



March 29, 2018

**Action Plan Status Update: Copper Cliff Smelter
Site-Specific Standard Approvals for Sulphur Dioxide, # 503-12-rv1, 504-12-rv1**

Context

On December 24, 2012 the Ministry of Environment issued Vale Canada Limited two Site-Specific Standard Approvals for sulphur dioxide at its Copper Cliff Smelter. #503-12-rv0 was the 1-hr Site-Specific Standard Approval and #504-12-rv0 addressed the 24-hr standard. Vale submitted an action plan with its application and this became Appendix 1 in the Approvals; it is appended to this report. The reference numbers in the action item updates below correspond with those in Appendix 1. The two Approvals were revised on April 10, 2017 (#503-12-rv1 and #504-12-rv1, respectively) to accommodate Vale's request to extend the expiry dates of the Site-Specific Standard Approvals to June 30, 2018. The new Approvals also included a requirement to meet more stringent modelled SO₂ limits (3100 ug/m³ 1-hr and 900 ug/m³ 24-hr) for the time period between the revision date and the expiry date.

The update of each action item is detailed below:

Action Items

1. Atmospheric Emissions Reduction (Clean AER) and Surface Facility Upgrade (SFU) Projects Update – Process modifications and equipment installation.

The work in 2018 continues to be focused on executing the revised Clean AER project plan that was developed in 2014 on the basis of a future single furnace operation.

The Clean AER Project was approximately 98.5% complete at the end of February 2018. Engineering, procurement, construction and commissioning have continued as per the execution plan. Detailed engineering and procurement are 100% complete. Construction and commissioning are 95% and 88.5% complete, respectively.

The major work scheduled for completion in **2018** is as follows:

Clean AER Project

- Converter wet gas cleaning plant commissioning complete and ramped up.
- Secondary baghouse and fan room complete and ramped up.
- Primary and secondary flue complete and ramped up.
- M-Floor conveyor modifications complete.
- AER Project complete and closed out.

Surface Facility Upgrade

- 2018 Maintenance Shut-down (August) tie-ins.
- MK loadout ramp up complete.
- Foundations complete for two new 450 ft stacks.

- Shell construction started for the new 450 ft stacks.
- Flue fabrication started for the new 450 ft stacks.

In **2019**, major work scheduled to be done at the Smelter as part of the SFU Project is as follows:

- Internal construction of the two new 450 ft stacks.
- Installation of all flues, burners and fans supporting the 450 ft stacks.

In **2020**, the SFU Project will continue with the following tasks:

- 450 ft stacks tie in to existing process.
- Decommissioning of Superstack.
- SFU Project complete and closed out.

2. Operate the Emissions Reduction Program (ERP).

The sulphur dioxide Emissions Reduction Program (ERP) has been in existence since the 1970's, originally voluntary, and later mandated through various legal instruments issued by the Ministry. It is currently mandated by the Smelter Environmental Compliance Approval, # 4414-92QPT8. The purpose of the ERP is to limit sulphur dioxide emissions to the atmosphere by curtailing production at the Smelter on days when dispersion conditions are such that unacceptable ground level concentrations of SO₂ are anticipated or experienced in the community. Details of the ERP, the daily control forecasts, and real-time and historical community SO₂ monitoring network data are available on Vale's website:

<http://www.vale.com/canada/en/aboutvale/communities/sudbury/sudbury-environment/our-commitment-to-air-sudbury/pages/default.aspx>

This item is complete and ongoing, as reported March 18, 2013.

As noted in the "Context" section above, the Site-Specific Standards for SO₂ will expire on June 30, 2018. Numerous modelling analyses were conducted in the latter part of 2017 to determine if the Smelter could meet the provincial air quality standards during the transition period from July 1, 2018 to the time that the AER project was completed and collecting all primary converter gases from Smelter operations. The modelling determined that the air quality standards could be met during that time period, with the implementation of a modified ERP. Details about the modifications and all modelling files have been provided to the MOECC at a series of working meetings; dialogue is continuing.

3. Combined Analysis of Modelling and Monitoring study.

A second Combined Analysis of Modelling and Monitoring study was conducted to better correlate measured to modelled sulphur dioxide results in the community. The report was submitted to the Ministry of Environment on June 14, 2012. This item is complete, as reported March 18, 2013.

4. Review and enhance ERP to control SO₂ emissions post-AER project.

Vale annually reviews its sulphur dioxide Emission Reduction Program (ERP) and looks for opportunities to enhance the program. Item 2 above outlines the intention of continuing to operate the ERP after the Site-Specific Standard expires, in a modified capacity, and with the approval of the MOECC. Discussions are currently ongoing. The ERP operators will also continue to monitor measured levels of SO₂ in the community even after primary converter gases are collected and sent to the acid plant, to ensure that any remaining sources of sulphur dioxide at the Smelter are monitored.

5. Installation of a new continuous SO2 monitor in Little Italy.

A new continuous sulphur dioxide monitor was installed on Union Street in the Little Italy area of Copper Cliff in consultation with the Ministry of Environment. It was commissioned in November, 2012. Real time data and historical data for the entire Sudbury air quality monitoring network are available on Vale's website, <http://www.vale.com/canada/en/aboutvale/communities/sudbury/sudbury-environment/our-commitment-to-air-sudbury/pages/default.aspx>

This item is complete, as reported March 18, 2013.

6. Following completion of Clean AER project, perform source testing and conduct a Combined Analysis of Modelling and Monitoring study to verify the accomplishments of the AER and enhanced ERP.

Following completion of the Clean AER project, source testing will be performed and a Combined Analysis of Modelling and Monitoring study will be conducted to verify the emissions reduction accomplishments of the project and the enhancements made to the Emissions Reduction Program. This is planned to occur in 2020 when all components are complete. As well, it is realized that the Smelter ECA will need to be amended to account for the new Smelter configuration after the Clean AER project is complete; dialogue with the MOECC is planned to take place later in 2018.

Appendix 1: Summary of Action Plan Items

Table A: Measures to Reduce Sulphur Dioxide Emissions

Item Number	Reduction Measures	Description of Measure
1	Atmospheric Emissions Reduction (AER) Project- Process modifications and equipment installation.	Install new nickel smelting converters with water cooled primary hoods and spray coolers.
		Install a new dedicated Wet Gas Cleaning Plant that will clean gases from the nickel smelting converters before they are sent to the acid plant.
		Modifications to the existing acid plant to better control SO ₂ gas strengths and allow for more efficient operation.
		Install a SO ₂ scrubber at the existing Weak Acid Treatment Plant.
		Install secondary hoods on the nickel smelting converters to capture fugitive SO ₂ gases and install a secondary baghouse to remove particulate from the captured gases.
		For low strength SO ₂ sources not suitable for an acid plant:
		<ul style="list-style-type: none"> • Implement changes in the Fluid Bed Roasting area to increase SO₂ gas strength.
		<ul style="list-style-type: none"> • Modify exhausts to allow for better dispersion of emissions from the furnace building roof. • Redirect emissions from the Flash-furnace uptake vents to the Copper stack for better dispersion.
2	Operate the Emissions Reduction Program (ERP).	Continue to operate the existing ERP, curtailing production as required to keep the ground level SO ₂ concentrations in the community below the levels in Table 2.
3	Combined Analysis of Modelling and Monitoring study.	Completion of the second Combined Analysis of Modelling and Monitoring study to try to better correlate measured to modelled results in the community.

Item Number	Reduction Measures	Description of Measure
4	Review and enhance ERP to control SO ₂ emissions post AER project.	Review and enhance ERP to control the few SO ₂ emissions sources remaining after finalizing the Clean AER project.
5	Installation of a new continuous SO ₂ monitor in Little Italy.	Installation of a new continuous SO ₂ monitor in Little Italy.
6	Following completion of Clean AER project perform source testing and conduct a Combined Analysis of Modelling and Monitoring study to verify the accomplishments of the AER and enhanced ERP.	Following completion of Clean AER project perform source testing and conduct a Combined Analysis of Modelling and Monitoring study to verify the accomplishments of the AER and enhanced ERP.