



March 22, 2017

**Action Plan Status Update: Copper Cliff Smelter
Site-Specific Standard Approvals for Nickel, # 501-11-rv0, 502-11-rv0**

Context

On December 28, 2011 the Ministry of Environment issued Vale Canada Limited two Site-Specific Standard Approvals for nickel at its Copper Cliff Smelter. #501-11-rv0 is a 24-hr Site-Specific Standard Approval, which expires on June 30, 2016 when the nickel standard changes from a 24-hr to an annual basis (#502-11-rv0). Vale submitted an action plan with its application and this became Schedule 1 in the Approvals; it is appended to this report. The reference numbers in the action item updates below are those in Schedule 1.

The update of each action item is detailed below:

Action Items

Table A: Fugitive Property Sources

1. A Best Management Practices Plan for the control of fugitive dust emissions was prepared for the Smelter a number of years ago. Vale refers to this as a Dust Emissions Management Plan (DEMP). It is reviewed regularly and opportunities for continuous improvement projects, such as stockpile relocation, outside work and traffic pattern adjustment, are identified and acted on annually. A report will be prepared annually, submitted to the Ministry and reviewed with the community Environmental Monitoring Team. This item is complete and ongoing as reported November 20, 2012.
2. This item is addressed as part of action item 1. This item is complete.
3. Vale continues to progressively reclaim the non-operating footprint of the Smelter Complex. An annual evaluation is completed to determine if additional areas are available to be reclaimed and plans are developed accordingly. This item is complete and ongoing as reported March 31, 2014.
4. To fulfill this action item, on June 28, 2012 Vale submitted its Atmospheric Emissions Reduction (Clean AER) project Scope of Facilities Report; this report detailed all of the new facilities and facility modifications to be constructed to reduce the fugitive emissions of nickel from both process and property sources at the Copper Cliff Smelter. This item is complete. The execution of the Clean AER project is ongoing; progress is reported below.

Table B: Process Sources

5. The new high efficiency baghouses in the Matte Processing Fluid Bed Roaster department were installed and commissioned in September, 2010. This item is complete as reported November 20, 2012.
6. The new high efficiency baghouse on M floor in the Flash Furnace building was installed and commissioned in December, 2010. This item is complete as reported November 20, 2012.
7. The covers installed on the Matte Processing nickel slurry storage tanks have significantly reduced work place nickel concentrations in the area, without buildup in the tank or roof. Consequently, the new wet scrubber system that was installed in 2010 to vent the tanks has not been required and is not operating (and thus has zero emissions). It is being maintained and is available for use, should it be required in the future due to buildup formation. This item is complete, as reported November 20, 2012.
8. The matte crushing dust capture system upgrade included upgrade and enlarging of one baghouse and the replacement of a second unit with a new high efficiency baghouse. Construction and commissioning were completed in 2012. This item is complete, as reported March 18, 2013.
9. The installation of the new high efficiency converter aisle material handling baghouse was completed in October, 2012 and subsequently commissioned. This item is complete as reported September 24, 2013.
10. To fulfill this action item on June 28, 2012 Vale submitted its Atmospheric Emissions Reduction (Clean AER) project Scope of Facilities Report; this report details all of the new facilities and facility modifications to be constructed to reduce the fugitive emissions of nickel from both process and property sources at the Copper Cliff Smelter. This item is complete. The execution of the Clean AER project is ongoing; progress is reported below.

Table C: Additional Work

11. Source testing is executed to measure the performance of both existing and newly installed pollution control equipment, such as the baghouses in action items 5 to 9. This item is complete and ongoing, as reported November 20, 2012.
12. On behalf of Vale, a third party operates, maintains and reports the results from Vale's particulate monitoring network of 8 stations in accordance with the requirements of Operations Manual for Air Quality Monitoring in Ontario. As required by this Approval, the additional (8th) monitoring station was installed, in consultation with the Ministry, on Union Street adjacent to the Smelter. Construction and commissioning were completed in November, 2012. Quarterly reports are sent to the Ministry. Graphical summaries of the monitoring results and the quarterly reports are posted on Vale's internet website, <http://www.vale.com/canada/EN/aboutvale/communities/sudbury/sudbury-environment/environmental-reporting-sudbury/air-quality-monitoring-results/Pages/default.aspx> This item is complete and ongoing, as reported on March 18, 2013.
13. As required by the Regulation for Spill Prevention and Contingency Planning, O.Reg. 224/07, a Spill Prevention and Contingency Plan for the Smelter Complex was prepared in 2008. This plan is reviewed and updated annually as required by the Regulation. This item is complete and ongoing, as reported on November 20, 2012.

14. The environmental training needs analysis was updated. Environmental training requirements were identified for employees and contractors. The training topics included regulatory requirements, policy and environment management systems and technical and functional requirements. In 2012, environmental training packages and reference information were focussed on contractors, an identified gap. The development of new program content and delivery was prioritized. This item is complete and training program updates ongoing as required, as reported on March 18, 2013.
15. An Environmental Monitoring team with representatives from the Community, Ministry of Environment and Vale has been established and meets regularly to discuss air quality issues and review progress of these Action Plan items. An annual community engagement report is prepared and posted on the internet website, <http://www.vale.com/canada/EN/aboutvale/communities/sudbury/sudbury-environment/environmental-reporting-sudbury/air-quality-monitoring-results/Pages/default.aspx>. This item is complete and ongoing, as reported on March 18, 2013.

Atmospheric Emissions Reduction (Clean AER) Project Update

In January 2013, Vale's Ontario Operations announced that it was moving to a single-furnace operation, which has resulted in a reshaping of the Clean AER Project plan. The single-furnace Clean AER project will deliver significantly improved environmental outcomes. Early calculations estimated an approximately 70% reduction from 2013 nickel levels in the community along with the 85% reduction in SO₂ emissions.

The work in 2017 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 is approximately 70% complete to date. Engineering, procurement, fabrication and construction have continued as per the execution plan developed at the end of 2014. Detailed engineering is substantially complete and the Toronto engineering office is being demobilized. Procurement and fabrication is 93% complete. Construction is 41% complete and commissioning is 27% complete. Equipment fabrication and construction continue in the main areas as follows:

- The Converter 10 construction is complete; ramp-up is scheduled for August 2017.
- The Converter Wet Gas Cleaning Plant building and construction and equipment installation is currently underway. Construction will continue until late Q4 2017 to be followed by commissioning in Q1 2018.
- The Primary and Secondary Flue structural steel and ducting contract was awarded in Q4 2016. The contractor has mobilized to site and started erection of flue support steel. Completion is forecast for Q4 2017.
- Tie-ins for all completed flues is planned during the June Smelter shut-down (Planned Maintenance Period - PMP).
- The Secondary Baghouse and Fan Building construction contract was awarded late Q4 2016. Mobilization to site is planned for early Q2 2017.
- The acid plant and FBR gas cleaning modifications are well underway with much of the final work planned to take place during the June PMP.
- M Floor conveyor modifications ramp-up is planned for Q3 2017.
- Surface facility upgrades planned for 2017 include ramp up of Copper product (MK) filtration and loadout operations, and Matte Separation and Flash Furnace modifications.

Schedule 1: Summary of Action Plan Items

Table A – Measures to Reduce Nickel Air Emissions from Fugitive Property Sources at the Facility

Equipment/ Sources	Item Number	Description of Measure
Smelter Property sources including roads, material stockpiles, outside material handling and wind erosion.	1	Implement Smelter Property Dust Management Plan.
	2	Continue evaluation of opportunities to relocate stockpiles, outside work, adjust traffic patterns away from sensitive areas.
	3	Continue reclamation and re-vegetation of select community boundary areas to reduce dusting by wind erosion.
	4	Submit to the District Manager with a copy to the Director a written evaluation of alternatives, as part of the Company's AER Project, to further reduce nickel emissions from fugitive property sources.

Schedule 1: Summary of Action Plan Items continued

**Table B –
Measures to Reduce Nickel Air Emissions from Process Sources at the Facility**

Equipment/ Sources	Item Number	Description of Measure
Matte Process Fluid Bed Roasters	5	Implement baghouses #1, 2, 4, 5, 7, 8 and 9.
Flash Furnaces - M Floor Area Baghouse	6	Implement new baghouse for M floor to improve capture of feed transport system fugitive particulate emissions.
Matte Processing Nickel Storage Tank	7	Implement scrubber for Matte Processing Nickel Storage tank fugitive emissions.
Casting and Crushing Building Baghouses	8	Install the matte crushing system dust capture system upgrade.
Converter Aisle	9	Install the material handling baghouse in converter aisle.
Process Sources – General	10	Submit to the District Manager with a copy to the Director a written evaluation of alternatives, as part of the Company's AER Project, to further reduce nickel emissions from process sources.

Schedule 1: Summary of Action Plan Items continued

Table C – Measures to Reduce Nickel Air Emissions – Additional Work

Equipment/ Sources	Item Number	Description of Measure
All Sources of Nickel Air Emissions	11	Continue to characterize emissions and measure the result and effectiveness of control projects.
	12	Operate a community particulate monitoring network.
	13	Review in writing the Smelter Complex Environmental Emergency and Spill Prevention and Contingency plans annually and update as required or give written reasons for not updating.
	14	Review the Smelter Complex environmental training program and update as required.
	15	Review the Company's community involvement, partnerships and committees. In consultation with stakeholders, develop a forum/methodology to inform and consult with the community on air quality issues.