December 2012

Toxic Reduction Plan Summaries

Copper Cliff Smelter Complex

Arsenic
Cadmium
Chromium
Cobalt
Copper
Dioxins, Furans and Hexachlorobenzene
Lead
Nickel
Selenium
Sulphuric Acid
VOCs
Zinc
Toxic Substance Reduction Plan Summaries for Toxic Substances at the Copper Cliff Smelter Complex

1. Facility information

NPRI identification number: 444
NAICS identification number: 33-14-10
NAICS Canada code: 33

Legal and trade name of company: Vale Canada Limited

Facility Street Address:
Copper Cliff Smelter
18 Rink Street,
Copper Cliff, Ontario
P0M 1N0

Facility Mailing Address:
Copper Cliff Smelter,
18 Rink Street,
Copper Cliff, Ontario
P0M 1N0

Number of full time employee equivalents (2011): 515

UTM x: 493502
UTM y: 5143518

Public Contact:
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Manager – Environment (Air)
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P0M 1N0

Prepared Plan:
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18 Rink Street,
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  18 Rink Street,
  Copper Cliff, Ontario
  P0M 1N0

Toxic Reduction Planner and certifier:
  Mary Dubel
  Licence number: TSRP0118

Company information:
  Vale Canada Limited
  Business Number: 102475084
  DUNS number: 200429306
  Street Address:
    200 Bay Street,
    Suite 200, South Tower, P.O. Box 70
    Toronto, Ontario
    M5J 2K2

Parent Company:
  Companhia Vale Do Rio Doce (Vale)
  Business Number: 102475084
  DUNS Number: 200429306
  26 Graça Aranha Avenue,
  Rio de Janeiro, Brazil

2. List of Toxic Substances used and created at the Copper Cliff Smelter Complex and CAS # of Substance

  Arsenic and its compounds NA - 02
  Cadmium and its compounds NA-03
  Chromium and its compounds NA-04
  Cobalt and its compounds NA-05
  Copper and its compounds NA-06
  Dioxins, Furans and Hexachlorobenzene NA-D/F, 118-74-1
  Lead and its compounds NA-08
  Nickel and its compounds NA-11
  Selenium and its compounds NA-12
  Sulphuric Acid 7664-93-9
  VOCs NA – M16
  Zinc and its compounds NA-14
3. Toxic Reduction Policy Statement of Intent

At Vale’s Sudbury Operations, we are committed to sustainable development – meeting the needs of the present without compromising the ability of future generations to meet their own needs. Vale believes in zero harm, to our people, to our workplaces, to the communities in which we operate and to the natural environment. Vale Canada Sudbury Operation’s is committed to playing a leadership role in protecting the environment. While, for milling, smelting and refining, this primarily means reducing toxic substances end-of-pipe emissions, wherever feasible, Vale will adopt safer alternatives and technologies to reduce the use and release of toxic substances. Toxic substance reduction will be a continuing effort in our company and new technologically and economically feasible reduction options will be considered if opportunities become available in the future and are in compliance with all federal and provincial regulations.

4. Objectives

4.1. Arsenic and Lead

At this time, Vale’s Sudbury Operations does not intend to reduce the use of arsenic and lead at the Copper Cliff Smelter Complex. Reduction options were identified, however, at this time all options were not technically or economically feasible for the facility. The main source of arsenic and lead at the Smelter Complex is Clarabelle Mill nickel bulk concentrate. Ore essentially contains the periodic table of elements, with many undesired elements metallurgically bound to metals of value. As well, many other feed materials into the Smelter, with high arsenic and lead levels, are recycled material from the facility, other Vale operations or external sources. Processing this secondary feed material helps ensure environmentally safe and efficient recycling of these valuable resources.

The primary control strategy of the Smelter Complex to control arsenic is to maintain a desired level of arsenic in the bulk concentrate from Clarabelle Mill. Ore mined in Sudbury which is high in arsenic is segregated into stockpiles. The ore types delivered from the mines are adjusted to control the arsenic content of the concentrate.

The primary control strategy to control the amount of lead that is processed at the Smelter is to coordinate with the Ore Flow Coordinating group through ore blending during the first stages of the milling process. The ore processed at Clarabelle is the main input of lead into the system at Vale’s Sudbury Operation. Adjustments are made to the deliveries of various ore to control lead content of the concentrate.

Vale’s Sudbury Operations have committed to and deployed projects that will result in the reduction in the release of arsenic and lead to the environment. As part of the Clean AER (Atmospheric Emissions Reduction) project, the current outdoors Feed and Material Handling area, located at the Copper Cliff Smelter Complex, will be moved into vented buildings with dust capture. By enclosing the dry feed material, environmental forces, such as wind erosion, will no longer act on the material minimizing the loss to the environment. With the additional storage and handling facilities, opportunities for improved handling practices will reduce the loss of purchased and recycled materials.
4.2. Cadmium, Chromium and Zinc

At this time, Vale’s Sudbury Operations does not intend to reduce the use of cadmium, chromium and zinc at the Copper Cliff Smelter Complex. Vale’s Sudbury Operations were not able to identify options to reduce the use and release of cadmium, chromium and zinc at the Smelter Complex. The main source of cadmium, chromium and zinc at the Smelter Complex is Clarabelle Mill bulk concentrate. As well, many other feed materials used at the Smelter, with high cadmium, chromium and zinc levels, are recycled material from the facility, other Vale operations or external sources. Processing this secondary feed material helps ensure environmentally safe and efficient recycling of these valuable resources.

Vale Sudbury Operations have committed to and deployed projects that will result in the reduction in the release of cadmium, chromium and zinc to the environment. As part of the Clean AER (Atmospheric Emissions Reduction) project, the current outdoors Feed and Material Handling area, located at the Copper Cliff Smelter Complex, will be moved into vented buildings with dust capture. By enclosing the dry feed material, environmental forces, such as wind erosion, will no longer act on the material minimizing the loss to the environment. With the additional storage and handling facilities, opportunities for improved handling practices will reduce the loss of purchased and recycled materials.

4.3. Cobalt, Copper, Nickel and Selenium

Vale’s Sudbury Operations does not intend to reduce the use (input) of cobalt, copper, nickel and selenium at the Copper Cliff Smelter Complex. Vale Canada Limited is in the business of supplying Canada and the world market with high quality cobalt, copper, nickel and selenium products; as such, reducing input of these metals into the smelting process is not economically feasible. Vale will continue its efforts to reduce the release of cobalt, copper, nickel and selenium into the environment and reduce the loss of any feed material during processing.

4.4. Sulphuric Acid

Part of Vale’s continued initiatives to reduce sulphur dioxide emissions and to comply with Ontario Regulations 194/05 and Ontario Regulation 419/05, Vale’s Sudbury Operations have begun construction of the Clean AER (Atmospheric Emissions Reduction) project. With the implementation of the Clean AER project, sulphur dioxide emissions from the Smelter will be reduced by 70% over current levels. The project is designed primarily to capture sulphur bearing gases from the Smelter’s converter aisle that currently report to the Superstack and convert these emissions into sulphuric acid. With additional capture of the off gases from the converter aisle, the amount of sulphuric acid created by the Smelter Complex will increase.

As Vale Canada Limited is in the business of producing and supplying the world market with high quality sulphur products (sulphuric acid, liquid sulphur dioxide and Oleum) and must produce these products to be in regulatory compliance for SO₂ emission targets, options to reduce the amount of sulphuric acid created at the Copper Cliff Smelter will not be considered. The current process flow at the Copper Cliff Smelter Complex is designed to process the nickel sulphide concentrate at the Flash Furnaces. The exothermic reaction produced by the combustion of iron and sulphur maintains the heat balance needed for the smelting process.
4.5. Dioxins, Furans and Hexachlorobenzenes

At this time, Vale’s Sudbury Operations does not intend to reduce the creation of dioxins, furans and hexachlorobenzenes. Vale’s Sudbury Operations were not able to identify options to reduce the creation or release of dioxins, furans, or hexachlorobenzene at the Smelter Complex. Dioxins, furans and hexachlorobenzenes can be generated from the use of organic materials in the smelting process. These organic materials, which contain carbon, are used for supplemental heat and as reducing agents, components of minor processing stages of smelting.

4.6. VOCs

At this time, Vale’s Sudbury Operations does not intend to reduce the creation of VOCs. Vale’s Copper Cliff Smelter Complex was not able to identify new options to reduce the creation and release of VOCs. Vale’s Sudbury Operations have committed to and started to deploy projects that will reduce the creation of VOCs. The Clean AER (Atmospheric Emissions Reduction) project will make several significant changes to the consumption of natural gas at the Smelter Complex, the source for the creation of VOCs.

5. Description of Substances

5.1. Arsenic, Cadmium, Chromium, Lead, and Zinc

Arsenic, cadmium, chromium, lead and zinc are not ‘used’ at the Copper Cliff Smelter Complex. These substances are incidentally present in the feed material for the Smelter Complex, primarily nickel bulk concentrate, which is produced at Vale’s Clarabelle Mill. The ore essentially contains the periodic table of elements, with many elements metallurgically bound to base metals of value. It is the goal of the milling, smelting and refining process to remove the unwanted components from the ore to produce a valuable base metal product, in the case of Vale’s Sudbury Operations, primarily nickel, copper, cobalt and precious metals.

5.2. Cobalt, Copper, Nickel and Selenium

Cobalt, copper, nickel and selenium enter the Copper Cliff Smelter Complex from the nickel bulk concentrate feed produced at Vale’s Clarabelle Mill. It is the goal of the milling, smelting and refining process to remove the unwanted material from the ore to produce a valuable base metal product, in the case of Vale’s Sudbury Operations, primarily nickel, copper, cobalt and precious metals.

Feed streams at the Copper Cliff Smelter Complex containing copper are processed to create a pure copper anode product for sale on the market. Additional product streams containing copper from the Smelter Complex are processed at Vale’s Electrowinning plant. All feed streams containing nickel are processed at the Copper Cliff Smelter and Copper Cliff Nickel Refinery to create a pure nickel product for sale on the market. Electrolytic cobalt is produced at Vale’s Port Colborne Refinery located in Port Colborne, Ontario. Cobalt containing material that originated at the Sudbury mines and the Copper Cliff Smelter Complex are processed at this facility. The selenium, found in the Smelter products, is further processed at the Copper Cliff Nickel Refinery Complex. A TOL slurry, containing selenium, is produced and sent to Vale’s Port Colborne Precious Metals Refinery (PMR). During the precious metal refining process, selenium is recovered into a cake product and is sold to market.
5.3. Sulphuric Acid

The ore, which is processed at Clarabelle Mill, naturally contains many elements, including nickel, copper, cobalt, precious metals and sulphur. Sulphur is a component of the feed materials processed at the Smelter with bulk concentrate, from the Mill, being the primary source. It is the goal of the smelting and refining process to remove the undesirable impurities to produce a pure base metal product. During the Smelting process, sulphur dioxide gas evolves from the sulphur in the bulk concentrate. To reduce the emissions of sulphur dioxide to the atmosphere, a primary cause of acid rain, many of the process gases from the Smelter Complex are captured and the sulphur recovered in the form of sulphuric acid, oleum and liquid SO2.

5.4. Dioxins, Furans and Hexachlorobenzenes

Dioxins, furans and hexachlorobenzenes are not ‘used’ at the Copper Cliff Smelter Complex. Dioxins furans and hexachlorobenzenes are not an input into the smelter. Dioxins, furans and hexachlorobenzenes are present as impurities in the air emissions emitted from the Smelter’s Superstack created by the industrial processes. Based on source testing of the Superstack air emissions, the quantity of dioxins, furans and hexachlorobenzenes are below the level of quantification (LoQ), as set by the NPRI guideline.

5.5. VOCs

VOCs are created from natural gas combustion at the Smelter Complex. Natural gas is used for supplementary heat in the process, heating of process gas and equipment, and, in some cases, to provide heat for the workroom environment.

6. Rationale as to Why No Reduction Options Were Selected

6.1. Arsenic and Lead

Even though several reduction options were identified for arsenic and lead, at this time, these options were not selected for implementation. The options presented in the plan did not meet the technical and economic feasibility criteria established by the facility.

6.2. Cadmium, Chromium and Zinc

At this time, Vale’s Sudbury Operations were not able to identified options to reduce the use (input) of cadmium, chromium and zinc. Because the main source of cadmium, chromium and zinc is the bulk concentrate from Clarabelle Mill, only removal of cadmium, chromium and zinc at this stage of the nickel/copper production will affect the input of these substances into the process at the Smelter.

External materials and recycled materials used as feed material at the Smelter contain cadmium, chromium and zinc. This recycled material comes from the Smelter process, other Vale facilities and from external purchased sources. It is in the best interest of Vale to process the recycled feed materials, in order to extract the profitable minerals. The use of recycled feed material helps to ensure environmentally safe and efficient recycling of these valuable resources.
6.3. Cobalt, Copper, Nickel and Selenium

Vale Canada Limited is in the business of producing and supplying the world market with high quality cobalt, copper, nickel and selenium products. Options to reduce the amount of cobalt, copper, nickel and selenium processed and extracted at the Copper Cliff Smelter Complex will not be considered as these are our products.

6.4. Sulphuric acid

Abatement of SO₂ emissions has been a long standing objective at the Copper Cliff Smelter. The Flash Furnace was designed and constructed to process the nickel-copper sulphide concentrate, leading to high SO₂ off-gas streams amenable to economic fixation through utilizing a Sulphuric Acid Plant and Liquid SO₂ Plant. The Sulphuric Acid Plant and Liquid SO₂ Plant are a necessary stage in the smelting process to achieve the necessary pollution control vital to the continued operation of the Smelter Complex. The ability of the Copper Cliff Smelter to produce and sell high quality sulphur products (sulphuric acid, liquid sulphur dioxide, and Oleum) is an additional benefit to the company.

The Clean AER (Atmospheric Emissions Reduction) project is set to reduce Vale Sudbury’s impact on the surrounding community. The Clean AER Project will reduce sulphur dioxide emissions from the Smelter by 70% over current levels. The project is designed primarily to capture sulphur bearing gases from the Smelter’s converter aisle that currently report to the Superstack and convert these emissions into sulphuric acid. The outcome of the Clean AER project is to have the Smelter Complex meet the future Ontario Regulation 194 sulphur dioxide emission limits of 66kT and to meet the federal Pollution Prevention Planning notice emission reduction targets for SO₂. The reduction in sulphur dioxide emissions will also align the Smelter Complex to meet the changing standards associated with ambient ground level concentrations related to Ontario Regulation 419. As Vale Canada Limited is in the business of producing and supplying the world market with high quality sulphur products (sulphuric acid, liquid sulphur dioxide and Oleum) and must produce these products to be in regulatory compliance for SO₂ emission targets, options to reduce the amount of sulphuric acid created at the Copper Cliff Smelter will not be considered.

6.5. Dioxins, Furans and Hexachlorobenzenes

Reduction options for the Smelter Complex were not identified since the dioxins, furans and hexachlorobenzenes emissions were below the LoQ. The creation of any dioxins, furans, and hexachlorobenzenes are due to very small amounts of organic material added to the process. Organic materials used for supplemental heat and as a reducing agent are very minor components of the smelting process. At Vale, the concept of sustainability has been incorporated into our milling, smelting and refining practices in Ontario. Vale will continue to strive to be an industry leader by integrating the concept of zero harm in every aspect of our business.

6.6. VOCs

Even though a reduction option was identified for creation of VOCs, at this time, this option was not selected for implementation. The option presented in the plan did not meet the economic feasibility criteria established by the facility. Due to possible construction and cash-flow restrictions associated with the construction and commissioning of the Clean AER (Atmospheric Emissions Reduction) project, the reduction of natural gas combustion at the Smelter Complex due to the Clean AER will only be
This plan summary is an accurate synopsis of the content of the toxic substance reduction plan for arsenic, cadmium, chromium, cobalt, copper, dioxins, furans, hexachlorobenzenes, lead, nickel, selenium, sulphuric acid, VOCs and zinc present at the Copper Cliff Smelter Complex, Sudbury Operations, prepared for Vale Canada Limited, dated December 2012. The content of the summary is up to date and reflects the current version of the toxic substance reduction plan.
Certification by Highest Ranking Employee, Copper Cliff Smelter Complex

As of December 14th, 2012, I, Joe Costigan, certify that I have read the toxic substance reduction plans for the toxic substances referred to below and am familiar with their contents, and to my knowledge the plans are factually accurate and comply with the Toxics Reduction Act, 2009 and Ontario Regulation 455/09 (General) made under the Act.

Arsenic
Cadmium
Chromium
Copper
Cobalt
Dioxins, Furans and Hexachlorobenzene
Lead
Selenium
Sulphuric Acid
VOCs
Zinc

Joe Costigan
Manager – Operations, Bulk Smelter

December 14, 2012

Certification by Toxic Substance Reduction Planner

As of December 14th, I, Mary Dubel, certify that I am familiar with the process at Vale’s Copper Cliff Smelter Complex that use and/or create the toxic substances referred to below, that I agree with the estimates referred to in subparagraph 7 iii, iv and v of subsection 4(1) of the Toxics Reduction Act, 2009 that are set out in the toxic substance reduction plans referred to below for the toxic substances and that the plans comply with that Act and Ontario Regulation 455/09 (General) made under that Act.

Arsenic, December 2012
Cadmium, December 2012
Chromium, December 2012
Copper, December 2012
Cobalt, December 2012
Lead, December 2012
Dioxin, Furans, and Hexachlorobenzene, December 2012
Selenium, December 2012
Sulphuric Acid, December 2012
VOCs, December 2012
Zinc, December 2012

Mary Dubel,
Toxic Substance Reduction Planner

December 14, 2012