	Transfer to direct processor elsewhere in North America	Transfer to direct processor outside of North America	Multi-step processing (BC or ON)	Multi-step processing elsewhere in North America	Multi-step processing outside of North America
Basis of evidence for product treatment	<ul style="list-style-type: none"> Due diligence in process for supplier selection (including detailed qualification of downstream suppliers by Aevitas) Detailed contracts with collection facility Monthly reporting from collection facilities 					
	<ul style="list-style-type: none"> Annual site visit to review processes 				<ul style="list-style-type: none"> Official shipping manifest with product weights Certificate of Destruction/Recycling provided by retort facility 	
Component (% of component sold/transferred for processing that is treated under each processing pathway)						
Plastics	>99%	0%	0%	0%	0%	0%
Metals	>99%	0%	0%	0%	0%	0%
Mercury Vessels (glass and mercury)	0%	0%	0%	0%	100%	0%

7. Product Sold and Collected and Recovery Rate

The amount of product sold is not currently tracked as mercury-containing thermostats are no longer sold into Canada, thus there are no sales to report. As for newer programmable models, the sales of these devices are not currently tracked by the manufacturers with sufficient detail to produce reporting at the provincial level as sales are currently only tracked at the national level. It is also worth noting that thermostats can have a life span of 20-30 years, though renovations can reduce that life span to 7-10 years. These timelines are long enough to make any direct correlation between product sold into the market and product available for recovery per year quite difficult, even if sales data were available.

Given the above, the Thermostat Recovery Program does not use a recovery rate as a measure of program performance, but instead measures the total amount of product collected measured against targets set out in the approved program plan. Collection totals and progress against targets will be discussed in [Section 9](#), below.

Thermostat Recovery Program 2016 Report to Director, Waste Management

8. Summary of Deposits, Refunds, Revenues and Expenditures (N/A)

As the Thermostat Recovery Program does not charge deposits, this section is not applicable.

Plan Performance

The following table describes progress made towards the approved targets set out in the stewardship plan for the Thermostat Recovery Program.

Plan Target	2016 Results	Strategies for Improvement in 2017
<i>Performance Targets*</i>		
1. Collection: 3,357 thermostats	Adjusted total: 4,040 thermostats collected (20% over target)	<ul style="list-style-type: none"> • Increase number of public drop-off locations • Increase number of collection points through targeted outreach in areas of low coverage • Continue to improve communication with wholesalers so that they can effectively market the program at their locations
2. Participants: 420	371 participants (88% of target)	<ul style="list-style-type: none"> • Increase outreach to wholesaler locations, especially those with multiple locations in the province. • Improved face-to-face communication at trade shows • Explore new recruitment options (eg. new marketing plan, new outreach events)
<i>Communication Targets</i>		
3. Program website: monthly updates	<ul style="list-style-type: none"> • Website is updated in real time with any new drop-off locations • Quarterly updates are made to ensure that all information is as up to date as possible • There were 492 visits to www.hrai.ca/trp from BC in 2016 (due to launch, from Oct –Dec) 	

Thermostat Recovery Program 2016 Report to Director, Waste Management

Plan Target	2016 Results	Strategies for Improvement in 2017
4. Printed brochures: a minimum of 500 brochures will be printed and distributed on an annual basis	Approximately 1194 brochures distributed. 25 brochures are distributed to each new participant (225); brochures have been sent to participants upon request (719); and approx 250 distributed at the 2016 CIPHEX Show held in Vancouver, BC.	<ul style="list-style-type: none"> • Increase registration numbers (each new participant receives 25 brochures for distribution to their clients/stakeholders) • More public outreach (using program brochures as a tool to spread the word about the program)
5. Printed posters will be distributed to all new drop-off locations to be displayed on site.	73 posters distributed to new (9) and existing (64) drop-off locations and as requested by participants	In 2016 new posters were developed including new program name & branding, and the program began to distribute them to drop-off locations.
6. Industry facing advertising - a minimum of 5 ads per year will target industry	Print ads appeared in all 7 issues of HPAC magazine	HPAC magazine is an industry publication with a readership of approximately 20,000.
	<p>In addition to the targeted communications described above, as outlined in Section 3 the TRP engaged in public facing advertising in 5 regional district calendars; as well the program was promoted through the SABC "British Columbia's Recycling Handbook", which provides a simple guide to what can be recycled under BC stewardship programs.</p> <p>A total of 5,000 handbooks were distributed to various stakeholders, including regional districts, community centers and libraries, school districts, and other relevant groups.</p> <p>A digital version is available at www.bcstewards.com.</p>	

** targets are calculated based on the calendar year rather than the previously used program year in order to align it with the calendar year reporting.*

Thermostat Recovery Program 2016 Report to Director, Waste Management

Progress Toward Collection Targets

The following table provides further information regarding the amount of product collected by the Thermostat Recovery Program during the period of January 1 to December 31, 2016, measured against the targets outlined in the official stewardship plan, as well as the program growth as compared to the same period in 2015 and demonstrates the program's commitment to continuous improvement.

Collection of Mercury-Containing Thermostats: Progress Against Targets and Program Growth				
	Targets (January 1 to December 31, 2016)*	Results Achieved from January 1 to December 31, 2016	Results Achieved from January 1 to December 31, 2015	Percentage increase in 2016
Number of Thermostats Collected	3,357 thermostats	3,280 mercury containing; 426 electronic; Total: 3,706	3,439 mercury containing; 206 electronic; Total: 3,645	2%
Number of Loose Vessels Collected	n/a	467	454	3%
Adjusted Total Thermostats Collected**	n/a	4,040	3,969	2%

*targets are calculated based on the calendar year rather than the previously used program year in order to align it with the calendar year reporting.

**Although all participating collection points are encouraged to return only intact thermostats, loose vessels (which have been clipped out of thermostats) are occasionally returned as well. However, as you will see above even though there was communication outreach with the participants, etc., the number of loose vessels collected has slightly increased compared to 2016. Therefore, TRP will continue to ramp up communication outreach to participants in 2017. Using the industry-accepted standard of 1.4 vessels per thermostat, the number of loose vessels returned in 2016 is equivalent to 467 thermostats. The adjusted total number of thermostats collected in 2016 is then 4,040.

Amount Collected by Regional District

The following chart presents the number of thermostats collected in each regional district.

Region	Number of Thermostats Collected***	Number of Loose Vessels Collected
Capital Regional District	143	7
Columbia-Shuswap Regional District	75	0
Cariboo Regional District	36	0
Cowichan Valley Regional District	42	0
Fraser Valley Regional District	343	64
Greater Vancouver Regional District	1914	169
Powell River Regional District	35	0

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Regional District of Central Okanagan	367	227
Regional District of East Kootenay	3	0
Regional District of Nanaimo	57	0
Regional District of North Okanagan	121	0
Thompson–Nicola Regional District	144	0
TOTAL	3280	467

***Number of intact thermostats (both mercury-containing and electronic)

Thermostat Recovery Program 2016 Report to Director, Waste Management

Appendices / Additional Information and Third Party Assurance

Appendix A – Earned Media

RCBC Recyclepedia

The screenshot shows the RCBC Recyclepedia website. The header includes the RCBC logo and navigation links. The main content area displays search results for 'Mercury-containing Thermostats in Abbotsford'. It includes a description of the program, a list of participating drop-off locations (AlarmRecycle, ElectoRecycle, etc.), and contact information for the recycling hotline. A sidebar on the right provides additional resources and a 'Submit a Nomination' button.

SABC Recycling Handbook – (To be updated in 2017 with TRP re-branded details)

The screenshot shows a brochure for the 'THERMOSTATS SWITCH THE 'STAT'' program. The brochure includes a photograph of a thermostat, a list of participating locations, and contact information. It also features a section on 'WHAT'S INCLUDED?' and 'HOW IT'S RECYCLED'. The brochure is designed to inform the public about the program and encourage participation.

< NEWS continued from p14

PEX FITTING STANDARDS NOW REFERENCE LOW-LEAD REQUIREMENTS

A number of the PEX product standards by the CSA Group have been updated to reference the low-lead requirements in NSF 372 (no more than a weighted average content of 0.25 per cent on wetted surfaces).

Some of the common standards for manufacturers of thermoplastic pressure pipe, associated fittings and applicable compounds, and cements included in the CSA B137-13 Series of Standards are B137.0, B137.5, B137.10, B137.11. Manufacturers had to comply by January 2, 2016 in order to guarantee certification updates, and listings were to be completed by July 1, 2016, according to the CSA Group.

In order for manufacturers to maintain compliance and certifications to NSF 61, there is already a requirement for NSF 372 integrated for potable applications.

www.csagroup.com

ASHRAE RECOGNIZES OUTSTANDING ACHIEVEMENTS

Ninety-two people were recognized by ASHRAE for their contributions to the Society and the built environment industry at the Society's Annual Conference held June 25 to 29.

Denis Morris, P.E., fellow ASHRAE, life member from



Laura Ward, vice president, building efficiency global chiller business, Johnson Controls, presenting a \$100,000 cheque to ASHRAE Research during the President's Luncheon at the ASHRAE 2016 Annual Conference in St. Louis. Photo: Jim Ezell, EZ Event Photography

Halifax, NS and James Scriven, P.E., fellow ASHRAE, life member also from Halifax, NS received the distinguished 50-year member award. The exceptional service award went to Canadian Craig Wray, P. Eng., who is retired from Lawrence Berkeley National Laboratory. Two Canadians received the distinguished service award. John Cowan, P. Eng., life member, is an independent consultant in the arts and sciences and is

involved in the fair reporting of energy savings achieved by energy efficiency projects in Toronto, ON. Alex McGowan, P. Eng., vice president of technical services, WSP Canada Inc. also received this award.

In other ASHRAE news, its 2016 handbook on HVAC systems and equipment features revisions to the majority of its chapters. Updated chapters include chapter 12, district heating and cooling, which has new content from ASHRAE research project RP-1267 (the new District Heating Guide, and District Cooling Guide). Chapter 51, thermal storage, has new content on grid reliability, renewable power integration, heat storage, emergency cooling, water treatment and commissioning.

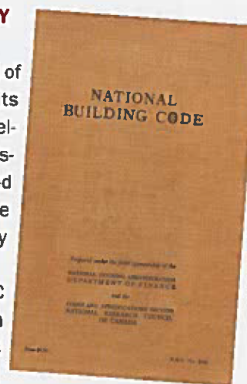
The volume is available in print and in electronic format. To order, tel: 800.527.4723, or visit www.ashrae.org. www.johnsoncontrols.com

NRC CELEBRATES A CENTURY OF INNOVATION

The National Research Council of Canada (NRC) is celebrating its 100th birthday this year. In celebration, it is donating the historic first colour-standardized Canadian national flag to the Canada Science and Technology Museum (CSTM).

Fifty years ago, NRC researchers were tasked with creating a flag that maintains colour consistency throughout wear and tear. NRC selected the iconic red colouring, which became the standard for all Canadian flags.

The historic flag will be exhibited at CSTM when it reopens in the fall of 2017 as Canada celebrates 150 years as a nation. www.nrc-cnrc.gc.ca



EASY. SAFE. FREE.

THERMOSTAT RECYCLING

We recycle all elements of the thermostat;
plastic, metal, electronics
and mercury (which is
particularly hazardous).



Do your part and join the more than 1,500 contractors already participating in the program.

FOR MORE INFORMATION
1(800) 267-2231, x 224
Email pthompson@hrai.ca

Administered & delivered by:

Supported by:

Fraser Valley Regional District, District of Mission on the Fraser, District of Invermere & Okanagan Valley District Waste Management Calendar Ad



EASY. SAFE. FREE.
THERMOSTAT RECYCLING

We recycle all elements of the thermostat;
plastic, metal, electronics and mercury (which is particularly hazardous).



Do your part and join the more than 1,500 contractors already participating in the program.

FOR MORE INFORMATION
1(800) 267-2231, x 224
Email: pthompson@hrai.ca

Administered & delivered by:



Supported by:



Appendix C – Retort Manifest Copies

2735642000

Movement Document / Manifest Reference No.
N° de référence du document du mouvement/manifeste:

A Generator / producteur Producteur / expéditeur		Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial ✓ 08022-082		B Carrier Transporteur		Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial A650427		Reference Nos. of other required documents (if any) / N° des autres documents requis (s'il y a lieu)	
Company name / Nom de l'entreprise AVERTIS INC.		Company name / Nom de l'entreprise VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Company name / Nom de l'entreprise VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Receiver / consignee Réceptionnaire / destinataire		Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial	
Mailing address / Adresse postale 9999 as below		City / Ville YVR		Province ON		Postal code / Code postal M9B1E5		Receiver / consignee information same as in Part A Les renseignements du réceptionnaire / destinataire sont les mêmes qu'à la Partie A <input type="checkbox"/> Yes / Oui <input type="checkbox"/> No, complete this box below / Non, remplir la case ci-dessous	
E-mail / Courriel électronique		Tel. No. / N° de tél. (519) 748-1333		E-mail / Courriel électronique		Tel. No. / N° de tél. (613) 733-1449		Company name / Nom de l'entreprise	
Mailing address / Adresse du lieu de l'expédition 75 WANLESS COURT		City / Ville YVR		Province ON		Postal code / Code postal M9B1E5		Mailing address / Adresse postale	
Interested Receiver / consignee Réceptionnaire / destinataire pour VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial 5756-BXPJ26		Part of entry Partie d'entrée 149 62F		Part of entry Partie d'entrée 149 62F		Part of entry Partie d'entrée 149 62F	
Mailing address / Adresse postale 9999 as below		City / Ville YVR		Province ON		Postal code / Code postal M9B1E5		Part of entry Partie d'entrée 149 62F	
E-mail / Courriel électronique		Tel. No. / N° de tél. 888 451-3267		Part of entry Partie d'entrée 149 62F		Part of entry Partie d'entrée 149 62F		Part of entry Partie d'entrée 149 62F	
Receiver's full address / Adresse du lieu de destination 620 HICKAY ROAD		City / Ville PICKERING		Province ON		Postal code / Code postal L1R2T4		Part of entry Partie d'entrée 149 62F	
Phone code / Code prov. 148C		Shipping name Appellation réglementaire MERCURY CONTAINED IN MANUFACTURED ARTICLES (THERMOSTAT VESSELS)		Class / Classe Sub-class / Sous-classe Description / Description 8 (6.1) UR3505		UN No. UR3505		Packing / Packaging Net weight / Poids net 243	
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* Please see comments provided on [Page 28](#).

MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

Movement Document/Manifest Reference No.
N° de référence du document de mouvement/manifeste

A Generator / consigneur Producteur / expéditeur		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 067682102		B Carrier Transporteur		Registration No. / Numéro d'ID No. N° d'identification - id. provincial SR65627		Reference Nos. of other movement documents / Numéros d'ID No. d'autres documents de mouvement 5750 5750	
C Receiver / consignee Réceptionnaire / destinataire		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 5750 5750		Company name / Nom de l'entreprise VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Mailing address / Adresse postale 4145 BELLECHUE DRIVE OTTAWA ON K1G3N2		City / Ville OTTAWA	
Shipping site address / Adresse du lieu de l'expédition 75 WARELESS COURT		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Intended Receiver / consignee Réceptionnaire / destinataire prévu VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 5750-0XPJ26		Vehicle / Véhicule Trailer - Rail car No. 1 2. transport - wagon		Port of entry / Port d'entrée Montreal		Port of exit / Port de sortie Montreal	
Mailing address / Adresse postale 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Shipping site address / Adresse du lieu de l'expédition 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Intended Receiver / consignee Réceptionnaire / destinataire prévu VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 5750-0XPJ26		Vehicle / Véhicule Trailer - Rail car No. 1 2. transport - wagon		Port of entry / Port d'entrée Montreal		Port of exit / Port de sortie Montreal	
Mailing address / Adresse postale 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Shipping site address / Adresse du lieu de l'expédition 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Intended Receiver / consignee Réceptionnaire / destinataire prévu VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 5750-0XPJ26		Vehicle / Véhicule Trailer - Rail car No. 1 2. transport - wagon		Port of entry / Port d'entrée Montreal		Port of exit / Port de sortie Montreal	
Mailing address / Adresse postale 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Shipping site address / Adresse du lieu de l'expédition 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Intended Receiver / consignee Réceptionnaire / destinataire prévu VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 5750-0XPJ26		Vehicle / Véhicule Trailer - Rail car No. 1 2. transport - wagon		Port of entry / Port d'entrée Montreal		Port of exit / Port de sortie Montreal	
Mailing address / Adresse postale 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Shipping site address / Adresse du lieu de l'expédition 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Intended Receiver / consignee Réceptionnaire / destinataire prévu VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 5750-0XPJ26		Vehicle / Véhicule Trailer - Rail car No. 1 2. transport - wagon		Port of entry / Port d'entrée Montreal		Port of exit / Port de sortie Montreal	
Mailing address / Adresse postale 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Shipping site address / Adresse du lieu de l'expédition 8368 85 below		City / Ville OTTAWA		Province ON		Postal code / Code postal K1G3N2		Tel. No. / N° de tél. (613) 733-1419	
Intended Receiver / consignee Réceptionnaire / destinataire prévu VEDLIA ES CANADA INDUSTRIAL SERVICES INC		Registration No. / Numéro d'ID No. N° d'identification - id. provincial 5750-0XPJ26		Vehicle / Véhicule Trailer - Rail car No. 1 2. transport - wagon		Port of entry / Port d'entrée Montreal		Port of exit / Port de sortie Montreal	
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Intended Receiver / consignee Réceptionnaire / destinataire prévu VEDLIA ES CANADA INDUSTRIAL SERVICES INC									

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Page 29

Appendix D – Third Party Assurance



June 29, 2017

Independent Reasonable Assurance Report

To the Directors of the Heating, Refrigeration and Air Conditioning Institute of Canada on selected non-financial information included in the HRAI 2016 Annual Report

Scope

We have been engaged by the Heating, Refrigeration and Air Conditioning Institute of Canada ("HRAI") to perform a reasonable assurance engagement in respect of the following information (the "Selected Information") detailed in Appendix A, and also included within HRAI's Annual Report to the Director of Extended Producer Responsibility Programs ("Director") at the Ministry of the Environment, Government of British Columbia ("MOE") for the year ended December 31, 2016:

1. The location of collection facilities, and any changes in the number and location of collection facilities from the prior year in accordance with Section 8(2)(b) of the British Columbia Regulation 449/2004 Recycling Regulation ("Recycling Regulation");
2. The description of how recovered product was managed in accordance with the pollution prevention hierarchy in accordance with 8(2)(d) of the Recycling Regulation;
3. The total amount of the producers' product collected for the year ended December 31, 2016 in accordance with 8(2)(e) of the Recycling Regulation; and
4. The description of performance for the year in relation to targets in the approved stewardship plan under Section 8(2)(e), in accordance with Section 8(2)(g) of the Recycling Regulation.

Responsibilities

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Our responsibility is to carry out an independent reasonable assurance engagement and to express an opinion on the Selected Information based on the procedures we have performed and the evidence we have obtained. We conducted our reasonable assurance engagement in accordance with the International Standard on Assurance Engagements 3000 Revised (ISAE 3000 Revised), *Assurance Engagements other than Audits or Reviews of Historical Financial Information*, published by the International Auditing and Assurance Standards Board (IAASB), and the *Guide to Third Party Assurance for Non-Financial Information in Annual Reports – 2015 Reporting Year*, dated February, 2016 ("Assurance Requirements"), published by the MOE.

HRAI

HRAI is responsible for the preparation and fair presentation of the Selected Information in accordance with the evaluation criteria as listed in Appendix A. Management is also responsible for such internal control as management determines is necessary to enable the preparation of the Selected Information such that it is free from material misstatement. Furthermore management is

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responsible for preparation of suitable evaluation criteria in accordance with the Assurance Requirements as specified by the Director under section 8(2)(h) of the Recycling Regulation.

HRAI is responsible for providing us with information about any frauds (including alleged and/or suspected instances of fraud) or illegal (or possibly illegal) acts communicated by employees, former employees, or contractors and all related known facts known by management that may relate to the Selected Information. HRAI is also responsible for demonstrating adherence to the Recycling Regulation as outlined within Section 1 of the Annual Report to the Director.

Our Independence and Quality Control

We have complied with the relevant rules of professional conduct / code of ethics applicable to the practice of public accounting and related to assurance engagements, issued by various professional accounting bodies, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

Our firm applies the International Standard on Quality Control 1, and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Methodology and Assurance Procedures

We conducted our reasonable assurance engagement in accordance with ISAE 3000 Revised. This standard requires that we comply with independence requirements and plan and perform the engagement to obtain reasonable assurance about whether the Selected Information is free of material misstatement.

A reasonable assurance engagement includes examining, on a test basis, evidence supporting the amounts and disclosures within the Selected Information. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement in the Selected Information due to omissions, misrepresentation and errors. In making those risk assessments, we consider internal control relevant to the entity's preparation and fair presentation of the Selected Information in order to design assurance procedures that are appropriate in the circumstances, but not for the purpose of expressing a conclusion on the effectiveness of the entity's internal control. A reasonable assurance engagement also includes assessing the evaluation criteria used and significant estimates made by management, as well as evaluating the overall presentation of the Selected Information.

The main elements of our work included:

- Obtaining an understanding of the management systems, processes, and controls used to generate, aggregate and report the data;
- Testing relevant controls, documents and records on a sample basis;
- Testing and re-calculating quantitative information related to the Selected Information on a sample basis; and
- Reviewing the consistency of the Selected Information with the related disclosures in the Annual Report to the Director.



We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our conclusion.

Inherent limitations

Non-financial performance information is subject to more inherent limitations than financial information, given the characteristics of the Selected Information and the methods used for determining and calculating such information. Qualitative interpretations of relevance, materiality and the accuracy of data are subject to individual assumptions and judgements. Furthermore, the nature and methods used to determine such information, as well the evaluation criteria and the precision thereof, may change over time. It is important to read our report in the context of the evaluation criteria.

Conclusion

In our opinion, the Selected Information for the year ended December 31, 2016 presents fairly, in all material respects, in accordance with the evaluation criteria listed in Appendix A:

1. The location of collection facilities, and any changes in the number and location of collection facilities from the prior year in accordance with Section 8(2)(b) of the British Columbia Regulation 449/2004 Recycling Regulation ("Recycling Regulation");
2. The description of how recovered product was managed in accordance with the pollution prevention hierarchy in accordance with Section 8(2)(d) of the Recycling Regulation;
3. The total amount of the producers' product collected for the year ended December 31, 2016 in accordance with Section 8(2)(e) of the Recycling Regulation; and
4. The description of performance for the year in relation to targets in the approved stewardship plan under Section 8(2)(e), in accordance with Section 8(2)(g) of the Recycling Regulation.

Emphasis of matter

Without qualifying our opinion, we draw your attention to Appendix B which describes why certain items required by the Assurance Requirements have been excluded. Our opinion is not qualified in respect of these matters.

Other matters

Our report has been prepared solely for the purposes of HRAI's compliance with the reporting requirements relating to Sections 8(2)(b), (d), (e) and (g) of the Recycling Regulation and is not intended to be and should not be used for any other purpose. Our duties in relation to this report are owed solely to HRAI, and accordingly, we do not accept any responsibility for loss occasioned to any other party acting or refraining from acting based on this report.

Our opinion does not constitute a legal determination on HRAI's compliance with the Recycling Regulation.



HRAI is responsible for their website and we do not accept responsibility for any changes that may have occurred to the reported subject matter information or criteria since they were initially presented on the website.

PricewaterhouseCoopers LLP

PricewaterhouseCoopers LLP
Chartered Professional Accountants
June 29, 2017



Appendix A to the Independent Reasonable Assurance Report

Selected Information:

1. **The location of collection facilities, and any changes in the number and location of collection facilities from the previous report in accordance with Section 8(2)(b) of the Recycling Regulation as presented on page 4 and 14 of HRAI's 2016 Annual Report to the Director.**

"1 main collection facility (1 to be fully phased out by 2017)"

"In 2016, TRP set out to use Aevitas as the sole collection facility for the program."

Evaluation Criteria:

- "Program Products" are all products included in the program as listed in the currently approved product stewardship plan dated February 3, 2010, Section 1.3.
- "Collection Facilities" are considered to be locations with a signed contract with HRAI for the purpose of collecting, processing, shipping, and reporting on Program Products at any point during the reporting year.
- "Collection Points" are mechanisms for collection. This term was new to the program as of the 2012 reporting year. In prior years, the collection points were considered the collection facilities. Collection Points may include the following types of businesses (also known as 'participants') and have either signed a formal document or a had a verbal discussion outlining their agreement with the Agency to take part in the program:
 - Contractors
 - Wholesalers
 - Local or regional government recycling centers or transfer stations
 - Direct send-back
- Reporting Period: January 1st to December 31st annually.

Method of Reporting:

- HRAI considers Aevitas Inc. to be the only Collection Facility, because "Collection Points" are more of a mechanism of recovery that increases access to the public similar to the function of a Canada Post or Courier outlet.
- The number of Collection Facilities is reported on the basis of the number of Collection Facilities who have a signed contract with HRAI to collect, process, ship, and report on collected program products during the reporting period. While Aevitas Inc. had a contract with HRAI for the reporting year, Tri-Arrow's contract terminated on December 31, 2015.
- The changes in number and location of Collection Facilities are calculated by tracking the additions and removals of Collection Facilities throughout a given reporting year. This information is further compared with the equivalent data from the end of the prior year.



Selected Information:

2. The description of how the recovered product was managed in accordance with the pollution prevention hierarchy under Section 8(2)(d) of the Recycling Regulation as presented on pages 17, 18 and 19 of HRAI's 2016 Annual Report to the Director.

In 2016, the breakdown of materials recovered and recycled from the province of British Columbia included:

- 5,052 mercury-containing vessels collected (there can be anywhere between 1 to 4 mercury vessels contained in each thermostat)
- 12.63 kg of mercury (calculated based on 2.5 grams of Hg per vessel)
- 5.05 kg of glass (calculated based on 1 gram of glass per vessel)
- 78.31 kg of metals
- 245.33 kg of plastics

The descriptions of how components (i.e. plastic, metals, glass vials containing mercury) are processed, is presented in a list on pages 18-19 of the Annual Report for Aevitas Inc.

The acceptable end fates for each of the components of a thermostat, is presented within the table on page 19 of the Annual Report.

NOTE: The selected information represent Aevitas' totals and do not include materials received by Tri-Arrow. As described in page 6 of the Annual Report, the collection figures provided by Tri-Arrow were not auditable because their contract ended with HRAI on December 31, 2015.

Evaluation Criteria:

- The Pollution Prevention Hierarchy includes the following:

"Reuse" includes all Program Products that are refurbished or can be reused "as-is" through either, resale, return to inventory, or given away as a donation.

"Recycle" includes:

- Any Program Product that cannot be Reused.
- Any Program Product where the sales agreement strictly prohibits the reuse of that product or requires its destruction.
- Any Program Product that is harvested for parts.
- Any commodities that are captured from the recycling process.

"Energy Recovery" relates to processing activities after the recycling stage and includes any element of the Program Product that is harvested to generate energy.

"Waste" includes any products not captured in the three streams above.

- "End of fate" is defined as final processed state of each commodity before entering a re-use stream or shipment to landfill / sequestration.
- Reporting Period: January 1st to December 31st annually.



Processor Due Diligence:

- i. HRAI satisfies itself with the sufficiency of all downstream processors of Program Products, up to and including end of fate, based on an established due diligence process including qualification by primary processors and/or annual site visits).
- ii. The due diligence process is administered or overseen by HRAI and considers the qualifications and capabilities of the processors, in line with the goals of the Program as set out in the approved product stewardship plan dated February 3, 2010, prior to selection and on a periodic basis subsequent to selection.
- iii. If the due diligence process is administered by the processors (i.e., a primary processor assessing a secondary processor), the results of the due diligence are assessed by HRAI for sufficiency.
- iv. The rigour of the due diligence process is tailored using a risk-based approach to assess the likelihood that, and impact of, the associated Program Products/materials will enter a waste stream.
- v. Processors are responsible for designing and maintaining their own system of internal control over the Program Product reporting process, as well as assessing the system of internal control of the downstream processors as part of the selection and ongoing due diligence process.

Processor Reporting:

- The Primary Processors are responsible for maintaining the records for Program Products processed, for each separately identifiable commodity of Program Products, and reporting the results, including those from downstream processors, up to and including end of fate, on a consistent and timely basis to HRAI. Reporting includes both quantitative and qualitative end of fate data for Program Products. Since Tri-Arrow's contract with HRAI ended December 31, 2015, they were not obligated to participate in the audit process. Therefore, PwC was unable to verify their data.

Method of Reporting:

- Program Products collected are reported by end of fate both by commodity and by process on the Pollution Prevention Hierarchy:
 - Reuse: N/A – No Program Products are reused per the approved product stewardship plan dated February 3, 2010.
 - Recycle: Products are reported by each separately identifiable end of fate commodity (e.g. plastics, metals, glass, etc.) either based on the number of units for the mercury vessels; or based on weight in Kgs for the plastics, metals, mercury and glass:
 - The weight in kg of glass is calculated by multiplying the total number of mercury vessels by the industry standard of 1 gram of glass per vessel; and
 - The weight in kg of mercury is calculated by multiplying the total number of mercury vessels by the industry standard of 2.5 grams of mercury per vessel.
 - Recovery: N/A - No Program Products are recovered.
 - Waste: N/A – all Program Products collected are expected to be 100% recyclable. Non-program products that may be included in shipments are not recorded or reported by the program but efforts are made to dispose of them in accordance with the pollution prevention hierarchy.



Selected Information:

3. The description of total amount of the producer's product collected, in accordance with Section 8(2)(e) of the Recycling Regulation, as presented on page 5 of HRAI's 2016 Annual Report to the Director.

"Collected 3,280 mercury containing thermostats, 426 electronic thermostats, and 467 loose mercury vessels"

"Adjusted total: 3,614 mercury containing thermostats and 426 electronic thermostats, for a total of 4,040 collected"

NOTE: The selected information represent Aevitas' totals and do not include materials received by Tri-Arrow. As described in page 6 of the Annual Report, the collection figures provided by Tri-Arrow were not auditable because their contract ended with HRAI on December 31, 2015.

Evaluation Criteria:

- "Program Products" are all products included in the program as listed in the currently approved product stewardship plan dated February 3, 2010 Section 1.3.
- "Product Collected" is the amount of all Program Products collected from sources known to be located within the province of BC that occurred through the Collection Facilities. The amount of Product Collected is reported as the total number of thermostats, Adjusted total number of thermostats, total number of Mercury ("Hg") vessels, and number of loose Hg vessels received by the Collection Facilities during the reporting year.
- Reporting Period: January 1st to December 31st annually.

Product Collected:

- Quantification of Product Collected is based on the number of Thermostats and Hg vessels reported by the Collection Facilities as having been received/collected and diverted as a result of the approved product stewardship plan dated February 3, 2010 during the reporting year.
- These amounts are monitored on a monthly basis through information collected that includes the number of thermostats and Hg vessels collected by geographic location.
- Although all participating collection points are encouraged to return only intact thermostats, loose vessels (which have been clipped out of thermostats) are occasionally returned as well. The equivalent number of thermostats is calculated by dividing the number of loose vessels by the industry-accepted standard of 1.4 vessels per thermostat (determined through averages provided by the industry and confirmed during a pilot study conducted by the Agency in 2006).
 - The "Adjusted total number of thermostats" collected is calculated by summing the total number of thermostats collected and the equivalent number of thermostats calculated above.



- Additional information is also collected for internal tracking purposes such as:
 - Weight of plastics and metals collected;
 - Brand of the thermostat collected; and
 - Details of the mechanism used for collection (e.g. name and location of the Collection Point/Participant).

Selected Information:

4. The description of performance for the year in relation to targets in the approved stewardship plan under Sections 8(2)(e) in accordance with 8(2)(g) of the Recycling Regulation as presented on pages 5, 21 and 23 of HRAI's 2016 Annual Report to the Director.

The target "Collection: 3,357 thermostats" for 2016, and results of "Adjusted total: 4,040 thermostats collected (20% over target)" in the tables describing the progress made towards the performance target.

NOTE: The selected information represent Aevitas' totals and do not include materials received by Tri-Arrow. As described in page 6 of the Annual Report, the collection figures provided by Tri-Arrow were not auditable because their contract ended with HRAI on December 31, 2015.

Evaluation Criteria:

Specific 2016 targets set out in the draft Stewardship Plan for Thermostats, Revised 5 Year plan: 2015-2020 – see below:

- i. Section 8(2)(b) - target is set for collection points, not collection facilities and therefore, no assurance provided.
- ii. Section 8(2)(d) - no target set for how the product is managed in accordance with the pollution prevention hierarchy because the Thermostat Recovery Program is already able to recycle greater than 99% of materials recovered through the program, efforts to continually reduce environmental impacts have centered on improving the program's collection processes.
- iii. Section 8(2)(e) - no targets set for product sold (Product sold is not calculated or reported).
- iv. Section 8(2)(e) - 85% capture rate of the estimated number of mercury-containing thermostats available for collection (3,950), which equals a target of 3,357 thermostats to be collected.



Appendix B to the Independent Reasonable Assurance Report

HRAI has not reported the recovery rate for the year in accordance with 8(2)(e) of the Recycling Regulations for the year ended December 31, 2016 as the approved stewardship plan does not outline the requirement to report recovery rates. If the stewardship program does not report a recovery rate in the approved plan, assurance for producers' product sold data is not required as outlined in the Assurance Requirements.

HRAI has not reported its performance for the year in relation to targets under 8(2)(b) and (d) in accordance with 8(2)(g) of the Recycling Regulation for the year ended December 31, 2016 as HRAI is not required to report this to the Director as there are no targets set in the amended stewardship plan for these sections applicable to the reporting year.