EXTERNAL AUDIT REPORT IN FULFILMENT OF THE ENVIRONMENTAL AUTHORISATION FOR THE COKE OVEN CLEAN GAS AND WATER PROJECT AT ARCELORMITTAL SOUTH AFRICA VANDERBIJLPARK WORKS

Report Nr: 387-AMVD-2016

Audit date: 17 February 2016
Report date: 29 March 2016

General Information

Report Name:	External Audit Report for the Coke Oven Clean Gas and Water Project (COCGAW) ROD
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Report compiled by:	Trevor Hallatt
Report date:	29 March 2016
Status	Final
Reference number	GAUT 002/02-03/138

EXECUTIVE SUMMARY

Zantow Environmental Consulting Services CC was appointed by ArcelorMittal to conduct an independent compliance audit on its Record of Decision (RoD) (GAUT 002/02-03/138) which was received from the Gauteng Department of Agriculture, Conservation and Environment (GDACE), now the Gauteng Department of Agriculture and Rural Development (GDARD) on the 21st March 2004.

The methodology followed for conducting the compliance assessment audit included;

- Documentation review
- Compilation of audit checklist/questionnaire for site visit;
- Site Visit (Conducted on the 17th of February 2016); and
- Compilation of compliance audit report.

Table 1 sets out the compliance with the RoD conditions and where non-compliances were recorded the auditor ranked the specific non-compliances in terms of the following criteria:

- Minor Issues
- Moderate Issues
- Critical Issues
- Historical issues

ArcelorMittal Vanderbijlpark Works operate 5 coke batteries to produce metallurgical coke for the Blast Furnaces on site. Coke is an important input material into the iron making process. During the coke making process, gas and other by-products are formed. The Coke Batteries were built between 1945 and 1985 and the gas and water cleaning technologies were considered out dated and could not deliver a clean gas which resulted in various maintenance issues and other implications. ArcelorMittal commenced with the Coke Oven Clean Gas and Water Project (COCGAW) in the early 2000's in order to install new technology that would enable them to clean the coke oven gas for re-use in the works as fuel gas and also complying with Environmental Best Practice Standards internationally.

The project scope is technical and complex and included various improvements and changes to the existing plant as well as the installation of new infrastructure. The project aimed to improve the current controls at the batteries, improve the gas collecting mains, upgrade of the primary cooling to improve naphthalene removal, installation of a new chiller plant, installation of a distillation plant and a sulphur removal plant. The water portion included the installation of new tar decanters, a gravel filter plant and scrubbers.

The construction of the plant commenced in 2005 and commissioned in 2010 at the cost of more than R 330 million. The project faced numerous delays and challenges. In 2010 the plant ran successfully and proved significant sulphur reduction in terms of emissions. Unfortunately the plant was shut down at the end of 2010 due to technical and mechanical difficulties. From 2011 up to date ArcelorMittal repaired the identified fault in the process and then attempted to re-commission the facility on a few occasions. The plant has not run for more than a few days at end without interruption. Currently the gas is only partially cleaned but no sulphur removal is taking place.

The major concern is that the plant is not fully operational and ArcelorMittal is removing Sulphur from the coke oven gas which leads to the release of emissions from the facility to the environment. Other non-compliances recorded in terms of the authorisation mostly related to the groundwater monitoring requirements that are not met and fugitive emissions control. A number of measures and projects have been implemented to reduce fugitive emissions.

The following recommendations are made to improve compliance to the ROD;

- Commission the Sulpur removal section of Gas Cleaning plant and ensure the required measures are implemented to continuously operate the plant. **(ArcelorMittal, ASAP)**

- Monitoring of ground water at borehole CO-3D cannot be undertaken as the borehole no longer exists. Finalise the plans to drill an alternative suitable borehole that could be used for the same purpose envisaged and align the relevant legal requirements. (**ArcelorMittal, May 2016**)
- Exposure monitoring indicates that further fugitive emission mitigation measures are required. Although ArcelorMittal supplies specialised PPE and has implemented management measures to mitigate employee exposure, it is recommended that the additional fugitive emission reduction projects as identified by ArcelorMittal be prioritised and implemented**. (ArcelorMittal, as per project schedule)**
- The second phase of the water cleaning system will commence in 2016 which includes the installation of an ammonia stripping plant to remove ammonia from the wastewater emanating from the coke oven. This phase of the project was part of the initial project scope as approved by GDARD. The relevant documents such as the EMPr and site plans must be reviewed to adequately address the stripper plant prior to the commissioning thereof. **(ECO, prior to commissioning**)

Contents

1. INTRODUCTION

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- Critical Issues
- Historical issues

2. BACKGROUND AND PROJECT STATUS

ArcelorMittal Vanderbijlpark Works operates 5 coke batteries to produce metallurgical coke for the Blast Furnaces on site. Coke is an important input material into the iron making process. During the coke making process, gas and other by-products are formed. The Coke Batteries were built between 1945 and 1985 and the gas and water cleaning technologies were considered out dated and could not deliver a clean gas which resulted in various maintenance issues and other implications. ArcelorMittal commenced with the Coke Oven Clean Gas and Water Project (COCGAW) in the early 2000's in order to install new technology that would enable them to clean the coke oven gas for re-use in the works as fuel gas more efficiently and also complying with Environmental Best Practice Standards internationally.

The project scope is technical and complex and included various improvements and changes to existing plant as well as the installation of new infrastructure. The project aimed to improve the current controls at the batteries, improve the gas collecting mains, upgrade of the primary cooling to improve naphthalene removal, installation of a new chiller plant, installation of a distillation plant and a sulphur removal plant. The water portion included the installation of new tar decanters, a gravel filter plant and scrubbers. The primary purpose of the Elementary Sulphur and Stripper Plants are to remove H2S and NH3 vapours in the Coke Oven gas.

The plant consists the 2 main parts:

- Stripper Plant, enriched water from the gas plant scrubbers containing H2S and NH3, are distilled in columns heated with low pressure steam. Thus releasing the H2S and NH3 as vapours via the vapour condensers to reduce water content and then these vapours are send to the Elementary Sulphur Plant.
- Elementary Sulphur Plant, where the vapours from the Stripper plant are burned in the Crack Reactor at a temperature of about 1150°C and directed to a Claus Reactor to remove sulphur from the gas stream. The hot vapours are forced through the catalyst inside the Crack Reactor and then through the waste heat boiler train. The boiler train consists of a High Pressure waste heat boiler connected to a steam drum and the Low Pressure boiler with its Sulphur Condenser.

The construction of the plant commenced in 2005 and commissioned in 2010 at the cost of more than R 330 million. The project was faced with numerous delays and challenges. In 2010 the plant ran successfully and proved significant sulphur reduction in terms of emissions. Unfortunately the plant was shut down end of 2010 due to technical and mechanical difficulties. From 2011 up to date ArcelorMittal

repaired the identified fault in the process and the attempted to re-commission the facility. The plant has not run for more than a few days at end without interruption. Currently the gas is only partially cleaned but no sulphur removal is taking place. An investigation was undertaken at the end of 2015 by external specialists to analyse the plant and propose a strategy to repair and re-commission the plant. Different options were provided to ArcelorMittal and they are currently investigating the feasibility thereof. Once funds are available, the preferred strategy will be initiated and the reparations will commence.

The Environmental Authorisation condition 3.4.b requires that a bi-annual compliance audit be undertaken by an independent external auditor and the audit report submitted to the Department. This report is concluded in fulfilment of this condition.

3. PART 1: Audit Information

3.1. Date of Audit

External Audit date: - 17th February 2016

Report date - 29th of February 2016

3.2. Audit Criteria / Scope of Work

The scope of work entailed conducting a compliance audit to verify compliance to the Environmental Authorisation (ROD) conditions as per condition 3.4.b. The bi-annual environmental performance audit must be conducted by an independent auditor and must be submitted to the department 30 days after the audit has been conducted.

The following documents and or information were considered in order to determine compliance with the conditions of the ROD:

- Environmental Authorisation
- Amendment applications and amended ROD's
- External and internal audit reports
- Various database monitoring results made available / presented during the audit
- Monitoring reports / data
- Procedures and the electronic Environmental Management System (EMS)
- Relevant communications between ArcelorMittal, Authorities and I & APs
- Applicable South African Environmental Legislation.

In light of the above, the auditor has, in addition to indicating compliance and non-compliance, ranked the specific non-compliances in terms of the following criteria:

Critical Issues

- There is a critical failure against legal requirements or management response that presents an immediate or significant risk that: Could result in prosecution and /or adverse legal finding due to failure to meet regulatory requirements;
- Could result in immediate injury or serious injury or environmental harm;
- Could result in prolonged business outage; and/or
- Could result in serious damage to the project's reputation.
- Critical issues must be addressed immediately and all activities resulting in negative critical findings must cease until such time as the issue has been rectified.

Moderate Issues

- There is a substantial failure to meet the environmental requirements for the project,
- There is a possibility of substantial environmental degradation and/or pollution and/or

- Objective evidence was observed raising doubt as to the integrity of data or records inspected.

Minor Issues

- Isolated observations demonstrating that full compliance to the environmental requirements on site have not been, or will not be, fully achieved.
- No physical environmental harm

Historic Issues

- No physical environmental harm – administrative in nature
- Historic non-compliance, out the company currently in control of compliance control
- No administrative or other remedy available to rectify the situation
- No further action required

3.3. Objectives

To carry out an independent compliance audit including:

- Inspection of operations and confirm compliance to the Authorisation
- Verify the effectiveness of impact management and mitigation.
- Assess allocations of responsibilities and actions.
- Report observations for further investigation and action.
- Specifically state whether conditions are adhered to.
- Make recommendations where appropriate.
- Prepare an audit report for submission to the relevant authorities.

As part of the conditions of the ROD issued for the COCGAW project, bi-annual environmental performance audits are required to be conducted by an independent, accredited auditor. The objective of these audits are to provide a status quo report on the COCGAW project in line with the requirements of the ROD more specifically condition 3.2.b which required the following reporting:

- Specifically state if the conditions of the ROD and EMP are adhered to;
- Include an interpretation of all available data and test results regarding the operation of the site and all its impacts on the environment
- Volume water treated, re-used, discharged and reduction in water use
- Results of improved air and water quality achieved
- Air quality monitoring and reporting regime
- Discussion on groundwater treatment
- Discussion on implementation of recommendations
- Results of groundwater and surface water monitoring
- Quantities of by-products produced
- Carousel system for tar handling
- Preventative Maintenance Plan
- Major Incidents
- Waste Management
- Monitoring of boreholes
- Details of the failure of the treatment system and how these where handled
- Details of the discharges

3.4. Independent Assessor

The role of the Independent Environmental Assessor is to provide independent, objective and professional advice on the environmental compliance of the COCGAW Project, with specific reference to the respective ROD conditions. Specific duties of the auditor include the following:

- Review and assess in an independent, objective and professional manner all aspects related to the ROD conditions;
- Conduct a random site inspection if deemed necessary; and
- Provide feedback on the assessment results to ArcelorMittal.

3.5. Comments from previous audit reports

The status of recommendations or proposed mitigation measures as set out in the previous audit report is as follows;

Finding and mitigation measure as per Aug 2014 external audit	**Status 2015**	**Status 2016**
3.2.g.1 *"The Sulphur Plant is not operational. H_2S emissions are exceeding the limit and repairs to the plant have been prioritised. It was noted that it takes approximately three weeks for the plant to heat to the required temperature and leaks are only visible once the plant is operational." A high level meeting was held to evaluate potential solutions to commission the plant*	Compliant. The monitoring results indicate that the H2S emissions are below the limits. ArcelorMittal indicated that the coal has been changed to a lower Sulphur percentage coal which led to an improvement. The Sulphur removal plant must still be commissioned. Experts have initiated a process to assess the plant in order to generate solutions for the operational deficiencies. ArcelorMittal expects a full report regarding the assessment by September 2015.	Unresolved An investigation was undertaken at the end of 2015 by external specialists to analyse the plant and propose a strategy to repair and re-commission the plant. Different options were provided to ArcelorMittal and the company is currently investigating the feasibility thereof. The preferred strategy will be initiated by ArcelorMittal once the decision has been taken.
Un-cleaned gas is being flared due to the non-operational Sulphur Plant. H2S emissions are exceeding the limit and repairs to the plant have been prioritised. It was noted that it takes approximately three weeks for the plant to heat to the required temperature and leaks are only visible once the plant is operational.	The status is unchanged and the condition remains a non-compliance. Recent monitoring showed a slight reduction in H_2S production. This may be ascribed to recent change in coal supplies with lower sulphur content.	The status is unchanged.
Commission the Gas Cleaning plant and ensure the required measures are implemented to continuously operate the plant. The organisation has initiated a process to source expert advice to examine the plant and to propose potential solutions.	The plant has not been re-commissioned to date and the recommendation therefore still stands. Experts have initiated a process to assess the plant in order to generate solutions for the operational deficiencies. ArcelorMittal expects a full report regarding the assessment by September 2015.	An investigation was undertaken at the end of 2015 by external specialists to analyse the plant and propose a strategy to repair and re-commission the plant. Different options were provided to ArcelorMittal and the company is currently investigating the feasibility thereof. The preferred strategy will be initiated by ArcelorMittal once the decision has been taken.
Monitoring of ground water	The issue with regards to borehole	The status is unchanged. An order

Finding and mitigation measure as per Aug 2014 external audit	Status 2015	Status 2016
at borehole CO-3D cannot be undertaken as the borehole no longer exists. It is recommended that ArcelorMittal propose an alternative suitable borehole that could be used for the same purpose envisaged and align the relevant legal requirements. No organic quality data was available for review. The samples were repeatedly taken in December 2013 but the analysis has not been obtained from the external laboratory to date. (ECO, July 2015)	CO-3D still stands. Monitoring is however done at CO-1D also located at the coke ovens as an alternative and the organisation is awaiting monitoring data. The organisation has recently approached a contractor to install new boreholes to replace CO-3D. The WUL should be amended to include the new boreholes after installation has been completed. The facility is in process to place an order.	has been placed to repair the boreholes. However, the contractor has not completed the work to date.
Exposure monitoring indicates that further fugitive emission mitigation measures are required*. It is recommended that the additional fugitive emission reduction projects as identified by ArcelorMittal be prioritised and implemented.* ***(ArcelorMittal, as per project schedule)***	This is a long term action and the recommendations are therefore still valid. ArcelorMittal has however implemented management and mitigation measures such as efficient gasmasks to protect employees and reduce exposure	The status is unchanged.

Although a process has commenced to evaluate potential solutions, the same issues remain due to the fact that the gas cleaning plant is not operational.

3.6. Declaration of independence

I, **Trevor Hallatt**, as an independent consultant compiled this audit report and declare that it correctly reflects the findings made at the time of the audit. I further declare that I,

Act as an independent consultant;

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act107 of 1998) and the National Environmental Management Waste Act;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, will present the results and conclusion within the associated document to the best of my professional judgement.

_____

Trevor Hallatt
Environmental Specialist
Sacnasp reg nr: 300123/15

3.7. Compliance statement

3.7.1. Positive observations/findings

ArcelorMittal Executive Committee (Exco) consisting of the facilities top management on executive level, has prioritised the re-commissioning of the gas cleaning plant. An investigation was undertaken at the end of 2015 by external specialists to analyse the plant and propose a strategy to repair and re-commission the plant. Different options were provided to ArcelorMittal and they are currently investigating the feasibility thereof. Once funds are available, the preferred strategy will be initiated and the reparations will commence. The progress is reported to the Exco on a regular basis and the Exco has committed resources to solve the problems experienced. This illustrates that the facility is taking the issue seriously. It should be noted that the Coke Oven Gas and Water Cleaning plant and technology is the only of its kind in South Africa and there is therefore no local experience or knowledge or service providers other than the trained in house ArcelorMittal employees.

The gravel filter plant commissioned in 2013 seems to be performing well and has delivered very good oil and suspended solid removal rates. The second phase of the water treatment system will commence in 2016 which includes the installation of an ammonia stripper to remove ammonia from coke oven process water.

The administrative compliance management of the RoD is well managed and ArcelorMittal proactively seeks to comply with conditions and regularly interacts with the authorities in this regard.

3.7.2. Compliance to the License conditions

In general ArcelorMittal is not complying fully with the authorisation as the sulphur plant is not operational. The gas cleaning plant aims to deliver many environmental benefits in terms of emission reduction, which is not realised until the Elemental Sulphur plant is repaired and re-commissioned. The plant has not been fully operational due to technical and mechanical failure(s) for the last four years which seems excessive for a new plant constructed less than 10 years ago and which has operated for less than 12 months consecutively.

Other than the non-compliances relating to the down time of the plant, non-compliance relates to ground water monitoring requirements and fugitive emissions control. A few observations have been made in light of the continued improvement drive. Table 1 addresses compliance to each relevant condition in the environmental authorisation.

1.1. Authorisation Conditions Assessment

Table 1: Compliance to the RoD conditions

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
3.1	The authorisation applies in respect of the upgrading and operation of coke oven gas (COG) and water cleaning systems at the existing coke ovens… Specific details regarding the project scope as per condition 3.1.1a-c and 3.1.2.a-k	Various changes were made and approved by GDARD. In the last reporting period, the gravel filter plant was constructed according to the scope. The caustic dosing infrastructure is planned for construction in 2016. On completion of the last infrastructure requirements the water can be sent to the BF Gas cleaning system as planned originally and therefore cleaner water used for quenching. ArcelorMittal reported that the last outstanding items to be constructed is towards improving the works water balance and does not influence the plants operability. Instead of the water being treated and re-used in the BF Gas cleaning system, the water is used at the coke ovens to quench with. The second phase of the water cleaning system will commence in 2016 which includes the installation of an ammonia stripping plant to remove ammonia from the coke oven process water. The relevant documents such as the site layout plans and the EMP must be revised to include the new facility's specifications prior to commencement.	Compliant	
3.2 Specific Conditions				
3.2 (a)	An updated project schedule must be submitted to the department 30 (thirty) days prior to the commencement of construction activities. The schedule must clearly indicate the different phases of construction activities. The schedule must clearly indicate the different phases of construction and commissioning and decommissioning (i.e. expected dates of commissioning of specific completed parts of the COG and water treatment systems).	A project schedule was submitted to the Department as required with the relevant items attached. The following information was submitted with the initial notification: • Answers to specific items in the ROD • EMP – construction phase • Layout drawings (pipes, demolished infrastructure, tanks and containment areas) • Diagram for storm water and spillage management • HIRA • Aspect and Impact register • Project Schedule	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
		• HAZOP The organisation should consider informing the department of their intentions to commence with the ammonia stripping plant, 30 days prior to construction.		
(b)	The Department must be informed of both start of construction and the start of commissioning at least 30 (thirty) calendar days prior to the commencement thereof.	The plant was commissioned on the 22nd January 2010 and the department informed accordingly. The Sulphur cleaning section of the plant has unfortunately been shut down due to mechanical and maintenance problems since December 2010. The facility has sent numerous letters to inform the department of expected start up again only to send an update that the start-up was not successful. In one of the last letters ArcelorMittal informed the department that they will notify them when start-up has been successful and the plant could run stable for a period of time.	Compliant	
(c)	A detailed Environmental Management Plan (EMP) for the implementation of the project must be submitted to the Department for approval 30 (thirty) calendar days prior to the commencement of construction activities. The EMP must specifically include, *inter a*	EMP submitted for construction as stipulated above. ArcelorMittal submitted an operational EMP on the 3rd November 2008 and an updated Operational plan on the 19th March 2012. ArcelorMittal followed up on the EMP approval from GDARD without any response other than acknowledgement of receipt per email from the department.	Compliant	
	• An auditable plan for monitoring all facets of the COG and water cleaning project, implementation and operation, including decommissioning of all underground sumps, piping (underground and overhead), obsolete machinery, plants e.g. the benzol plant, ammonium sulphate plant, tar remediation required, and any remedial measures to be implemented.	The decommissioning of infrastructure was addressed in the construction EMP which was approved by the department. The operational EMP contains auditable elements relating to the COCGAW project.	Compliant	
	• A proposed surface and ground water monitoring regime, which will be in line with	Surface monitoring is being undertaken in line with the requirements of the	Partial compliance	Minor

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
	the DWAF Water Licence. The graphically represented results of this monitoring are to be included in a bi-annual audit, which must be submitted to this Department for review to determine if the removal measures have been successful or if further remediation is required.	water use license issued to the Works. During the previous audit, it was established that no groundwater monitoring is conducted at CO-3D as the borehole is damaged. However, ArcelorMittal continued with monitoring at CO-1D as an alternative borehole. The organisation has recently approached a contractor to install new boreholes to replace CO-3D. The WULA should be amended to include the new boreholes after installation has been completed. Ground water results and analyses are discussed in Section 5 of the report.		
	• Proposed methods of reducing spillage at the quench towers.	The EMP addresses the spillages at the quench towers. ArcelorMittal reportedly installed an alarm system at all the quench towers to warn operators of high sump levels. No spillages reported during the current audit period and no spillages noted during the site visit.	Compliant	
	• The EMP must include an air quality monitoring program based on the requirements of 3.2 (g).	The EMP that has been submitted to the Department includes an air quality monitoring programme which meets the requirements set out by the condition 3.2 (g) of the RoD.	Compliant	
	• A diagram indicating all unpaved areas, including, bunds and storm water channels, and any areas identified for storm water and surface water management. Plans must be developed to ensure that all surfaces are protected from spillage and erosion, and that dust in the area of coke ovens is reduced	Diagram available and submitted to the Department with the first bi-annual Environmental Performance Audit conducted in June 2010.	Compliant	
	• A proposal to address significant pollution from cooling tower sumps	General operating procedures are included in the EMP. The sumps are within bunded areas and a bio-dosing program in place to reduce potential microbial health risks.	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
	• Handling procedures of sulphur and other by-products produced.	EMP updated to include handling of all by-products, including coke breeze as per previous audit report recommendation. No sulphur currently generated.	Compliant	
	• A waste management plan pertaining to any waste from the treatment process not re-used or sold as by products, including expected columns and classification, the disposal thereof and waste manifest system.	The project specific EMP provides waste generation management measures in addition to the ArcelorMittal waste management plan for the industrial complex.	Compliant	
(d)	A copy of the detailed HAZOP study to be conducted during the detail design phase of the project must be submitted to the Department 30 (thirty) calendar days before commissioning commences. The HAZOP must specifically include risks related to commissioning or decommissioning of any equipment, failure of treatment systems due to inefficient operation etc., emergency and shutdown, incidents such as spills, and potential discharges to the environment (air, water and land) must propose operational and emergency procedures accordingly.	HAZOP study completed and available and was submitted as stipulated above.	Compliant	
(e)	An auditable Preventative Maintenance Plan must be developed to ensure all water systems and environmentally critical equipment such as exhausters, ESP's, scrubbers and strippers are maintained as required. This plan must be auditable and must conform to the original equipment manufacturer (OEM) specifications. The management of IVS are to commit to the budget to undertake the required preventative maintenance. A discussion on the implementation of and compliance within the maintenance plan must be included in the bi-	An amendment Application concerning external verification of the preventative maintenance plan (PMP), dated 29 July 2009, was submitted on 7 Aug 2009. Critical maintenance requirements have been identified and are captured on the "SAP" system for tracking and action. A job cards is created and managed on "SAP". The ETP was chosen as an example. The last job card was dated the 19 February 2016 (see Appendix B). From the job card and additional information provided it seems as if the maintenance plans are implemented	Compliant	Observation

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
	annual audit reports.	sufficiently. During the previous audit, it was recommended that the facility considers sourcing expert advice into the full repair from the start of the process to the finish and implement best practice maintenance plans. An investigation was undertaken at the end of 2015 by external specialists to analyse the plant and propose a strategy to repair and re-commission the plant. Different options were provided to ArcelorMittal and they are currently investigating the feasibility thereof. Once funds are available, the preferred strategy will be initiated and the reparations will commence.		
(f)	Final design plans for new and upgraded containment areas (sumps, tar decanters etc.) buffer tanks and chemical storage tanks as well as proof of the Department of Water Affairs and Forestry's (DWAF) approval thereof as applicable, must be provided 30 (thirty) calendar days prior to the commencement of construction thereof. The above design plans must include information on specific pollution prevention measures (e.g. bunding & liners), compliance with relevant SABS standards (specifically tanks), the sourcing of particular, materials as required (e.g. clay for liners), time-frames for construction, and exact location on site.	The designs were submitted to GDARD at a meeting as reflected in communication with the Department. The drawings was resubmitted to DWA and followed up by ArcelorMittal on many occasions. The facilities were already constructed and the approval thereof would therefore be superfluous at this stage. No further action is recommended on this matter. The plans should be upgraded prior to the commissioning of the ammonia stripping plant.	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
(g)	The following air quality management, monitoring and reporting regime must be implemented and reported on in the bi-annual environmental performance audits as applicable. *Note the emissions sampling(as required) is not required for each of the seven coke oven stacks, but may be conducted on a single stack representative of the whole plant (a short motivation for using a particular stack in terms of physical and gas flow characteristics similarly to other stacks, differences between stacks etc. must be provided). Note that conditions relevant to coke ovens themselves are applicable to all coke oven batteries on site (i.e. no 1, 3, 4, 6, 7, 8, 9*	The facility has chosen a representative stack for some sampling based on the age and performance of the battery. The "worst" performing battery was chosen from a precautionary approach for continuous or regular monitoring of dust and gas. Battery 4, 8 and 9 was chosen as the current Coke Strategy for the Works indicates that these 3 batteries will most likely be in operation for longer opposed to the other batteries with a shorter remaining life span. The facility argued that they wish to collect data on the remaining batteries which will remain in operation in order to have a long term trend for these batteries, both approaches are reasonable.	Compliant	
	• The concentrations of the following constituents of the cleaned Coke Oven Gas must be monitored before and after combustion in the coke ovens. The results are to be graphically represented and included in the bi-annual audit report. The H_2S content of the gas must be between 0.8 and 1.5 g/Nm^3.	The Sulphur Plant is not operational and therefore very limited sulphur removal is taking place. Although H2S concentrations in the COG are not exceeding the limit, repairs to the plant must remain a high priority. It was noted that it takes approximately three weeks for the plant to heat to the required temperature and leaks are only visible once the plant is operational. During the previous audit it was found that monitoring indicated that the H2S levels in the gas is around 1.9 g/Nm^3. Recent results showed that concentrations have decreased to less than 1.5 g/Nm^3. According to ArcelorMittal, the decrease may be ascribed to a change in coal suppliers with a lower sulphur content.	Compliant	Observation
	• The emissions from the stacks of the coke ovens must be monitored for dioxin and furan emissions within 6 months of decommissioning of the benzole plant. The results of this monitoring must be included in the bi-annual audit.	The benzole plant has been decommissioned. Results from dioxin and furan emission monitoring have previously been submitted in 2006. The results confirmed that Dioxins and Furans are not of a concern at the Coke Battery stacks.	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
	• A plan for door maintenance/ replacement of all the coke batteries (No.) and progress in achieving reduced fugitive emissions has to be developed. The plan must be supported by the results of personal monitors, and actual measurements at respective areas of the coke ovens.	Battery doors are on a maintenance schedule and are checked on a daily basis. Repairs are done continuously. Refer to Appendix A for the Battery Door Maintenance Program. It was observed during the site visit that the occasional door is still burning and smoking. The commitment from the facility was however also observed to repair and maintain the equipment as best as possible. The fugitive emissions are monitored according to the internationally accepted standards and recorded. The month report for July 2015 to Jan 2016 is detailed in Section 5 of the report. Exposure monitoring at the batteries indicates that additional fugitive emission mitigation measures are required, above that already implemented.. This can however not be attributed only towards doors but rather the battery emissions as a cumulative source. ArcelorMittal has however implemented management and mitigation measures such as specialised face masks and other management measures to protect employees and reduce exposure. Other measures are planned for 2016, including battery tightening and charge emission reduction projects.	Partial Compliance	Moderate
	• The assumptions regarding improved air quality made with respect to this project must be confirmed by actual ambient air quality monitoring. The improvements must be discussed in the bi-annual environmental performance audit reports. Attention must be paid to recommendation contained in the air quality report to install additional PM10 and gaseous samplers within the zone of impact directly south of the IVS site.	Ambient air quality monitoring is conducted and the assumptions were assessed during the period when the plant was operational. Additional ambient PM10 and gas monitoring stations were installed as recommended. No comment can be made currently on the compliance as the plant is not operational currently.	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance

	• The following must be undertaken within 6 months of the commissioning of the carious treatment plants. Results must be included in the first bi-annual environmental audit report, together a plan for remediation should these emissions be significant.
	  ○ Monitoring for ammonia and hydrogen sulphate fumes from the tar decanters and liquid sumps and storage tanks.
	  ○ Monitoring for benzene must be undertaken at the flushing liquor storage tanks.
	
	Sampling frequency and parameters for sampling of the cooling water tower emissions in the steam must be anticipated and sampling of the steam must be undertaken to determine the impact on the environment of the present cooling process, determine of mitigation measures are required, and to develop reduction plans accordingly.
		The relevant information was submitted.
		
		The implementation of the Gravel Filter Plant and the caustic dosing (Ammonia Stripping) infrastructure planned for 2016 is part of the medium to long term plan to enable the facility to adapt its internal water balance and improve on quenching practices.
		
		The facility implemented the relevant water monitoring program and the data is available.
			Compliant	Observation

	• The composition of the approximately 15% of treated COG that would be flared as well as the gas flare temperature must be determined and reported on in the first bi-annual environmental audit report. A discussion on the effective treatment of gas through flaring, and a plan to reduce the need for flaring the remaining 15% of COG must also be provided in the first audit.	The gas quality was reported on in the first bi-annual audit report as required. Partially cleaned gas is being flared due to the non-operational Sulphur Plant. The condition can therefore not be assessed. Repairs to the plant have been prioritised. It was noted that it takes approximately three weeks for the plant to heat to the required temperature and leaks are only visible once the plant is operational. An investigation was undertaken at the end of 2015 by external specialists to analyse the plant and propose a strategy to repair and re-commission the plant. Different options were provided to ArcelorMittal and they are currently	Compliant	Observation

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
		investigating the feasibility thereof. Once funds are available, the preferred strategy will be initiated and the reparations will commence.		
	• Based on the assumptions made in the air quality report, and the results of the actual isokinetic sampling and personal monitoring, a plan must be developed with proposals on future emissions sampling, including the frequency thereof and the constituents to be sampled for. This work must be undertaken by an external expert and a report with recommendations must be submitted with the first bi-annual report. In order to ensure early detection of issues to be addressed and ensure the efficiency of treatment equipment, relevant air quality monitoring of COG must be undertaken after each step of commissioning a specific treatment technology.	Airshed Planning Professionals was commissioned in 2011 to conduct the required assessment and develop the air quality monitoring plan for the Coke Ovens. The report was submitted as required.	Compliant	
	• Based on emission results further emission reduction programs may have to be developed. These plans must consider internal standards and best practice, such as the US EPA's Final rule to reduce toxic emissions from coke ovens (February, 2003) and NESHAP for Coke Ovens: Pushing, Quenching and Battery Stacks – Background information for proposed standards (February, 2001)	The works has developed a Coke Strategy for the short, medium and long term. The facility also implements additional Emission Reduction Plans in line with the Atmospheric Emissions License. The implementation of the plans, including the establishment of the Ammonia stripping plant, reportedly depends on resource availability.	Compliant	
(h)	The flaring of un-cleaned gas at the relevant flares is only permissible during upset conditions when Claus	The Sulphur plant is not operational and therefore partially cleaned gas is flared when there is no use for it in the rest of the works as energy source.	Non Compliance	Moderate

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
	Reactor is shut down for inspection/ maintenance for 3 weeks every three years, and must be undertaken at temperatures and atmospheric mixing conditions conductive to maximum dispersion of pollutants.	From an environmental perspective the SO_2 emissions load is the same whether the un-cleaned gas is flared or combusted at another plant for fuel or energy source. The Claus reactor is however now off for more than 4 years due to equipment failure and significant repairs and replacements required.		
(i)	Detailed up to date records must be kept of all incidents and complaints pertaining to the COG and water cleaning project, how these were managed, and the recurrence thereof prevented. These records must be made available to the Department within 14 (fourteen) calendar days upon written request by the Department.	Incidents are registered in the Work's internal reporting system and/or noted in ECO reports/incident register.	Compliant	
(j)	This Department and the Department of Water Affairs and Forestry must be informed of any major environmental and pollution incidents relating to the COG and water cleaning project within 24 (twenty four) hours of such incidents occurring.	No major or emergency incidents reported in the reporting period. Spills, should they occur, can be diverted to the coke plant sump and are therefore contained.	Compliant	
(k)	The use of existing Maturation Dams for the storage or disposal of any effluent/ sludge/ waste is prohibited as form 6 months after commissioning of the completed coke oven by-products plant. An application for authorisation and draft plan for decommissioning and rehabilitation of the existing Maturation Dams must be submitted to the Department within 120 (one hundred and twenty) calendar days of commissioning of the COG and water cleaning project.	Submission of application not met, however it was reported to the authorities. The Water Use License (WUL) and the COCGAW Project ROD had conflicting dates relating to the Maturation Ponds. ArcelorMittal notified GDARD that the timeframes as stipulated in the WUL will be followed as the Department of Water Affairs (DWA) was the competent authority at the time. The Department of Environmental Affairs (DEA) issued a Waste Management License for the decommissioning of the maturation ponds in February 2012. The facility implemented various process changes in order to cease the use of the dams. The dams were taken out of operation in 2008, two years before the COCGAW project was commissioned which is commendable. The remediation of the maturation ponds are progressing very well. The dam consisted out of 3 dams of which the remediation of Dams 2 and 3 is 100%	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
		complete and Dam 1 about 50% complete. Soil is being remediated in-situ.		
(l)	Planning with respect to addressing existing groundwater contamination identified in the Coke Plant area must continue. Confirmation of, or plans for, abstraction and or treatment of contaminated ground water or septic pollutants, including the feasibility of abstracting contaminated groundwater from the aquifer underlying the site as a source of water supply to the process, needs to be considered. Progress with respect to this matter must be reported on in the quarterly progress reports and bi-annual environmental performance audits thereafter.	The specialist investigations and development of a Final Ground Water Management Plan (including a specific investigation at the Coke and Tar plant) completed in May 2011 and was peer reviewed in 2012. ArcelorMittal is in process to develop a prioritised action plan and investigating alternative technical solutions, pending the approval of DWA. At the time of the audit, DWA has not formally responded to the GWMP submitted and ArcelorMittal stated that they are attempting to incorporate the GWMP into the WUL review period in 2015.	Compliant	.
(m)	The recommendations contained in the specialist studies submitted in support of the application for authorisation of the COG and water cleaning project are regarded as an extraction of the conditions of those authorisation. Implementation of or compliance with these recommendations must be discussed as part of the quarterly progress reports and bi-annual environmental performance audits thereafter.	Compliance to the specialist recommendations are detailed in Table 2 below and compliance is generally good.	Compliant	
(n)	An independent Environmental Control Officer (ECO) with an understanding of the coke oven operational and treatment process must be appointed for the duration of construction and commissioning, to monitor and report on compliance with the conditions of this authorisation.	Terrence Wilson from ArcelorMittal has been appointed as the ECO.	Compliant	
3.3 General Conditions				
3.3 (a)	Any changes to or deviations from the project description set out in this letter must be approved in	No changes made during the reporting period. The new Ammonia stripping	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
	writing by the Department before such changes or deviations may be effected. In assessing whether to grant such approval or not, the Department may request such information as it deems necessary to evaluate the significance and impacts of such changes or deviations.	that is planned for 2016 is also included under the scope.		
(b)	This Department may review the conditions contained in this letter from time to time and may by notice in writing to the applicant, amend, add or remove a condition.	No notices received in the current reporting period.	Compliant	
(c)	The applicant must notify the Department in writing at least 30 (thirty) days prior to the change of ownership, project developer or the alienation of any similar rights for the activity described in this letter. The applicant must furnish a copy of this document to the new owner, developer or person to whom the rights accrue and inform the new owner, developer or person to whom the rights accrue that the conditions contained herein are binding on them.	The Department was notified of name change in 2007 and change of contact person in February 2012. No other changes and associated amendments outstanding in the current reporting period.	Compliant	
(d)	Where any of the applicants contact details change, including the name of the responsible person, the physical or personal address and/ or telephonic details, the applicant must notify the Department as soon as the new details become known to the applicant.	The department was notified of name change in 2007 and change of contact person in February 2012. No other changes and associated amendments outstanding in the current reporting period.	Compliant	
(e)	Authorization for the activity is granted in terms of the Environmental Conservation Act, 1989 (Act 73 of 1989) only and does not exempt the holder from compliance with other relevant legislation.	ArcelorMittal is aware of other relevant legislation and receives relevant updates regularly. The facility has a legal register in place with sufficient legal advisors to ensure they are aware of their legal requirements.	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
(f)	The applicant shall be responsible for ensuring compliance with the conditions contained in this letter by any person acting on his behalf, including but not limited to an agent, servant, or employee or any other person rendering a service to the applicant in respect to the activity, including but not limited to contractors and consultants.	An environmental control officer has been appointed to ensure compliance with conditions of the authorisation and ensure contractors are informed of requirements.	Compliant	
(g)	Departmental officers shall be given access to the property referred to in 1 above for the purpose assessing and/ or monitoring compliance with the conditions contained in this document at all reasonable times.	The department has inspected the property and no issues have been noted in this regard.	Compliant	
(h)	The applicant must notify the department within 24 (twenty four) hours if any condition of this authorisation cannot, or is not, adhered to. The notification must be supplemented with reasons for non-compliance.	No additional non-compliances for the reporting period. The non-compliance and problems associated with the Elementary Sulphur Plant have been reported to the relevant authorities and have been highlighted as part of this audit.	Compliant	
3.4	**Reporting**			
3.4 (a)	A summarised quarterly progress report on the implementation of the COG and waster cleaning report must be submitted to the Department, the first report being due 90 (ninety) calendar days after the construction commences, and every 90 (ninety) calendar days thereafter. These progress reports must address inter alia, the following: • Up to date scheduling of implementation and associated time frames, • Records of any major incidents (see 3.2 (i) above)	ArcelorMittal received a letter from GDARD dated the 8th February 2010 stating quarterly audits must continue but doesn't need to be submitted anymore. The quarterly audits was available and on record	Compliant	

RoD Cond.	ROD Requirement	Status	Compliance Status	Intensity of non-compliance
	• Decommissioning of infrastructure, • Rehabilitation and disposal of contaminated waste material (soil, decommissioned equipment etc.) including the quantity and classification (general/hazardous) thereof. • Commissioning of any treatment infrastructure, • Results on the monitoring of efficiency of commissioned treatment infrastructure, • Monitoring of activities in terms of the environmental management plan (See 3.2 (c) above), • Any steps taken to rectify areas of non-compliance with environmental requirements.			
(b)	Bi-annual Environmental Performance Audit conducted by an independent, accredited auditor must be submitted to the Department for review, the first audit being due 6 (six) months after commissioning of the COG and water cleaning project, and every 6 (six) months thereafter. The bi-annual audit must include, inter alia, the following (results in graph format as applicable):"…"	The last external audit was conducted by Zantow Environmental in July 2015. This audit report has been structured to comply with the conditions and the specific items to be addressed are discussed in more detail under Section 5	Compliant	

2. SPECIFIC ITEMS TO BE ADRESSED IN TERMS OF CONDITION 3.4.b

2.1. Water and Waste Water

Volume of water treated, volume re-used, volume discharged and reduced in volume of fresh intake achieved, i.e. updated water balance for the site,

ArcelorMittal Vanderbijlpark Works is a zero effluent discharge facility as required in their Water Use License since the end of 2005. Prior to this, treated effluent was discharged from the works through the Rietspruit canal into the Rietspruit River which flows into the Vaal River.

The facility constructed and commissioned the Main Treatment Plant (MTP) as well as upgraded the existing Central Effluent Treatment Plant (CETP) in December 2005. This enabled ArcelorMittal to significantly decrease the raw water abstraction with approximately 50%. The MTP enabled ArcelorMittal Vanderbijlpark Works to treat its process effluent water that was previously discharged subject to the Water Use Licence applicable at the time. After treatment the water is re-used in the process. The facility has maintained their zero effluent status until 2011 when the system could no longer cope with the demand for high quality water and the excess low quality water was discharged. The discharge continued until end of July 2012 where after the zero effluent status was re-instituted. The facility installed additional salt removal capacity and made various process changes in order to optimise the system and reported during the audit that the water balance of the Works are not very tolerable of upsets. The updated water balance for the Works is illustrated in the figure below.

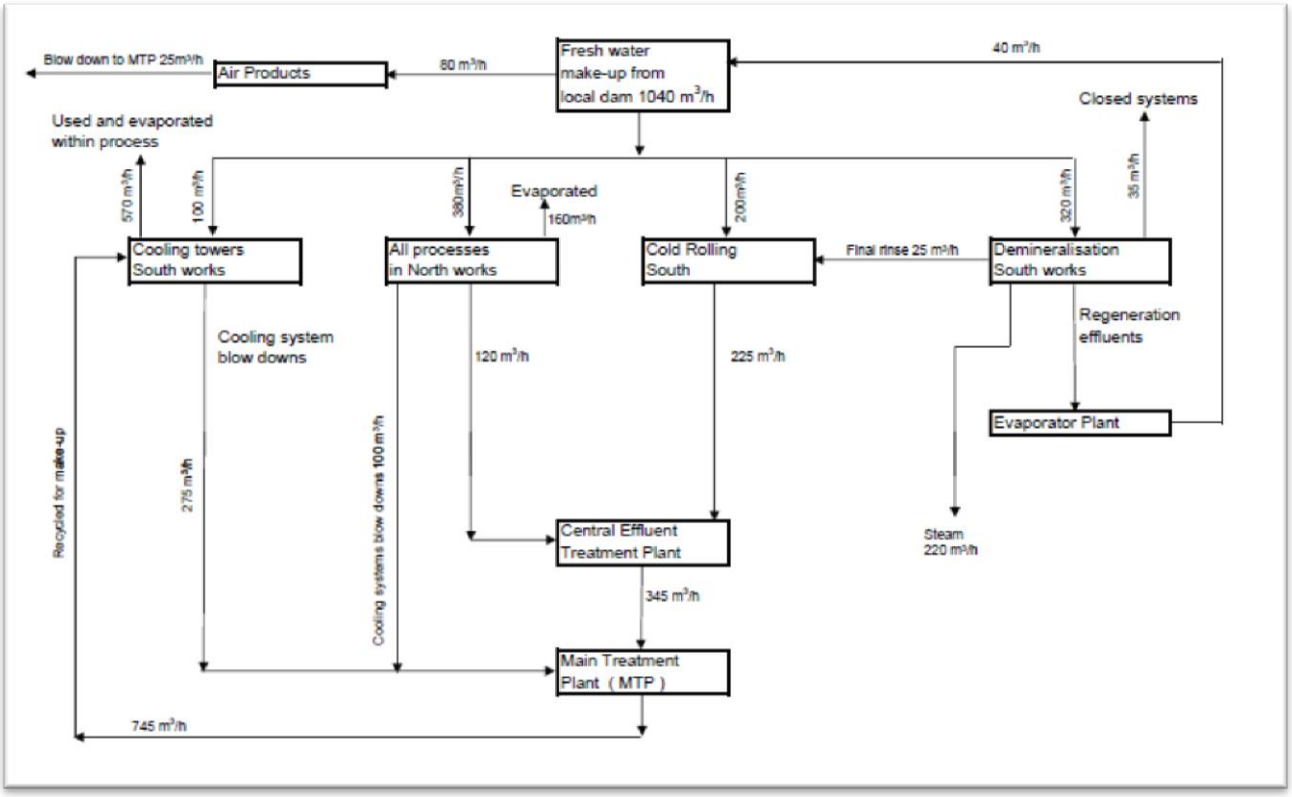

Figure 1 Updated Vanderbijlpark Works Water Balance

As can be seen in Figure 2 there was some effluent discharged in 2015 to date. The facility reported the relevant discharges to the competent authority and the matter falls outside the scope of this audit.

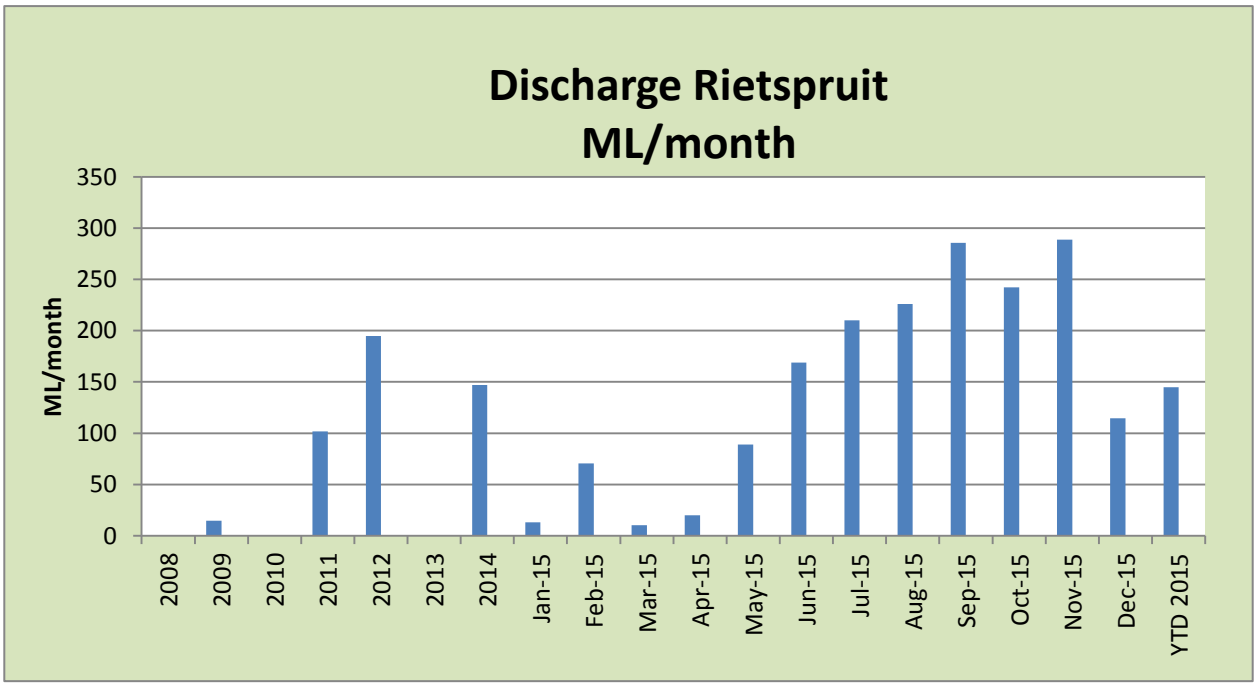

Figure 2 Effluent Discharge Volume (please provide volumes)

An average of 65% reduction of water abstraction since 2005 has been achieved.

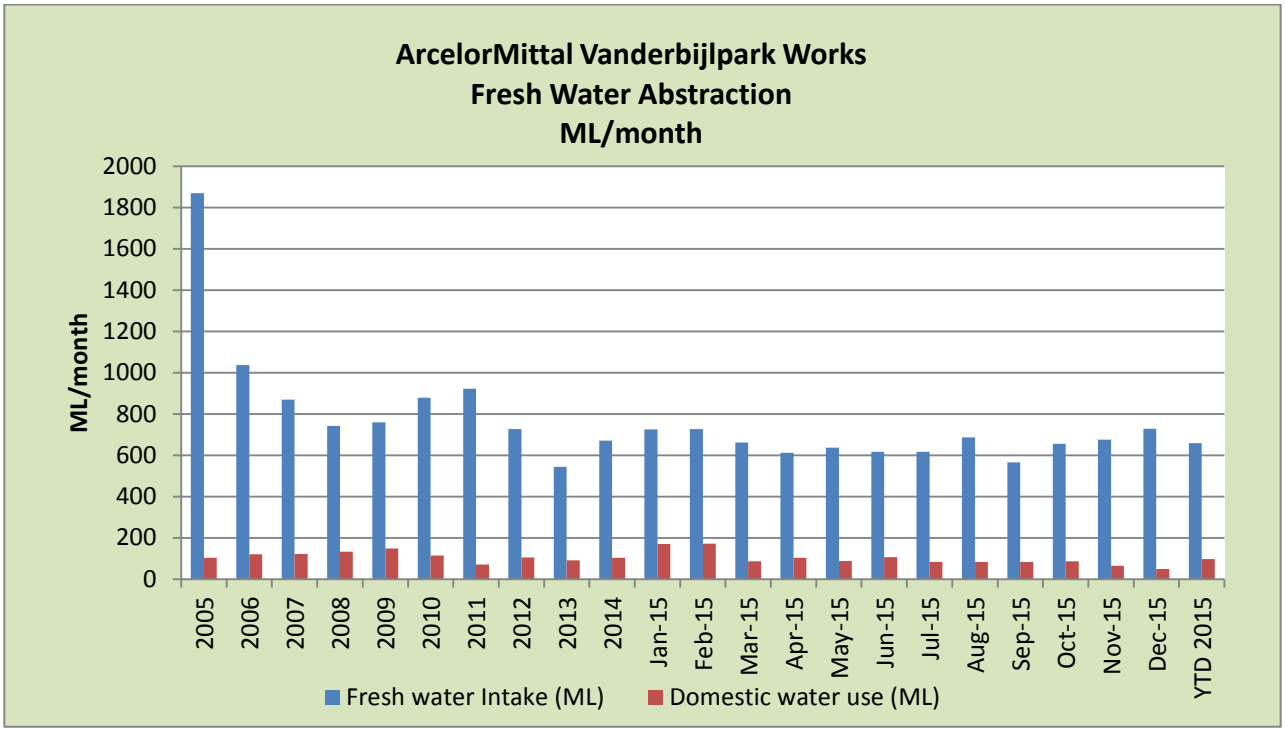

Figure 3 Fresh Water Abstraction

The coke ovens are however only a portion of the facilities water balance. The coke ovens create coal water as a by-product from the reduction of the coal to coke. The coal water and other sources of effluent water are directed to the oil skimmer where some mechanical oil skimming occurs. The effluent is then pumped to the quench tower quench tower sump and used as quenching water.

The Coke Plant water balance is set out below;

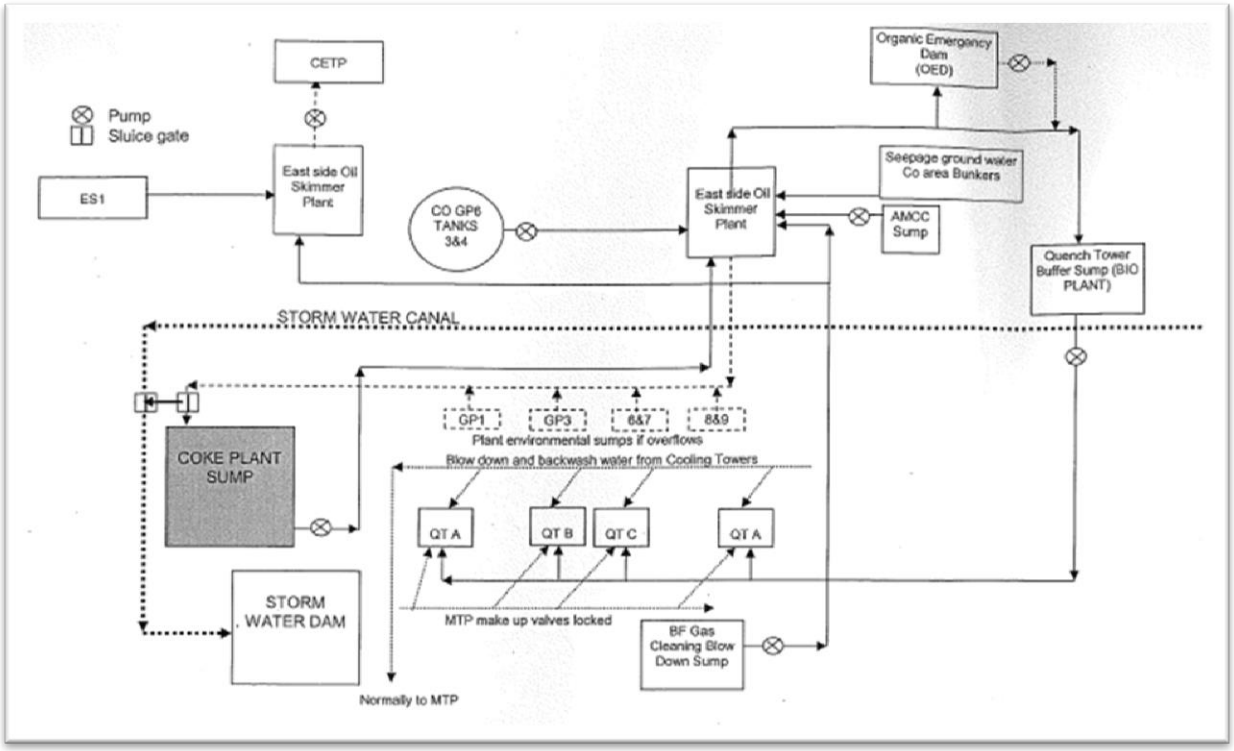

Figure 4 Coke Plant Water Balance

The Gravel Filter plant has been installed and commissioned in 2013 and the treatment of waste water in this process is shown to be effective. The gravel filter plant is part of the original design scope of the project to clean the coal water in order to avoid quenching with dirty water and enable the potential re-use of the treated coal water in the BF Gas cleaning plant.

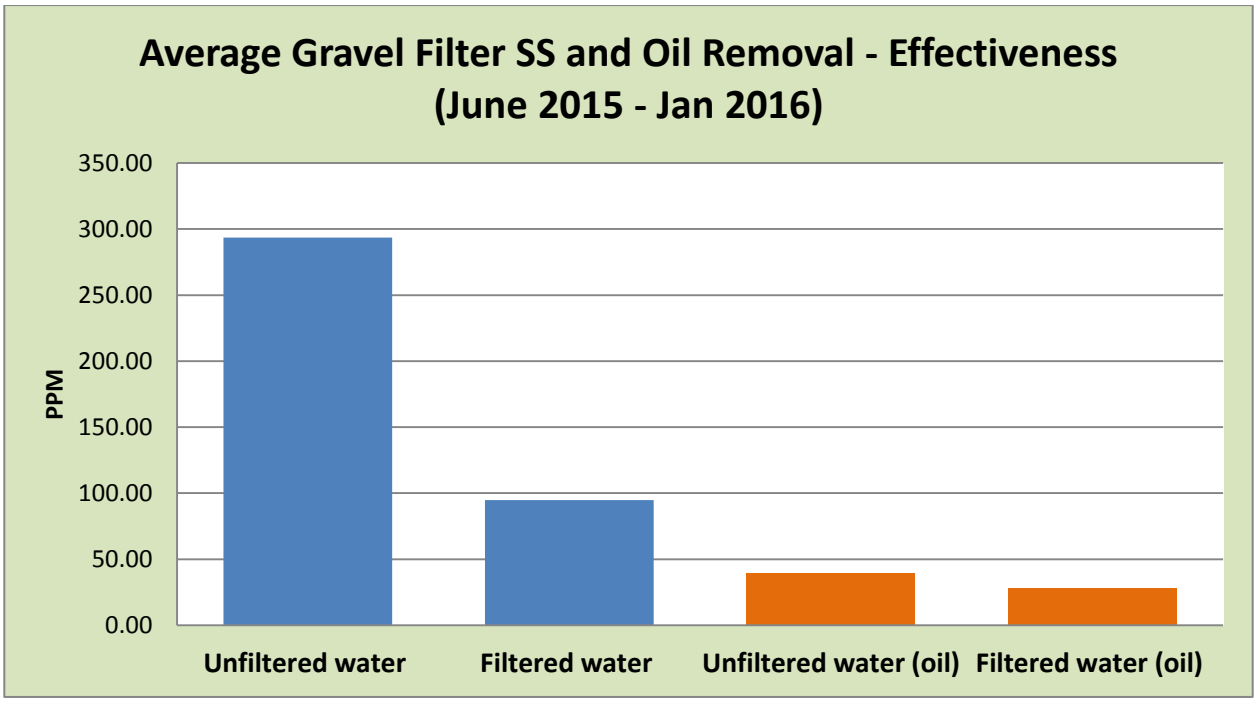

Figure 5 Gravel Filter SS and oil removal – 2015

The Caustic dosing part of the water treatment is aimed to be constructed in 2016 which will further improve the internal water balance and management of the effluent. Regardless of the internal process,

from an environmental perspective, no effluent is discharged during normal situations and therefore the impact of the water and effluent management is negligible.

2.2. Ground water

"Discussion on ground water treatment (volumes, pollution, stabilisation etc.),

Monitoring of relevant boreholes with respect to detecting any leaks/pollution from all facets of the COG and waster cleaning,"

Groundwater monitoring and management is being conducted according to the Water Use License (WUL).. The groundwater management plan has been finalized and peer reviewed to confirm assumptions and evaluate proposed recommendations, after which planning for remediation can commence. The facility is awaiting approval of the plan by the DWS. Currently groundwater is not actively pumped or treated at the coke plant.

The boreholes listed the WUL relating to the Coke Ovens are;

COKE PLANT AND SUMP				
CO-3D	-81247.45Y	2949626.41X	Biannual	At Coke Plant
NW -8D	-82937.49Y	2949579.08X	Biannual	At Plant

The boreholes are required to be monitored for inorganic elements and organic elements.

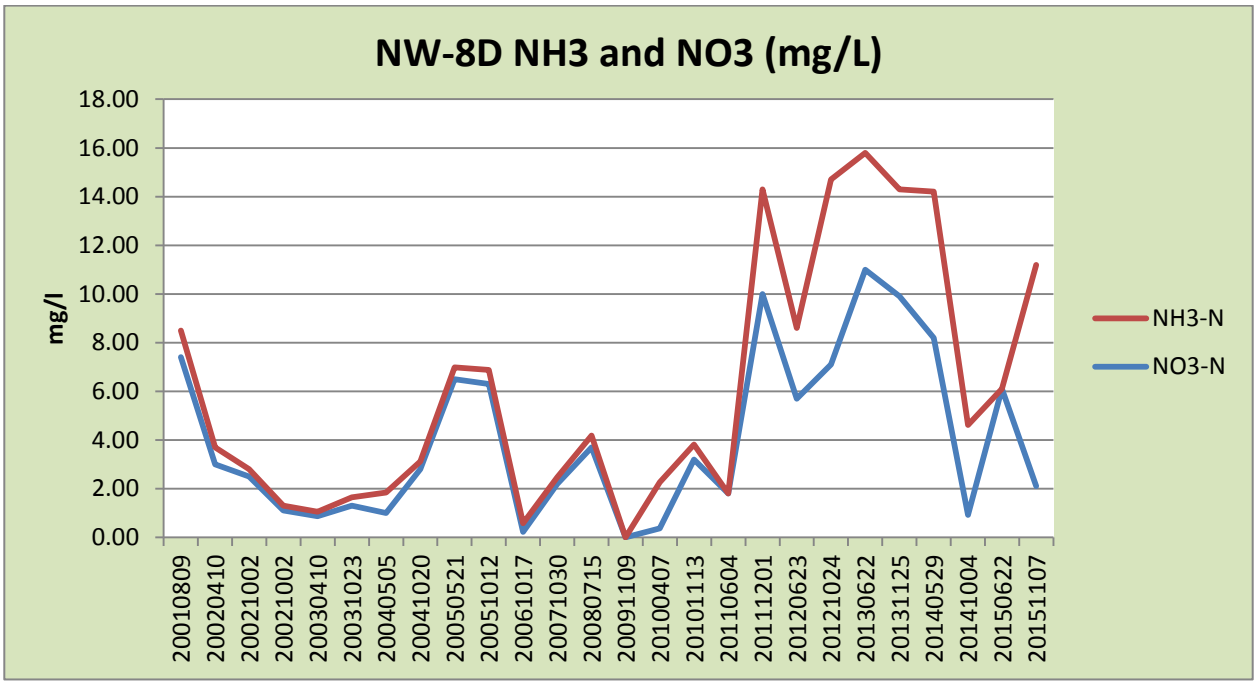

Figure 6 NW-8D NH3 and NO3

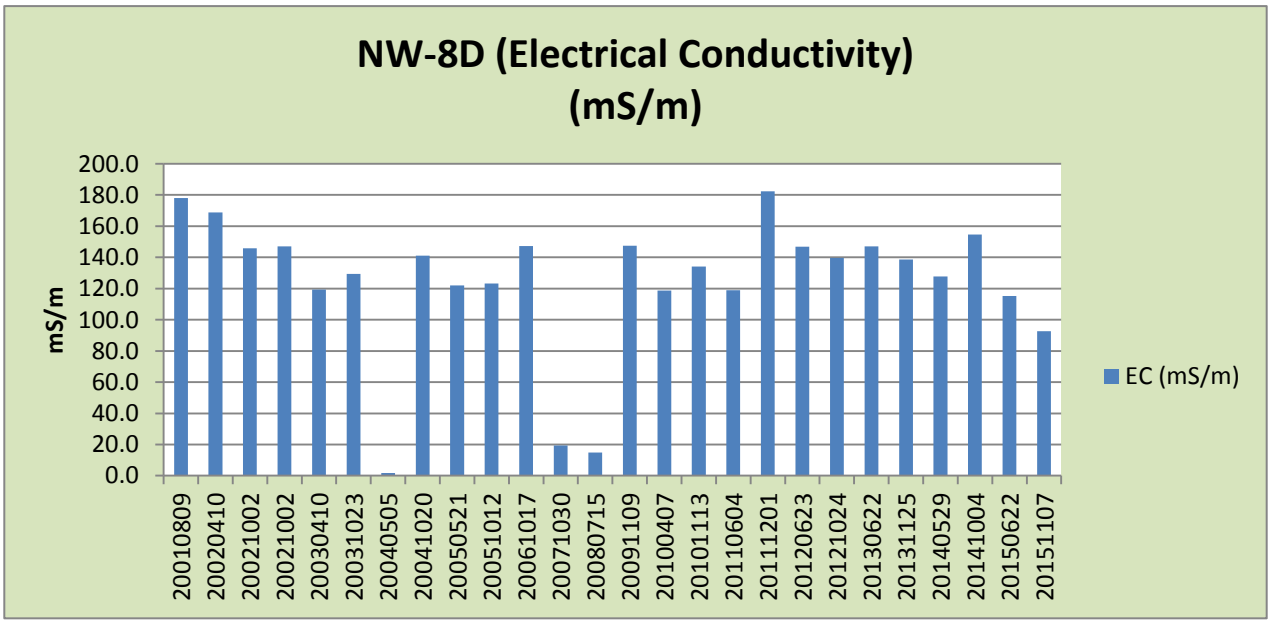

Figure 7 NW-8D Electric Conductivity

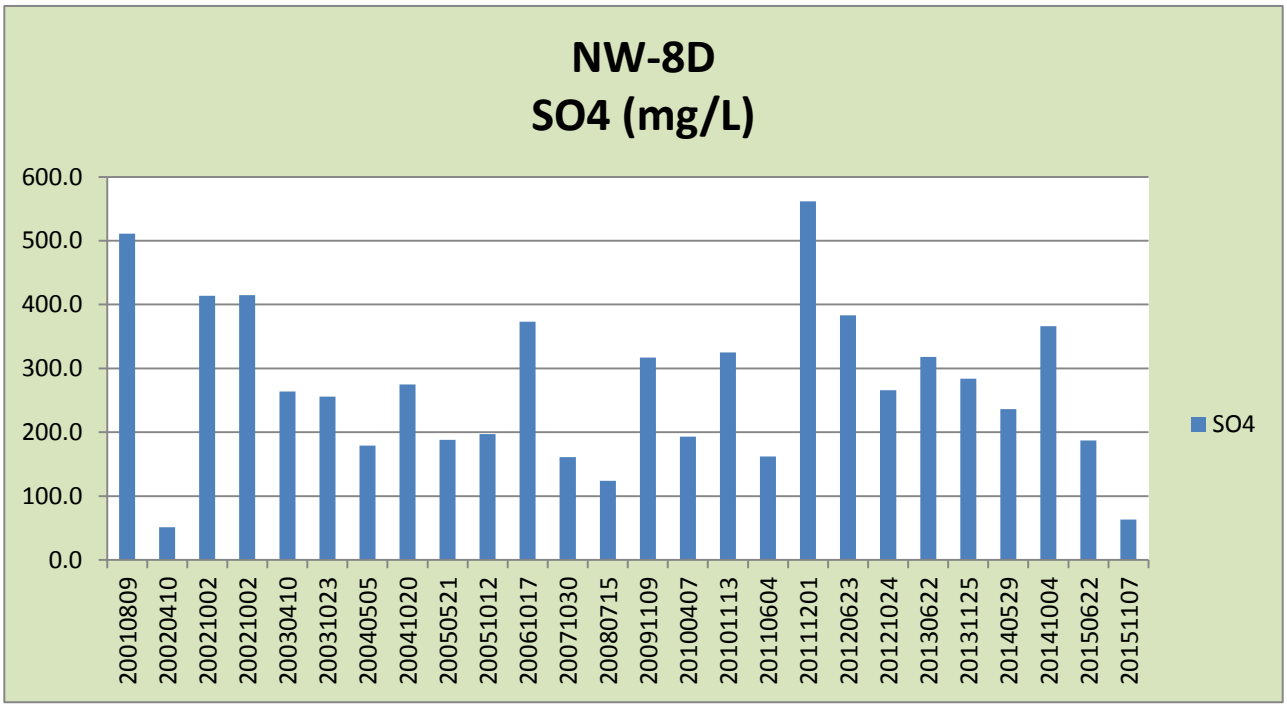

Figure 8: NW-8D SO4

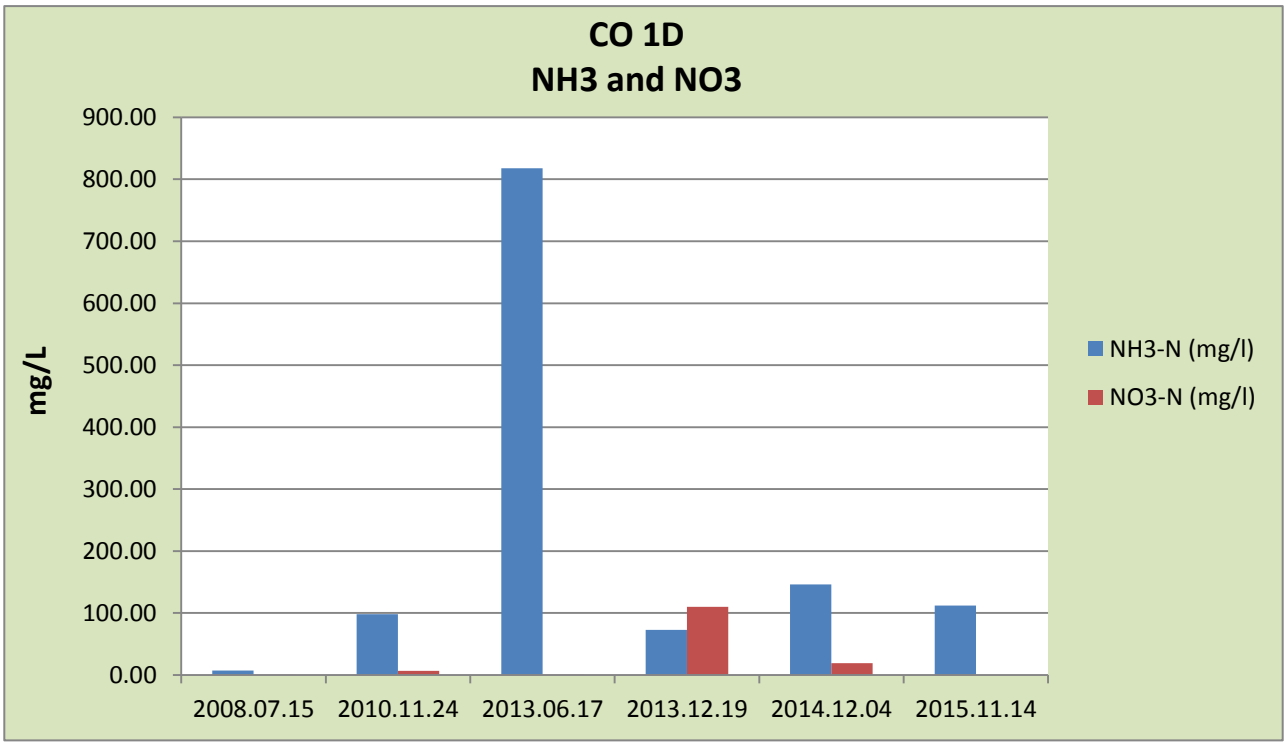

Figure 9 CO-1D groundwater data (NH3 and NO3)

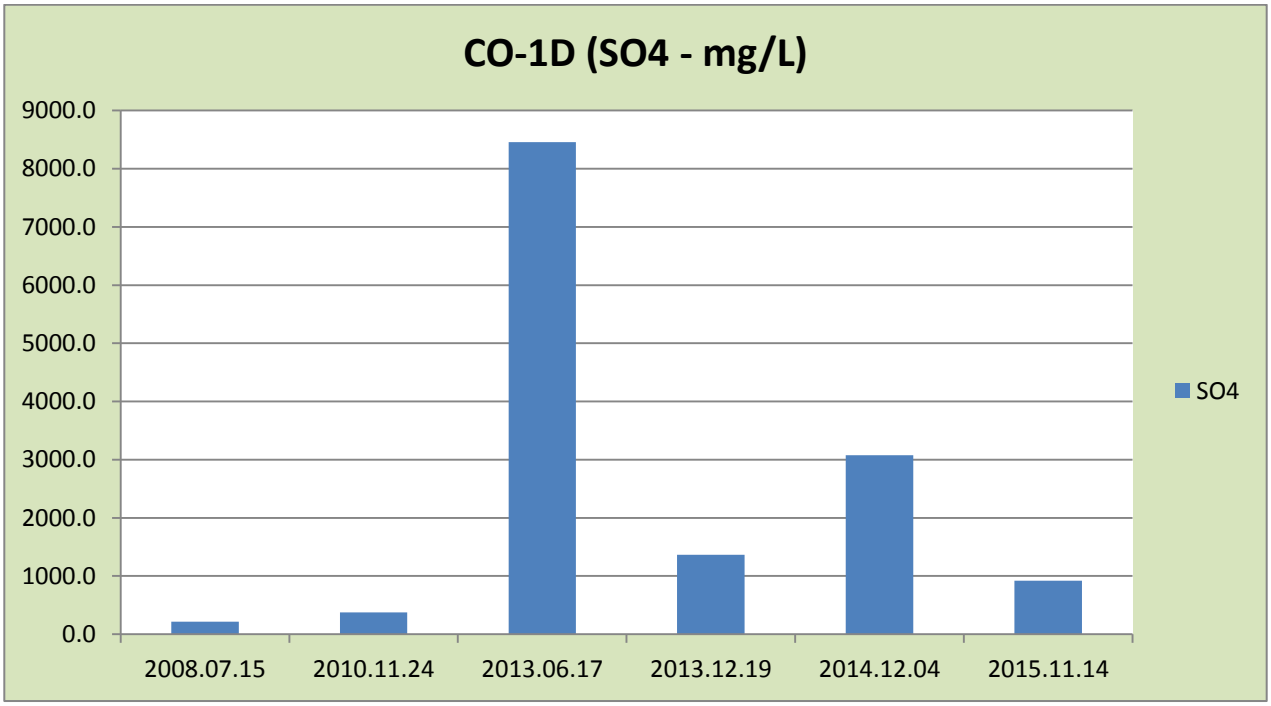

Figure 10 CO-1D ground water data (SO4)

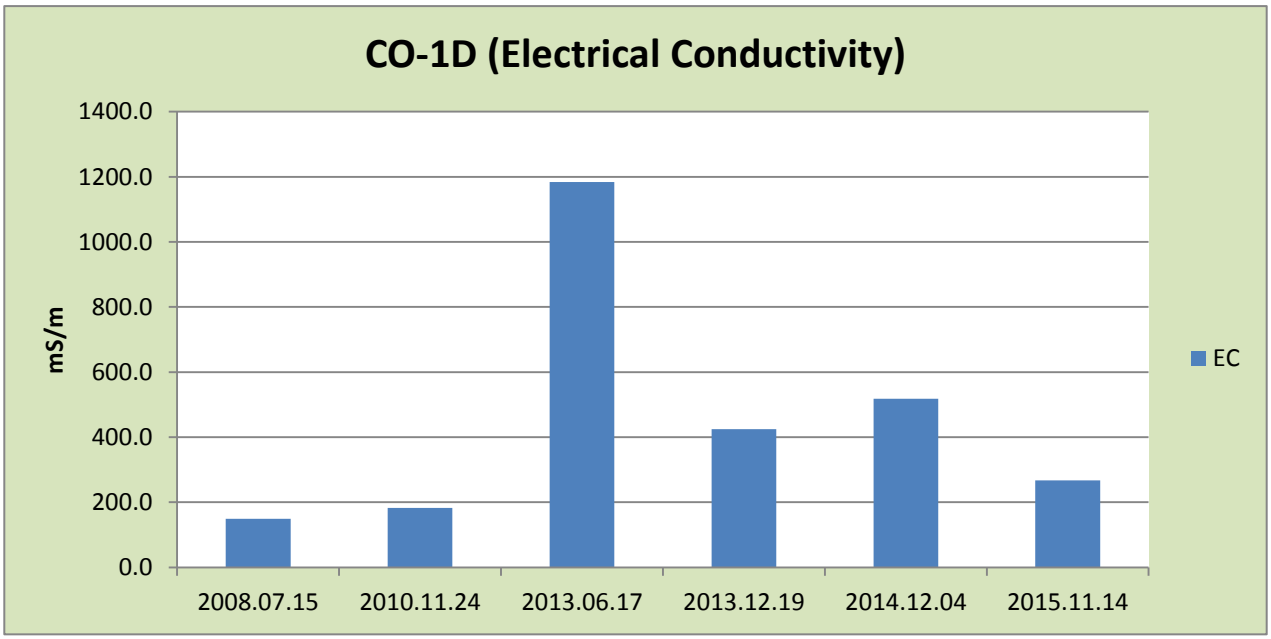

Figure 11: CO-1D ground water data (EC)

From the analysis it is clear the groundwater qualities in the specific areas are highly variable. This is expected according to the Groundwater Management Plan as the plume moves and dilutes over distances. The impact measured cannot be attributed towards the COCGAW specifically and from a source and scale perspective is most likely not the major cause of the poor quality.

The approval of the overall Ground Water Management Plan should be pursued with Water Affairs and implemented to ensure no adverse effects to off-site receptors.

2.3. Surface water

In the event of process upset conditions, contaminated surface water can be diverted to the Coke Plant sump. The coke plant sump is a buffer dam and water from the dam can be reclaimed again for re-use as and when there is sufficient capacity in the system. The levels of the coke plant sump is managed and measured to ensure the sump does not overflow.

Clean storm water is measured at the coke plant storm water drain but is combined with other areas inflows. The flow is measured continuously and the EC is also monitored and used to detect potential spills into the storm water drains.

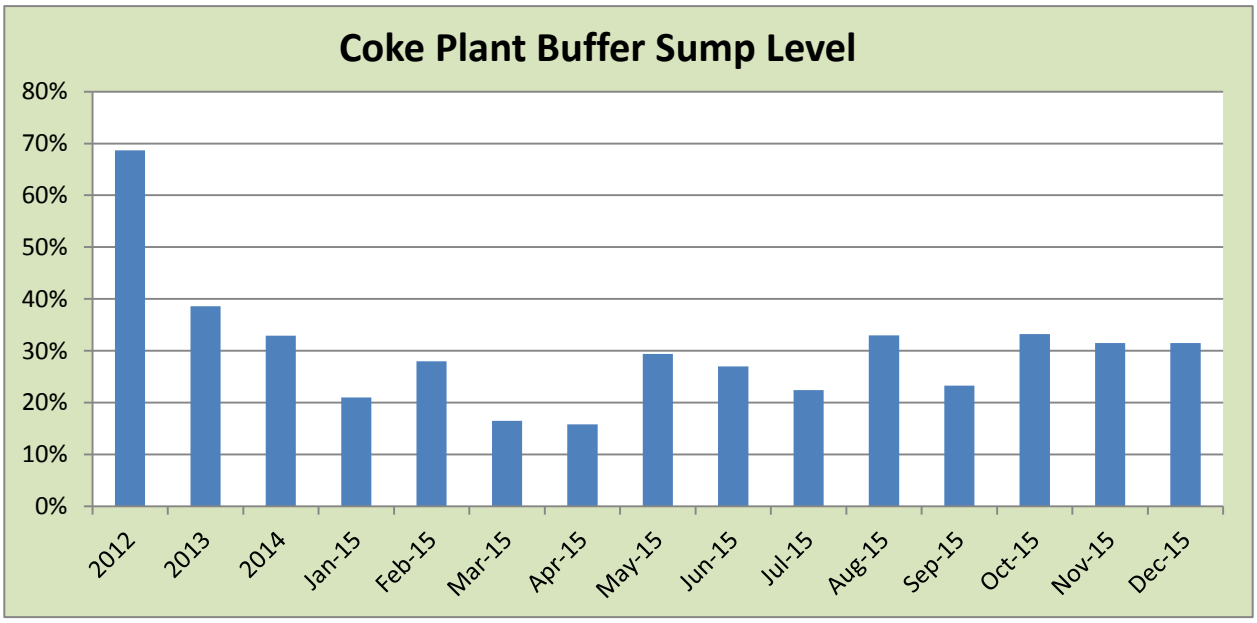

Figure 12: Coke Plant Sump level

2.4. Air quality monitoring

Air quality monitoring, management and reporting conducted according to the Atmospheric Emissions License (AEL), the ROD and the Air quality monitoring report by Airshed Planning Professionals.

Coke Oven Gas quality

The COCGAW plant aims to remove impurities from the gas which includes the removal of sulphur in the Claus Reactor. Due to the fact that the plant is not operational sulphur removal does not occur and the H_2S concentrations in the Coke Oven Gas can be improved upon with re-operation of the Sulphur plant. The gas is measured at the two gas plants and reported below. ArcelorMittal reported that the reduction in H2S levels could be as a result of the change of coal quality. Coal with lower sulphur content is reportedly sourced from a different supplier.

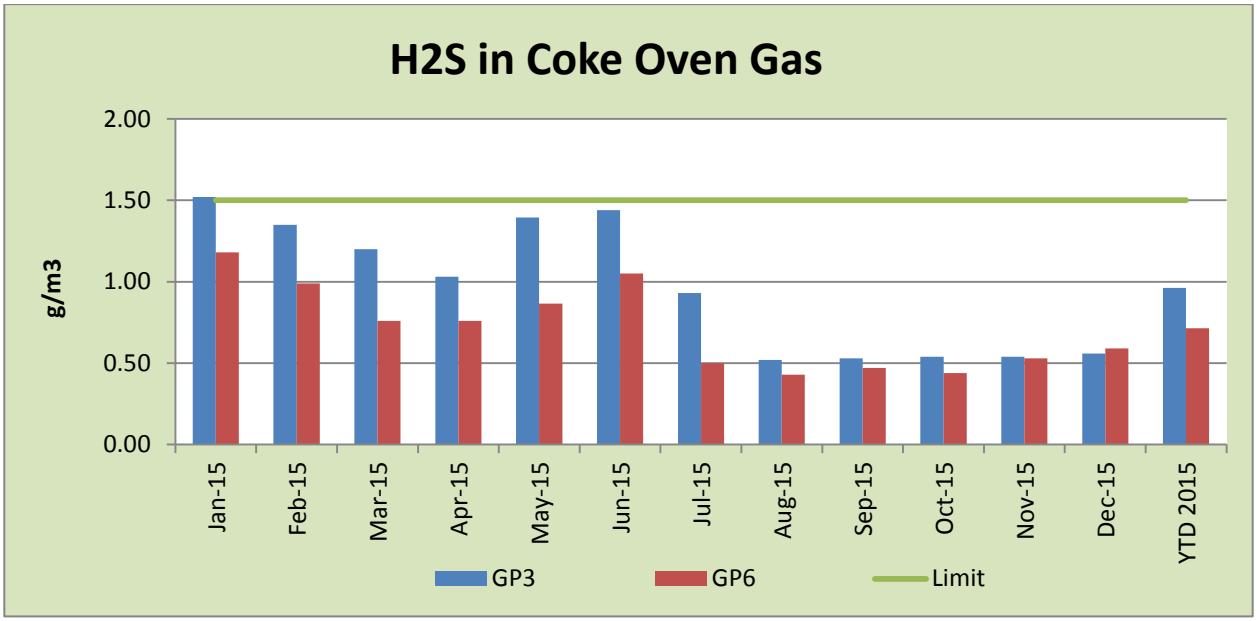

Figure 13: Coke Oven Gas quality

Coke Oven Stack Emissions

The partially cleaned gas is used as a fuel source at various users within the facility. The coke oven gas is distributed to the users which are able to utilise coke oven gas as energy source. The Coke Batteries are also a major user of the coke oven gas. The gas is combusted and emitted to atmosphere. The coke battery stacks performance in terms of gas and dust is stipulated below;

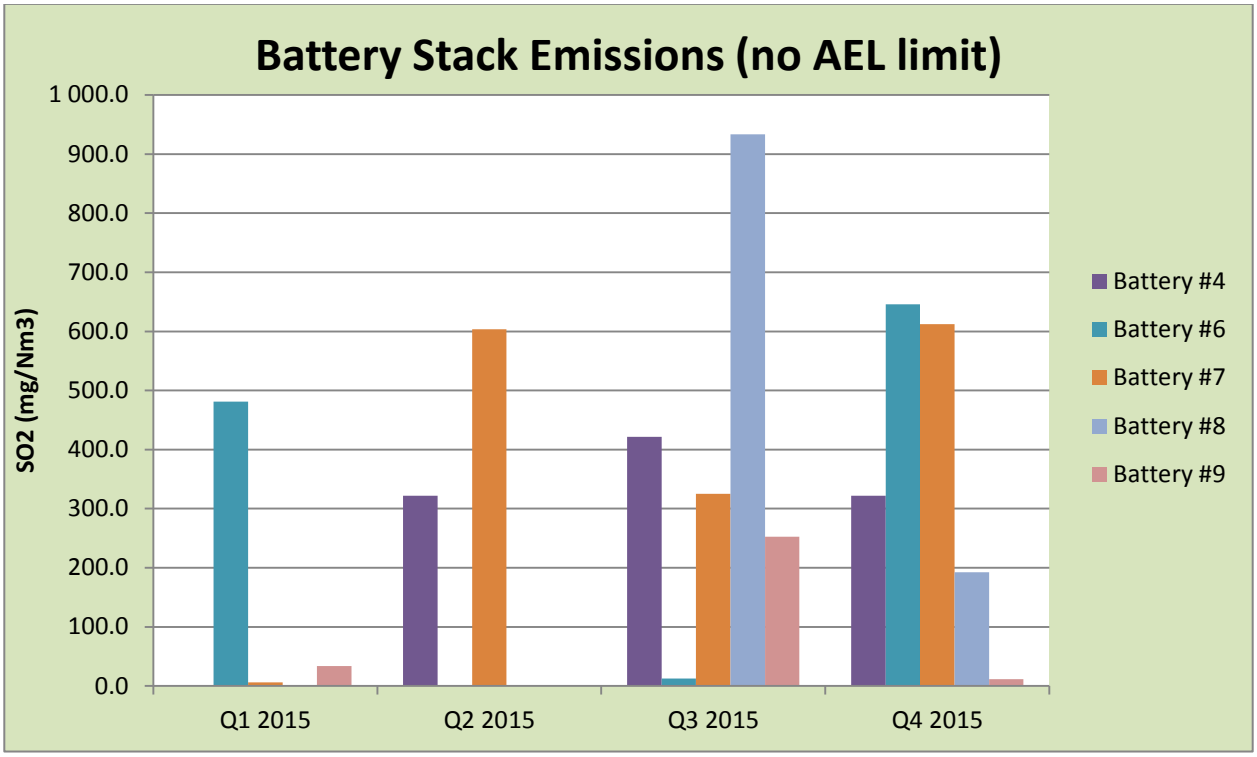

Figure 14 Coke Battery Stacks SO2 emissions (mg/Nm3)

Figure 15 Coke Battery Stack Dust Emissions

Fugitive Emissions

Fugitive Emissions is a concern at coke battery operations in general. The ROD required that a monitoring plan be developed to monitor and then improve the fugitive emission sources from the batteries. ArcelorMittal appointed Airshed Planning Professionals in 2011 to undertake such an investigation and recommend the monitoring requirements.

Fugitive emissions by nature are a difficult element to monitor. The monitoring system that was put in place by ArcelorMittal is commendable. The different sources of fugitive emissions are addressed in the fugitive emissions monitoring plan which includes the doors, pipes and charging times and smoke observed.

The occupational health monitoring undertaken in terms of the Occupational Health and Safety Act can be used as a monitoring program as well to determine the effectiveness of the mitigation measures implemented. The last available occupational health survey has indicated that additional fugitive emission mitigation measures are required. It should be noted that ArcelorMittal has implemented management and mitigation measures to protect employees and reduce exposure.

Ambient Air quality

The ambient air quality around the facility is monitored by ArcelorMittal at four locations around the works. There is no limit for H_2S in terms of ambient air quality but it is generally known that H2S has a distinct rotten egg smell which literature indicates can be detected as low as 45 ppb but health risks only above 40 ppm. It is clear that the ambient air quality in terms of H_2S is not considered a major issue around the facility after review of the data.

The coke oven gas plants main effect would be a reduction in SO_2. As the plant is not operational it was deemed unnecessary to include a full discussion on the SO_2 ambient air quality data monitored by the facility. Once the plant has been re-commissioned the SO_2 ambient data must be compared with the SO_2 ambient data measured prior to commissioning.

2.5. Waste and By-products monitoring

Quantities and handling of all by-products produced (sulphur, tar, etc.)

Quantity of waste generated and the management thereof,

Report on the success of carousal system being implemented for the collection of tar for tar decanters (first audit only), as well as the method used to return the tar to the coke ovens. A mechanism to collect spillages to indicate when the collection vessels are full,

During 2015, 141 tons of the general waste has been recycled from the 2 313 tons generated, which amounts to just about 6% of the generated volume, compared to 4.3% in 2014 and 1% in 2013. From this it is clear that an increase in recycling has occurred, but the project must be expanded and improved upon.

Disposed Internally	48.69 %
Re-used or Recycled internally	10.0 %
Re-used or Recycled Externally	37.26 %
Disposed externally (hazardous waste)	0.49 %
Stored for re-use internally	3.56 %

The Coke Ovens basically generates Coke Breeze, liquid raw tar and tar sludge as by-products and waste streams. Liquid tar generated is pumped to the tar plant for further processing.

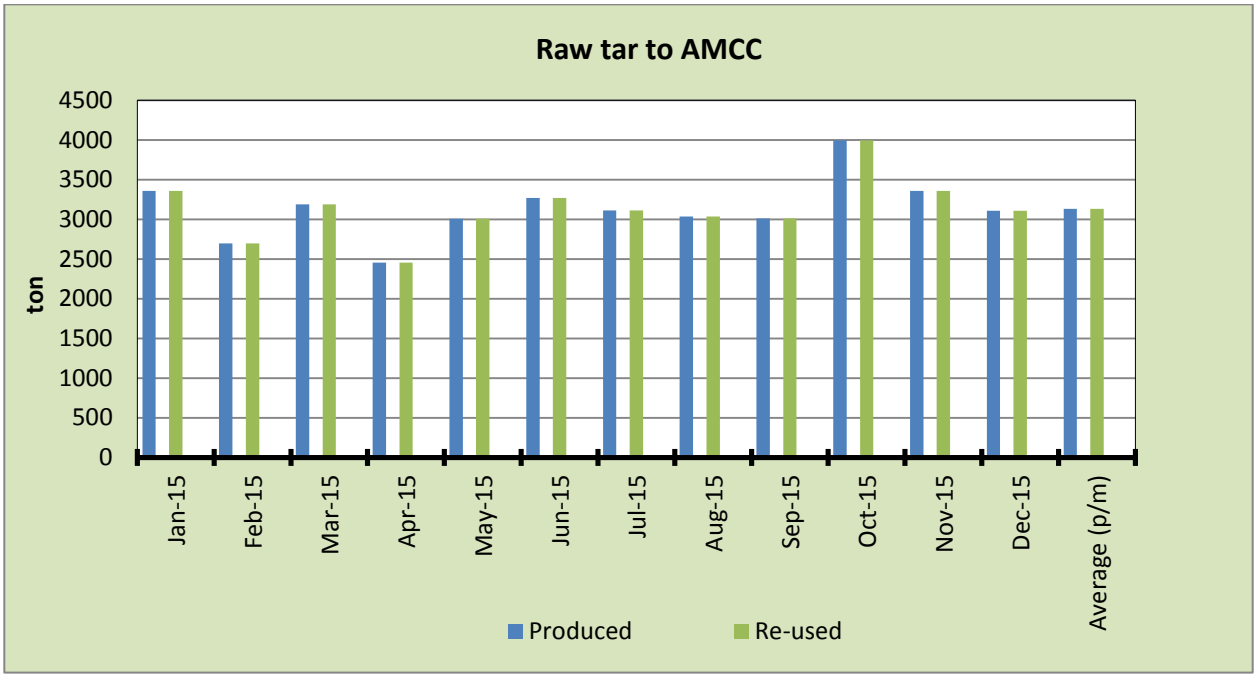

Figure 16 Tar volumes

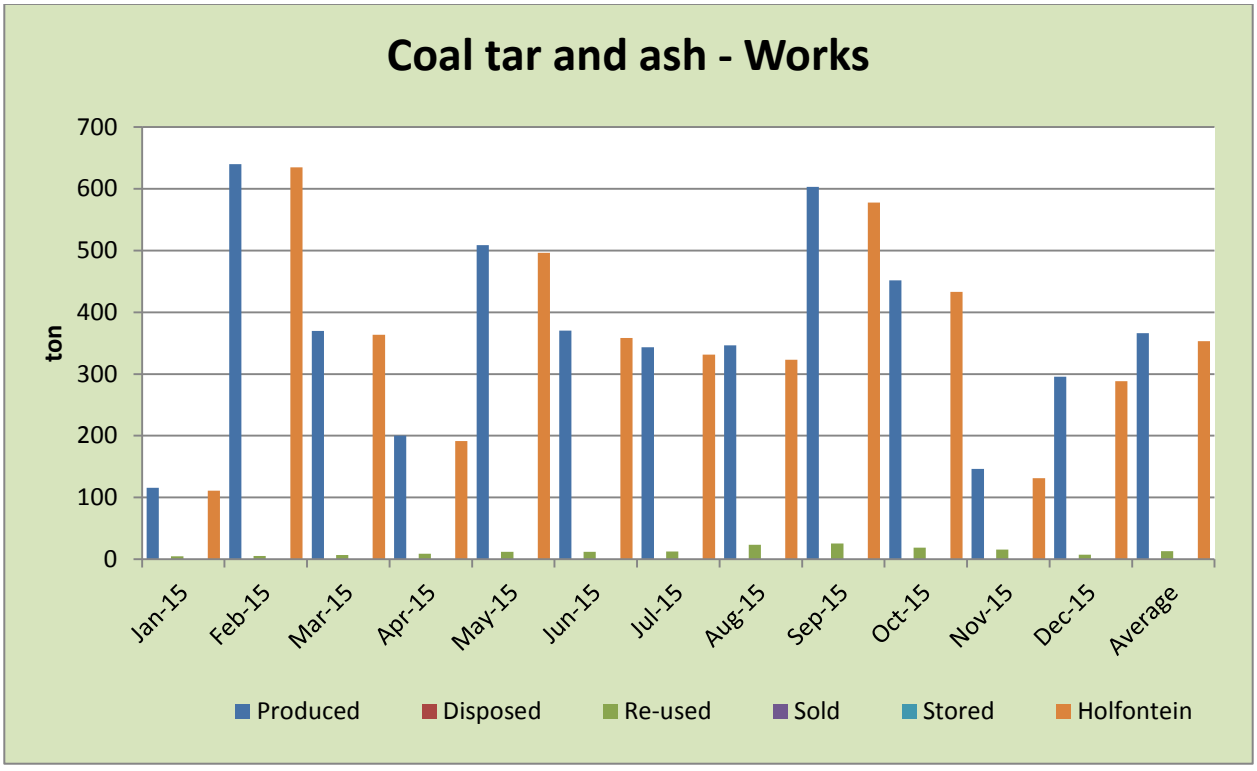

Figure 17 Coal tar and ash

Tar sludge is generated and mixed with coal dross at a temporary storage area from where it is collected by Enviroserv and disposed at Holfontein H:H Waste Disposal site. Safe disposal certificates are kept for the loads as removed. No liquid sulphur has been generated during the audit period as the plant is off line.

ArcelorMittal reported that the facility has constructed a plant to recycle and re-use the tar sludge back into the coke battery plant. The tar sludge is captured by the existing carousels system and is transported with

the forklift to the new tar sludge recycling plant. The tar sludge is mixed in with the coal and used in the coke making process again. The recycling facility has been commissioned with the anticipated outcome of a reduction/elimination of the disposal of hazardous waste.

Coke breeze is generated during the quenching process. Water is sprayed onto the hot coals when it is pushed out of the ovens. The coke breeze collects at the base of the quench tower. Some of the coke breeze is used for mixing with the tar sludge but the larger bulk, approximately 14 200 ton/month is transported by railway to the sinter plant for recycling.

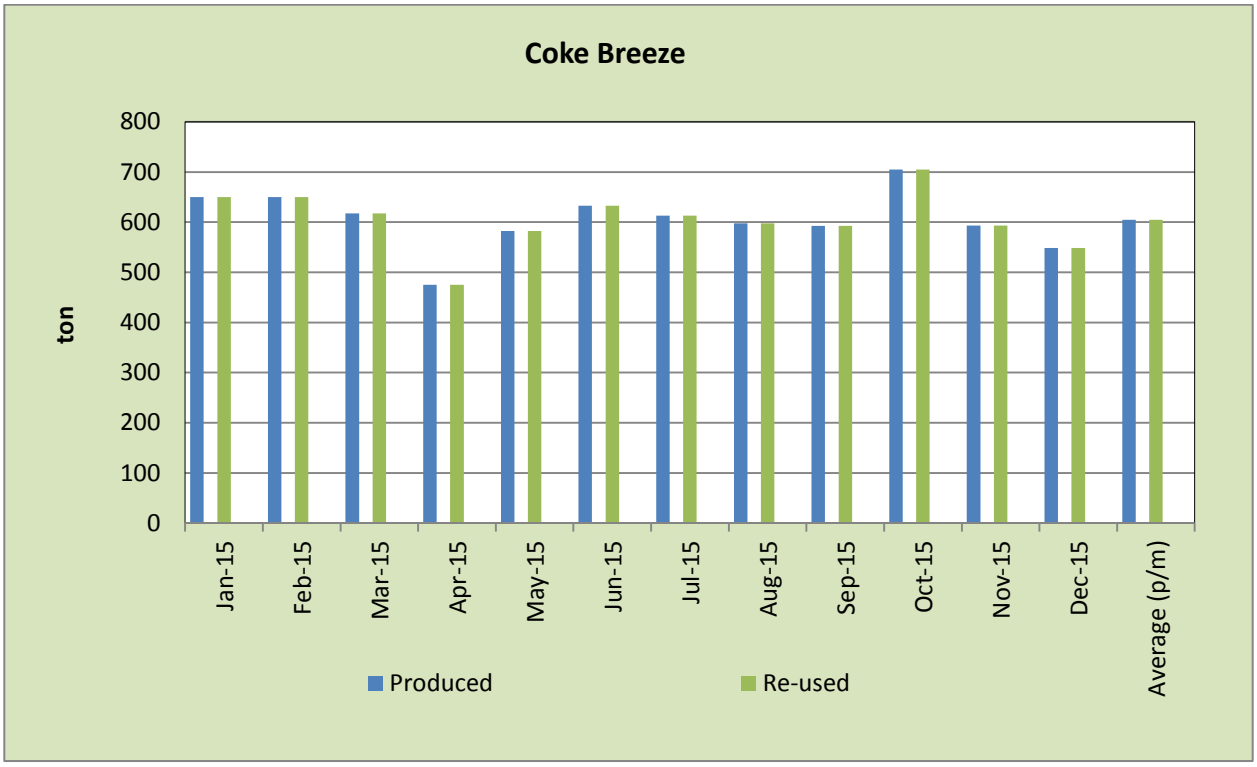

Figure 18 Coke Breeze volumes

No sulphur is being produced currently as the sulphur plant is not operational. A market has already been established for the sulphur by-product and ArcelorMittal indicated that as soon as they have re-commissioned the plant and sulphur production commenced again, the sulphur will be sold to third parties.

2.6. Specialist Studies Recommendations

Discussion on the implementation (or not) of recommendations as contained in the Scoring Report and Specialist Studies,

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
Process	
Balancing tanks to be installed prior to battery process water treatment facilities	Upgraded 4 x 1000 m^3 settling tanks prior to battery process water treatment. This will give sufficient buffer capacity to balance any process upsets in front of the treatment process – Completed

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
Monitor concentrations of cleaned COG and report.	Results reported in the first bi-annual report.
Monitor ambient levels of NH_3, H_2S and benzene, and take appropriate actions (as described in EIR) if found to be significant.	Results reported in the first bi-annual report.
The effluent stream sent to the Blast Furnaces should not be heated to the point where the NH_3 is stripped and released to atmosphere.	Investigation completed. The water is currently not used at the BF Gas cleaning system but used as coke quench water. The proposed ammonia stripper will remove ammonia from the process water, eliminating the concern.
All tar sludge should be returned to the coke ovens with the coal charge, using mechanical means and not by hand.	The tar-sludge recycling project has been implemented. ArcelorMittal has commissioned a process to construct a bund wall around the tar sludge recycling area. Design drawings were available.
All solid waste should be classified according to the Minimum Requirements and disposed of accordingly. Records should be maintained of all waste sent offsite.	Implementation completed. Records are available.
Scheduled preventative maintenance plan on all water systems to ensure segregation of process water, rainwater and indirect cooling water streams.	PMP implemented for all environmentally critical equipment.
Groundwater	
The feasibility of abstracting contaminated groundwater from the aquifer underlying the site, as a source of water supply to the process should be investigated.	The final ground water management plan for the Works has been completed and requires approval from DWA.
The option of development of drains in the form of trenches to abstract the contaminated groundwater from the shallow perched aquifer system as part of the foundation design and groundwater containment/remediation options should be investigated.	Same as above.
The water in the cooling tower sumps should be sampled and analysed to determine the quality.	Done – results available
The existing monitoring boreholes should be properly capped to prevent contamination from surface soils and dust with samples that are taken in the boreholes.	Upgrade of monitoring borehole network completed in 2010. Supplementary monitoring boreholes have been equipped with caps. New boreholes will be drilled to replace the damaged boreholes.
The construction of the monitoring boreholes should be reviewed to confirm whether the borehole construction material influences the values for iron and manganese in the groundwater in the Coke Ovens area.	Completed. Golder Associates Africa (Pty) Ltd conducted a study to assess the monitoring network.
The resident groundwater pollution should be managed.	On-going. A localised soil and groundwater contamination study was completed.
A numerical groundwater flow and contaminant transport model	Modelling conducted as part of the Groundwater

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
should be developed.	Management Plan.
Surface water	
The mitigating measures for the construction and operational phase, as proposed in the document, should be made binding on ArcelorMittal South Africa Vanderbijlpark Works, its employees and external contractors.	Noted.
A detailed Environmental Management Plan covering *inter alia* surface water management should be drafted and made binding on ArcelorMittal South Africa Vanderbijlpark Works.	EMP submitted to GDARD. EMP updated as per Air Quality Monitoring Plan recommendations and submitted to authorities for approval. The EMP has been upgraded to align it with new legal requirements.
The existing Coke and Gas Cleaning Plant surface water-monitoring programme should continue.	Monitoring programme will continue as per the Water Use Licence.
The process and products associated with the recycling of surplus water from the Coking Plant to the Blast Furnace need to be further investigated, in order to determine any potential negative impacts.	Surplus water is to be re-used in the coke making process. Should the need arise to direct surplus water to the Blast Furnaces, these items will be investigated.
Air Quality	
Install an additional PM10 and gaseous sampler (SO_2, NO_x and H_2S) within the zone of impact directly south of the MSVS site to monitor the impact on the surrounding communities.	Completed. Two ambient air monitoring stations were installed south and south-east of ArcelorMittal Vanderbijlpark Works during 2004. The third monitoring station at the northern boundary of the site was installed in 2007.
The monitoring of H_2S should act as a performance indicator to monitor the reductions in ambient H_2S concentrations.	Results reported in the first bi-annual report. It must be noted that it is expected to have a reduction of SO_2 rather than H_2S. This is because the H_2S contained in the gas used as a fuel at the works will be transformed to SO_2 emissions when burned.
The emission rates of the most significant pollutants need to be measured.	Results reported in the first bi-annual report.
Recommendations from Air Quality Monitoring Plan	
Monitoring of fugitive emissions from Batteries i.t.o. EPA Method 303. Accreditation of in-house training to be investigated subsequent to the Department of Environmental Affair's (DEA's) finalization of an emission monitoring accreditation scheme.	Liaison with DEA required.
Measurement of benzene, NH3, H2S and volatiles in accordance with OHS Act to continue.	Occupational Hygiene Department to ensure that these measurements are conducted.
Measurement of H2S before and after gas cleaning to be conducted on a quarterly basis to verify conformance to RoD	Currently conducted for an indication of H2S levels in coke oven gas.

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
Condition 3.2(g).	
Weekly analysis of quench water quality for comparison with future Minimum Emission Standards	Samples analysed on a weekly basis.

2.7. Complaints and Incidents

ArcelorMittal has a complaints procedure in place. The register is kept on site and was reviewed. None of the complaints received related to the COCGAW project.

The facility has an electronic incident management system (PIVOT) which manages the incidents. The system facilitates the investigation and mitigation measures between different responsible parties. The incident report was reviewed and none of the environmental incidents related to the COCGAW project.

2.8. Plant Performance and environmental improvements achieved

The plant is not operational and therefore the environmental reductions in terms of water and air could not be realised. The plant failures experienced to date is set out below;

- Vapour Condenser Gaskets Failure (2011) – Repaired
- Sulphur Condenser Tube Failure (2011) – plugged 14/256 tubes
- Low Pressure Boiler Tube Failure (2011) – replace 5 bottom rows
- GP # 6 Cooling tower fire (2011 – 2012) – Repair (2.5mil)
- High Pressure Boiler Crack (2012) – Specialised repair (38 Bar vessel)
- Sulphur Condenser Tube Failure (2012) – Re-tube and Weld
- Electrostatic Tar Precipitator repairs (2012 – 2013) – various repairs
- Sulphur Condenser Line (2013) – Repaired
- Low Pressure Boiler Tube complete replacement – Completed
- Ammonia Stripper Column (2013) – Specialised repair(Titanium vessel)
- Ammonia Stripper Plant (2016) – planned commencement

An investigation was undertaken at the end of 2015 by external specialists to analyse the plant and propose a strategy to repair and re-commission the plant. Different options were provided to ArcelorMittal and they are currently investigating the feasibility thereof. Once funds are available, the preferred strategy will be initiated and the reparations will commence.

3. CONCLUSION AND RECOMMENDATIONS

Zantow Environmental Consulting Services CC was appointed by ArcelorMittal to conduct an independent compliance audit on its Record of Decision (RoD) (GAUT 002/02-03/138) which was received from the Gauteng Department of Agriculture, Conservation and Environment (GDACE), now the Gauteng Department of Agriculture and Rural Development (GDARD) on the 21st March 2004.

The methodology followed for conducting the compliance assessment audit included;

- Documentation review
- Compilation of audit checklist/questionnaire for site visit;
- Site Visit (Conducted on the 17th of February 2016); and
- Compilation of compliance audit report.

Table 1 sets out the compliance with the RoD conditions and where non-compliances were recorded the auditor ranked the specific non-compliances in terms of the following criteria:

- Minor Issues
- Moderate Issues
- Critical Issues
- Historical issues

ArcelorMittal Vanderbijlpark Works operates 5 coke batteries to produce metallurgical coke for the Blast Furnaces on site. Coke is an important input material into the iron making process. During the coke making process, gas and other by-products are formed. The Coke Batteries were built between 1945 and 1985 and the gas and water cleaning technologies were considered out dated and could not deliver a clean gas which resulted in various maintenance issues and other implications. ArcelorMittal commenced with the Coke Oven Clean Gas and Water Project (COCGAW) in the early 2000's in order to install new technology that would enable them to clean the coke oven gas for re-use in the works as fuel gas and also complying with Environmental Best Practice Standards internationally.

The project scope is technical and complex and included various improvements and changes to the existing plant as well as the installation of new infrastructure. The project aimed to improve the current controls at the batteries, improve the gas collecting mains, upgrade of the primary cooling to improve naphthalene removal, installation of a new chiller plant, installation of a distillation plant and a sulphur removal plant. The water portion included the installation of new tar decanters, a gravel filter plant and scrubbers.

The construction of the plant commenced in 2005 and commissioned in 2010 at the cost of more than R 330 million. The project faced numerous delays and challenges. In 2010 the plant ran successfully and proved significant sulphur reduction in terms of emissions. Unfortunately the plant was shut down at the end of 2010 due to technical and mechanical difficulties. From 2011 up to date ArcelorMittal repaired the identified fault in the process and then attempted to re-commission the facility on a few occasions. The plant has not run for more than a few days at end without interruption. Currently the gas is only partially cleaned but no sulphur removal is taking place.

The major concern is that the plant is not fully operational and ArcelorMittal is not removing sulphur from the coke oven gas which leads to the release of emissions from the facility to the environment. Other non-compliances recorded in terms of the authorisation mostly related to the groundwater monitoring requirements that are not met and fugitive emissions control. A number of measures and projects have been implemented to reduce fugitive emissions.

The following recommendations are made to improve compliance to the ROD;

- Commission the Sulphur removal section of Gas Cleaning plant and ensure the required measures are implemented to continuously operate the plant. **(ArcelorMittal, ASAP)**
- Monitoring of ground water at borehole CO-3D cannot be undertaken as the borehole no longer exists. Finalise the plans to drill an alternative suitable borehole that could be used for the same purpose envisaged and align the relevant legal requirements. (**ArcelorMittal, May 2016**)
- Exposure monitoring indicates that further fugitive emission mitigation measures are required. Although ArcelorMittal supplies specialised PPE and has implemented management measures to mitigate employee exposure, it is recommended that the additional fugitive emission reduction projects as identified by ArcelorMittal be prioritised and implemented**. (ArcelorMittal, as per project schedule)**
- The second phase of the water cleaning system will commence in 2016 which includes the installation of an ammonia stripping plant to remove ammonia from the wastewater emanating from the coke oven. This phase of the project was part of the initial project scope as approved by GDARD. The relevant documents such as the EMPr and site plans must be reviewed to adequately address the stripper plant prior to the commissioning thereof. **(ECO, prior to commissioning**)

Appendices

Appendix A

DEVIATIONS ON INSPECTIONS OF BATTERY DOORS																
	P/S	DOORS	HEADS	CHECK/D	KLIETS	SADDLES	DOOR HOOKS	GUN LINTELS	APRONS	C/S	DOORS	KLIETS	SADDLES	DOOR HOOKS	GUN LINTELS	APRONS
4 BATT INSPECTION'	P/S	0	1	1	2	3	0	0	2	C/S	0	4	9	0	7	0
6 BATT INSPECTION'	P/S	0	1	3	4	0	0	4	0	C/S	1	20	2	2	0	0
7 BATT INSPECTION'	P/S	0	4	16	2	0	0	13	1	C/S	0	12	1	1	9	1
8 BATT INSPECTION '	P/S	0	6	9	1	3	1	15	0	C/S	1	5	8	4	51	0
9 BATT INSPECTIONS'	P/S	1	16	13	1	4	0	39	0	C/S	0	3	0	0	26	7
TOTAL DEVIATIONS	P/S	1	28	42	10	10	1	71	3	C/S	2	44	20	7	93	8

Figure 19: On-going coke oven door maintenance

Appendix B

Job card for ETP

Planning Plant: *SF01*
Vanderbijlpark Works

ArcelorMittal

BEFORE STARTING THE JOB, ASK YOURSELF THE FOLLOWING QUESTIONS

I W O R K S A F E — Is the equipment **isolated** ? (Mechanical, Electrical, Area)
Am I **wearing** the correct P.P.E. , What else should I use ?
What **other** party must know we are working here ?
Are the **right** tools available and safe for use ?
Have I discussed the **known** hazards with the team ?
What in the area could endanger our **safety** ?
Are specific procedures or instructions **applicable** ?
What can go wrong or **fail** during the job ?
Have I communicated **effectively** with the team ?

Does this job have an **Environmental impact?** (Y/N)
If "Y" describe impact .....
What precautions will be put in place to prevent/limit the impact?
.....

Maint Plant: *SFKN Coke Oven By-products* Date Printed: *2016.02.09*

Plant Maintenance Work Order Header Printed By: 3967580
Copy: 1

M/Plan Nr: 59391
Order Nr: 925580740 Notification Nr:

W/O Type: PM02 PM: Equipment Maint Plan generated Order

Funct Loc:

	03-S	*IFS South Works*
ABC IND:	*C*	*LOW IMPACT*
	03-S-FKN	*Coke Oven By-products*
ABC IND:	*C*	*LOW IMPACT*
	03-S-FKN-853	*GAS PLANT 3*
ABC IND:	*C*	*LOW IMPACT*
	03-S-FKN-853-03	*GP3 ELECTRO DETARRER SYSTEM*
ABC IND:	*A*	*HIGH IMPACT*

Equip:

Description: (Short) *Inspect all Detarrer insulators*

Planning Related Information

PM Planner grp: *MCA*	*Byproducts A-block*
Main work centre: *ICNS1 SF01*	*Superintendent Execution team 2*
System Condition: *5*	*Standing*
Priority: 2	*Sched - Future Med*
Status:	*REL CSER NMAT PRC SETC*
Activity Type: *002*	Statutory
Basic Start Date: *2016.02.17*	Basic End Date: *2016.02.17*
Basic Start Time: *07:00:00*	Basic End Time: *07:00:00*

Equipment Installed/Dismantled:

Equipment Number Dismantled:
Equipment Number Installed:

Operations Detail

Operation number: *0010*	*Inspect all Detarrer insulators*
Status: *REL*	
Work Centre: *ICNS2*	*SF01 Superintendent By-Products B-BLOCK*
Personnel Nr: *00000000*	
Number Capacities: *1*	Planned Duration: *0.0 HR*
Earliest Start: *2016.02.17*	Latest Finish: *2016.02.17*
Control Key: *PMIN*	*PMINPlant Maintenance Internal*
System Condition: *5*	*Standing*
Frequency (Package): *01*	*1 Weekly*

Material # Description	Reservation #	Purchase Order #	Quantity

PRT Number:	Description:	Quantity Required:

Confirmation number: *0045645133*

Operations Long Text

R=Right
W=Wrong
C=Corrected

Inspect all Detarrer insulators

Detarrer: 3A I 3B I 4A

Insulator temp. 75,50°C I 24,10°C I 119,70°C Deg.C

Doors closed. R I R I R

Is temp. visable R I R I R

4A Insulator teperatures:1: 119,70°C, 2: 91,40°C, 3: 119,30°C

ARTISAN TO COMPLETE

Confirmation Sheet:

StDate/Time	End Date/Time	Act.Dur	Emp.Nr	Sign	Descrip	Rem.Work
2016/02/19 10H00	11H00	1HR	40044779	[signature]	-	

---End---