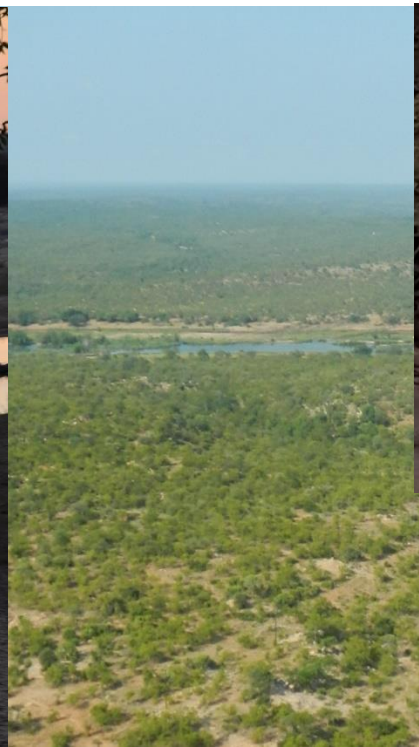



Environmental Management at Palabora Copper

A transition to ISO 14001: 2015

14 September 2018


Palabora Copper's SHEQ Management System

- Palabora Copper (PC) (also known as Palabora Mining Company) has been operational since 1965
- Produces copper, magnetite, vermiculite, nickel sulphate, sulphuric acid and PGMs
- Direct employment of 2450 employees and ±1500 contractors
- Manages 8500ha of surface area, 50% is under nature conservation
- Kruger National Park is a neighbour on the eastern boundary
- ISO14001 certified since 1998

Welcome to the SHEQ Management System

Trained 2200 employees to date on integrated SHEQ MS

PLAN

Element 2: Planning for the SHEQ MS

- 2.1 Hazard Identification & Risk Assessment (HIRA)
- 2.2 SHEQ Improvement Planning
- 2.3 Management of Change (MOC)
- 2.4 Legal & Other Requirements

DO

Element 4: Operational Control

- 4.1 Vendor Management
- 4.2 Contractor Management
- 4.3 Customer Requirements
- 4.4 Hazardous Substances, Materials & Contamination
- 4.5 Emergency Preparedness, Response & Business Continuity
- 4.6 SHE Standards ---------->

Element 1: Leadership

- 1.1 Leadership Commitment
- 1.2 Policy
- 1.3 Organisational Roles, Responsibilities & Authorities

Element 3: Support

- 3.1 Resources
- 3.2 Training, Competence & Awareness
- 3.3 Communication, Consultation & Reporting
- 3.4 Documented Information

4.6 SHE Standards

- 4.6.1 Electrical Safety
- 4.6.2 Personal Protective Equipment (PPE)
- 4.6.3 Isolation
- 4.6.4 Infrastructure, Tools, Appliances & Housekeeping
- 4.6.5 Permit to Work
- 4.6.6 Working at Heights
- 4.6.7 Confined Spaces
- 4.6.8 Lifting & Hoisting
- 4.6.9 Pressure Vessels
- 4.6.10 Hot Work
- 4.6.11 Wildlife Management
- 4.6.12 Trackless Mobile Machines(TMM)
- 4.6.13 Underground Operational Safety
- 4.6.14 Process Safety
- 4.6.15 Railway Safety
- 4.6.16 Ergonomics
- 4.6.17 Noise
- 4.6.18 Radiation
- 4.6.19 Thermal Stress
- 4.6.20 Wellness & Fitness for Work
- 4.6.21 Air Quality
- 4.6.22 Greenhouse Gas Emissions
- 4.6.23 Waste Management
- 4.6.24 Water Management
- 4.6.25 Land Use Management & Sustainability
- 4.6.26 Pest Control
- 4.6.27 Airborne Pollutants
- 4.6.28 Life of Mine Planning

ACT

Element 6: Improvement

- 6.1 Non-conformance, Incident & Action Management
- 6.2 Continual Improvement

CHECK

Element 5: Performance Evaluation

- 5.1 Monitoring, Measurement, Analysis & Evaluation
- 5.2 Performance Assessments, Auditing & Inspections
- 5.3 Management Review

Context of the Organization

The Context for Environmental Management:

- Neighbour to a Protected Area, the KNP, and other conservation areas
- Neighbour to residential areas – direct environmental impacts
- Significant consumer of a natural resource – water from Olifants River

Understanding the needs & expectations of interested parties

- External: KNP – protection of natural environment (water, dust, disease, poaching), prevention of alien and invasive species (mainly plants), protection of red data species that move between KNP & PC and those that breed & ‘live’ on PC (mostly mammals & birds).
- External: Residents – mitigation of impacts like dust, sulphur dioxide and noise.
- Internal: Employees and contractors – to understand and apply actions that reduce impacts to a minimum – dust control, sulphur capture, avoid unnecessary noisy activities, like reverse hooters. Pollution prevention and efficient use of water – right type & quantity for specific activity.

Environmental Management Plans

PC has the following management plans:

1. Environmental Management Programme report (DMR)
2. Land use Management Plan – current and future uses, including cultural heritage and sensitive landscapes.
3. Biodiversity action Plan – management of land and biodiversity in relation to neighbours, in particular KNP. Identification of indicator species, monitoring, measuring, analysis and evaluation of them determining medium and long-term actions
4. Progressive land rehabilitation standard
5. Life of Mine management plan that includes closure. This describes planning for closure and post closure activities. Financial provision of >R1bn.
6. Developing elephant and predator management plans.

Environmental Operational Control

The following actions have either been taken or are planned to control fauna & flora on-site:

- Identification and protection of crocodile nesting sites
- Containment of wildlife on PC property and prevention of movement to adjacent properties – wildlife fence constructed to contain buffalo (diseased) and elephant.
- Reduction of excessive buffalo to reduce impact on vegetation and need to move westwards where domestic cattle are found – capture and relocate (ongoing).
- Reduction of leopard numbers on and around the operations – due to abundance of prey (impala, warthog, etc)
- Investigating in reducing hippo and hyena numbers
- Collaring and tracking of elephants together with Elephants Alive

Opportunities for Improvement

Various opportunities for improvement have been identified and have been captured as part of the PC SHEQ Improvement Plan with objectives and targets. The significant ones are:

- Replacing current reverbatory furnace technology (1960's) with double-sided–blow furnace using oxygen as main fuel source versus coal in the Copper Smelter. The acid plant will also be upgraded to a double contact absorption plant versus the current single contact plant.
  The benefits are reduced SO2 to atmosphere with improved capture and absorption, reduced GHG emissions from coal burning, better copper recoveries, safer operation and less occupational exposure to emissions. This will also meet the 2020 minimum emission standard for copper smelting. A voluntary carbon budget will also be applied for.
- Re-mining of magnetite stockpiles of 240mt which initially were going to be a long-term environmental liability.
- New copper flotation plant to improve copper recoveries, less reagents, more water and energy efficient than current plant (1960's).

Performance Evaluation

Monitoring, Measuring, analysis and evaluation

Water samples are taken by the Env Dept. at various sampling points. Water quality is measured with field instruments for each sample

Samples are sent to the Lab for further analysis and measuring activities

Data of measuring activities are returned to Env Dept. and entered into a monitoring spreadsheet

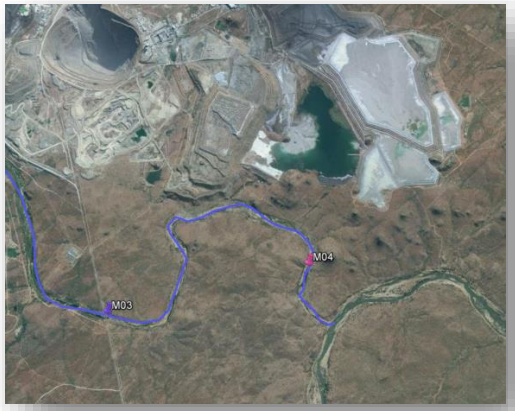
The Environmental Specialist monitors (watches) and evaluates the data against a specific objective to ensure that Palabora remains compliant

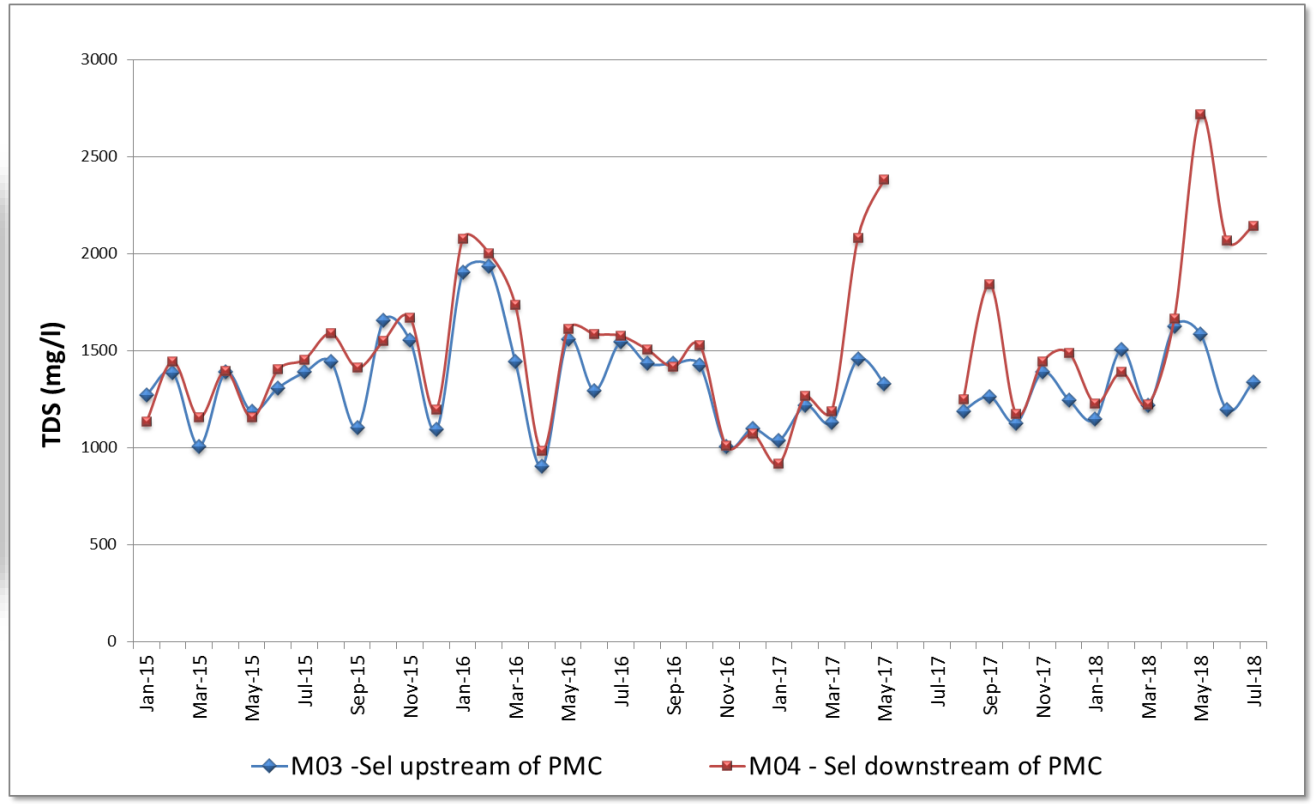
If any non-compliances are found, root cause needs to be established, actions put in place and effectiveness of actions to be evaluated

In this specific example measuring and monitoring is an ongoing compliance process

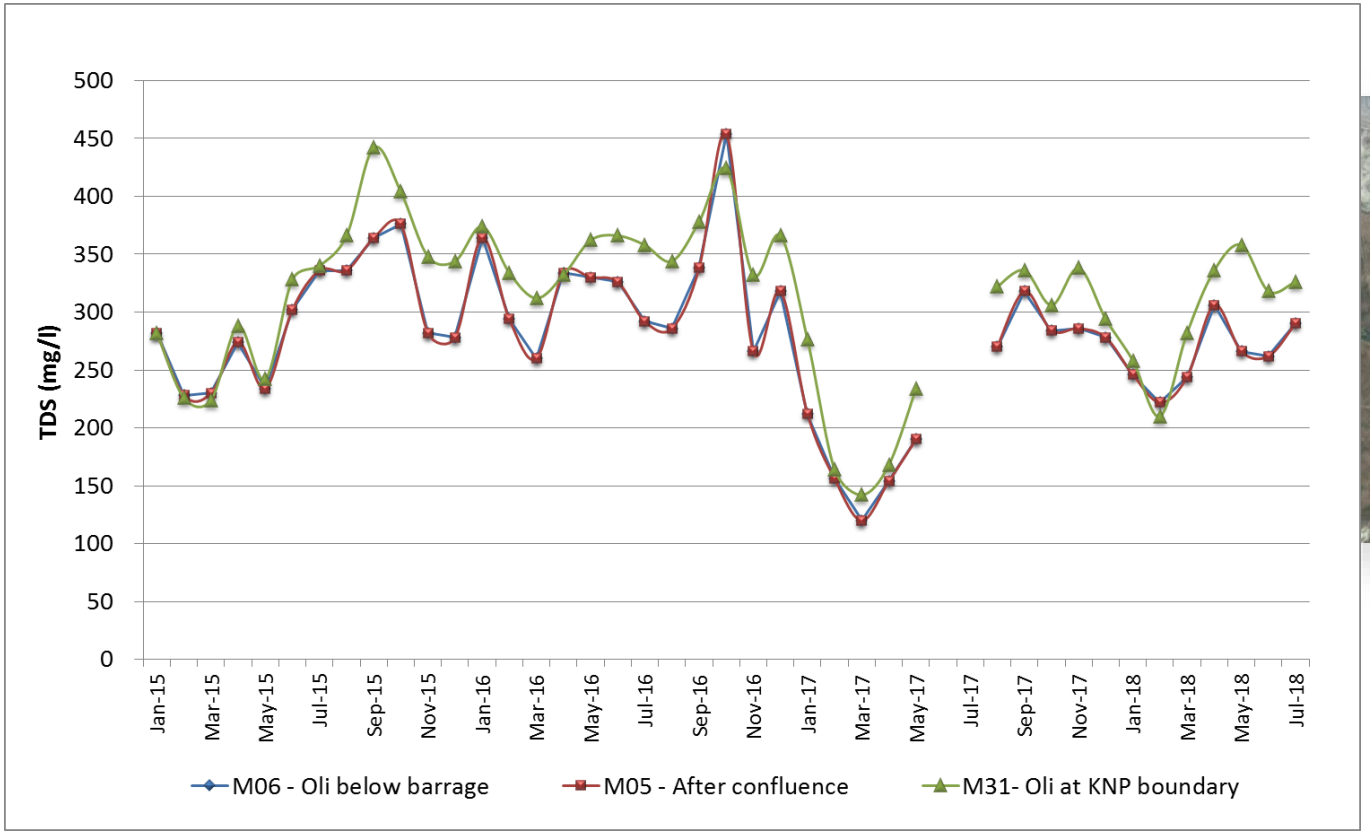
After corrective actions have been put in place you always have to evaluate the effectiveness of actions

Water Quality – Selati River

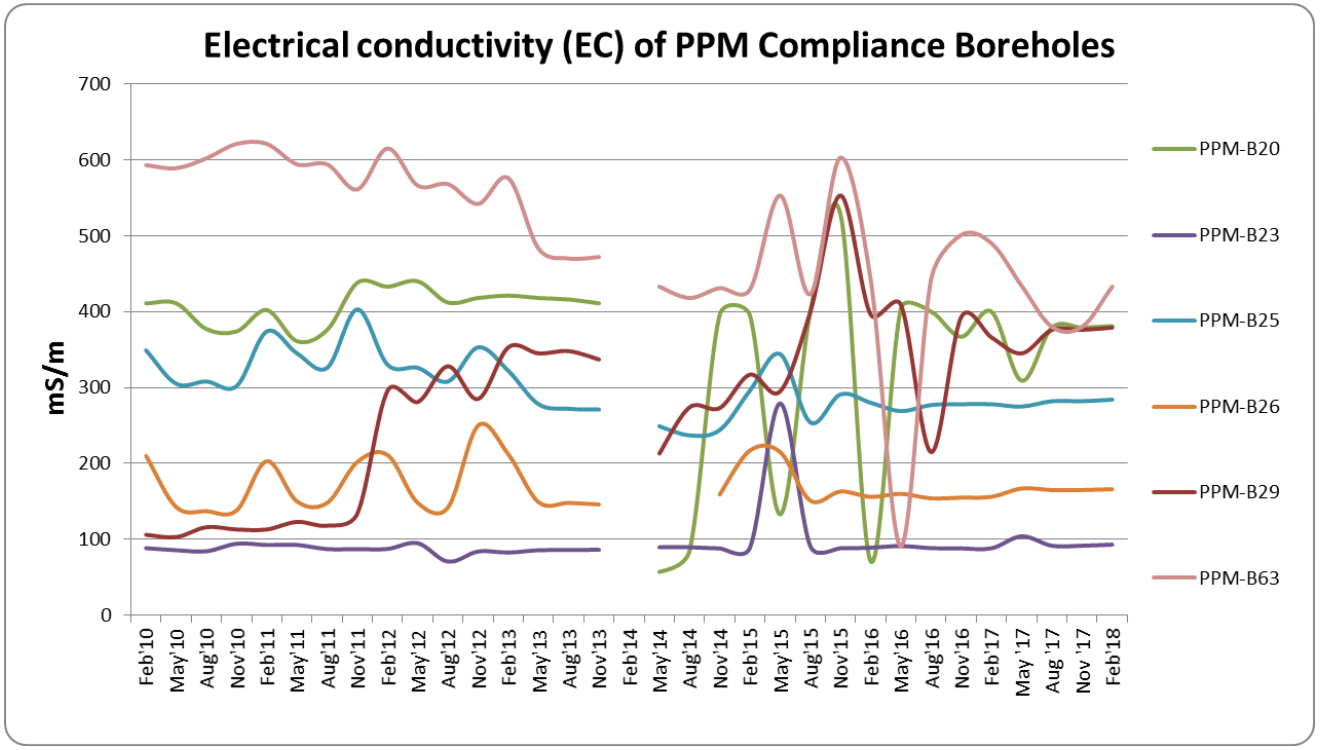




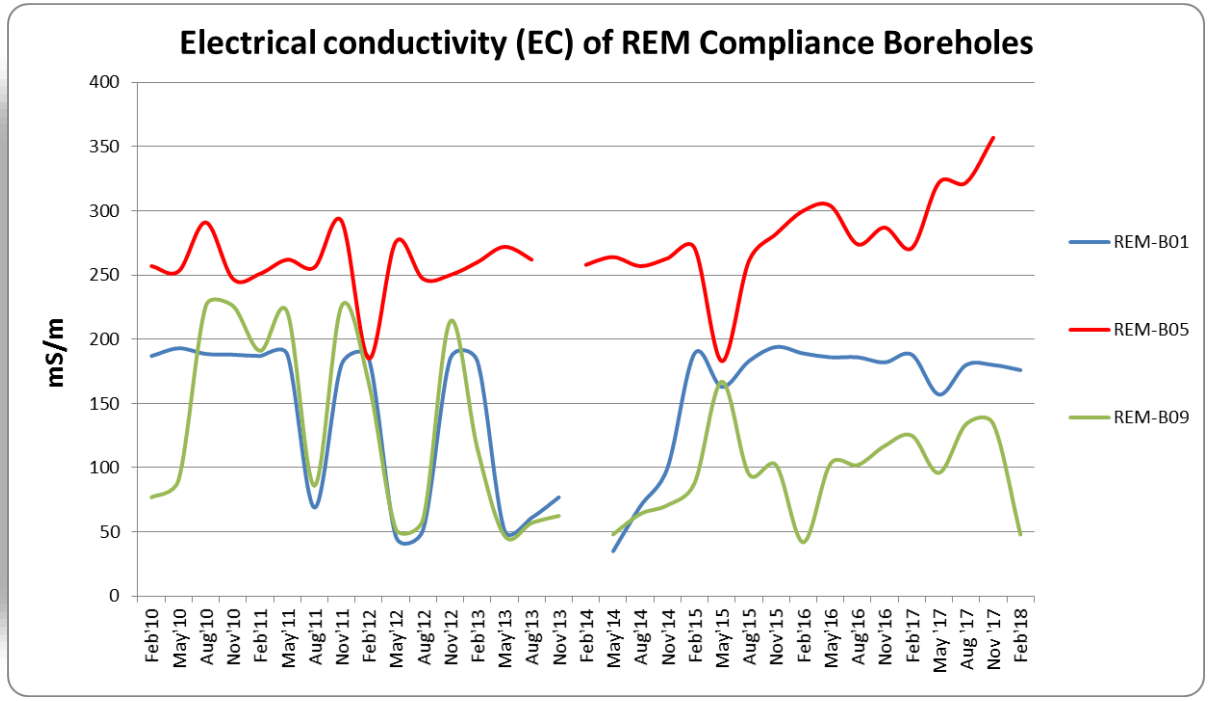
Water Quality – Olifants River



Borehole Water Quality



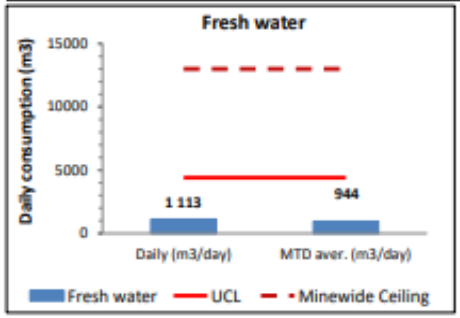
Borehole Water Quality

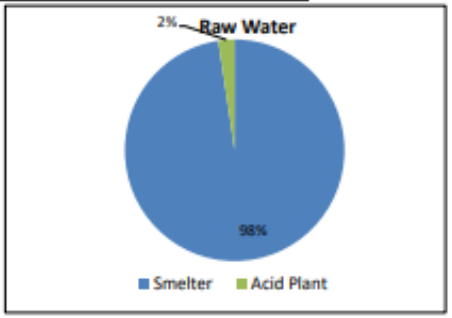


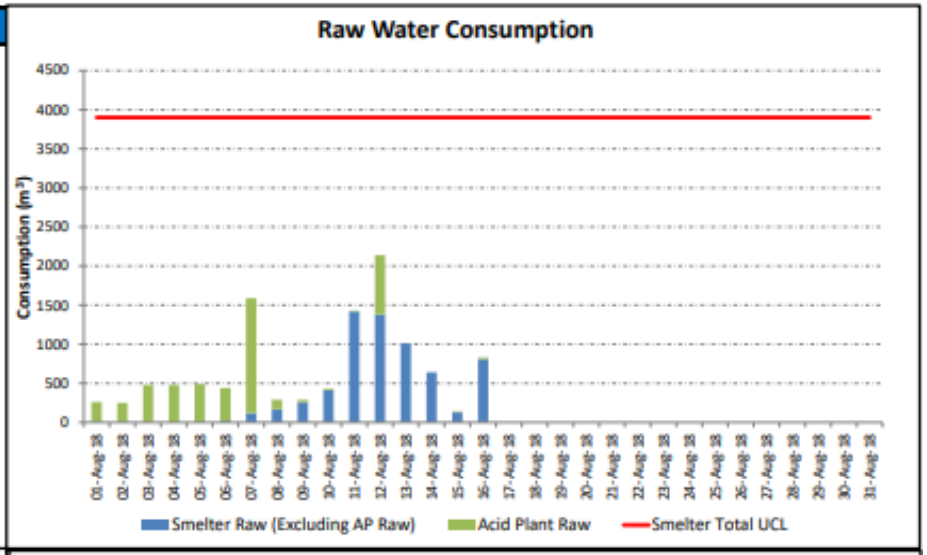
Smelter Water Consumption - 16 August 2018

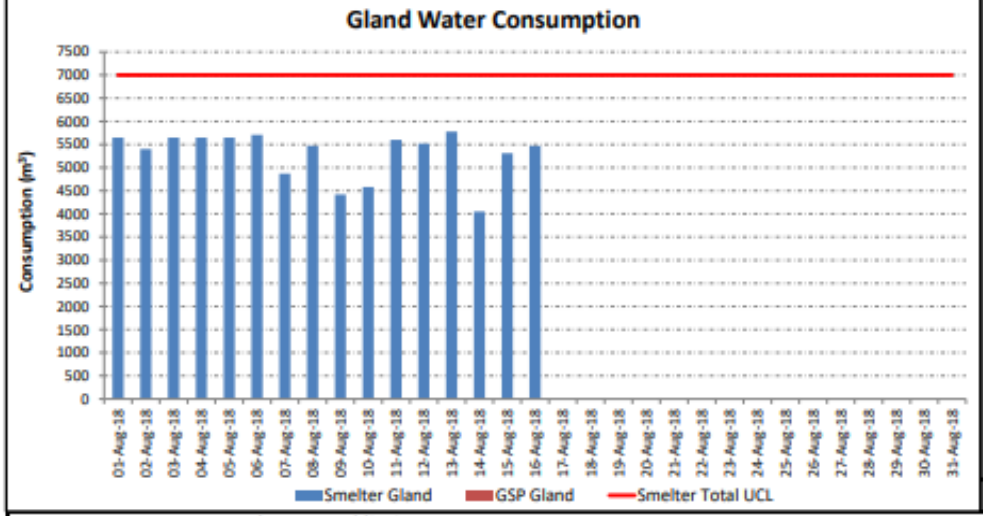
Date	16-Aug-18	Daily Summary

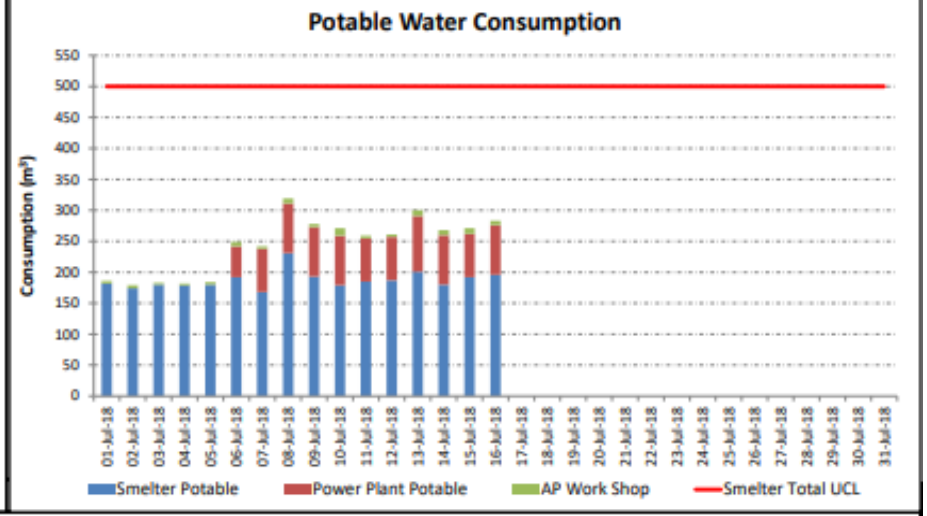
	Water Consumed						
	Raw	Potable	Fresh water	Gland	Total Water	RW	RW AP
Daily (m^3/day)	830	283	**1 113**	5 470	**6 583**	810	20
MTD aver. (m^3/day)	699	245	**944**	5 299	**6 243**		
MTD total (m^3)	11 190	3 915	**15 105**	84 780	**99 885**		









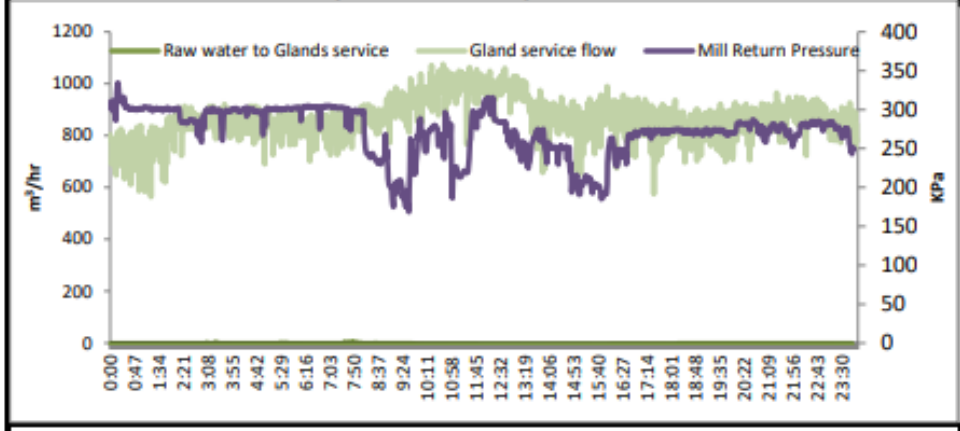


Raw water : Under control limit
Gland water : Under control limit (leaking water pipes at Gas handling is not yet fixed.)
Potable water : Under control limit (leaking water pipe at Reverb)

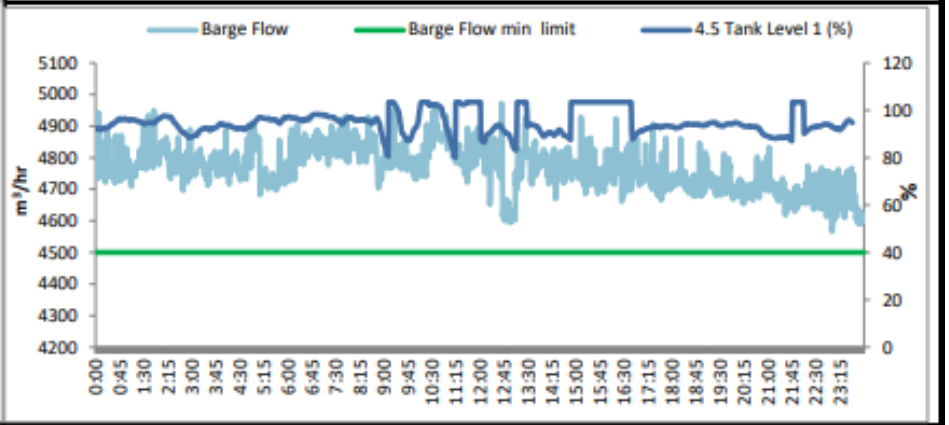
CONCENTRATOR AND MAGNETITE SECTION

DAILY WATER CONSUMPTION FLASH REPORT

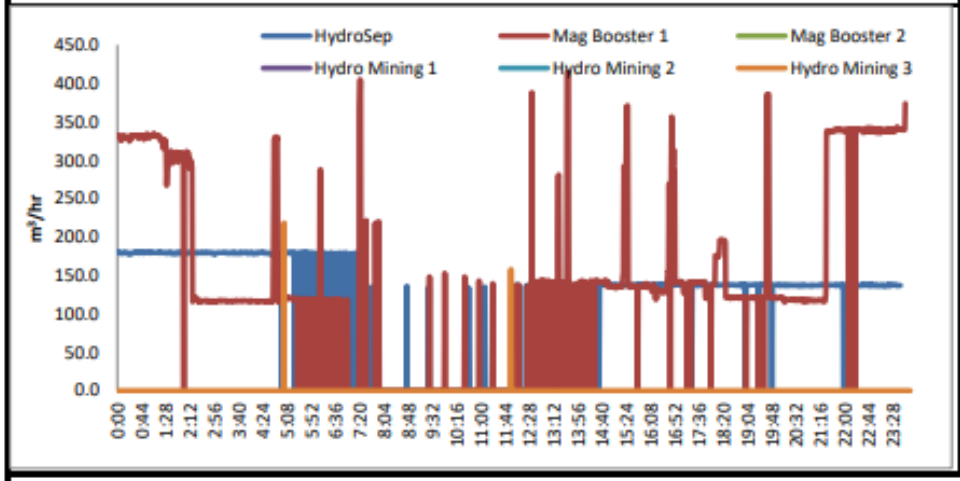
Daily Gland Service System Trends



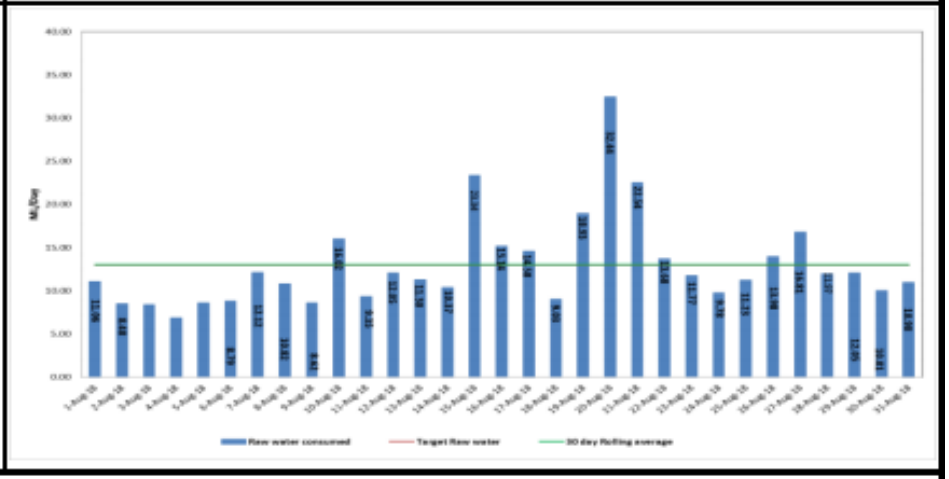
Return Water and 4.5 Reservoirs Trends



Hydrosep and Hydro mining water Usage Trends



MTD Raw water Consumption



Comments:

The raw water pumped into the Head tank on the 31st was 10.98 ML, where 10.75ML was consumed by the Plants. The 30 day rolling average consumption is 12.94 ML/day.

Performance Report

ESO-206 Water System Optimisation

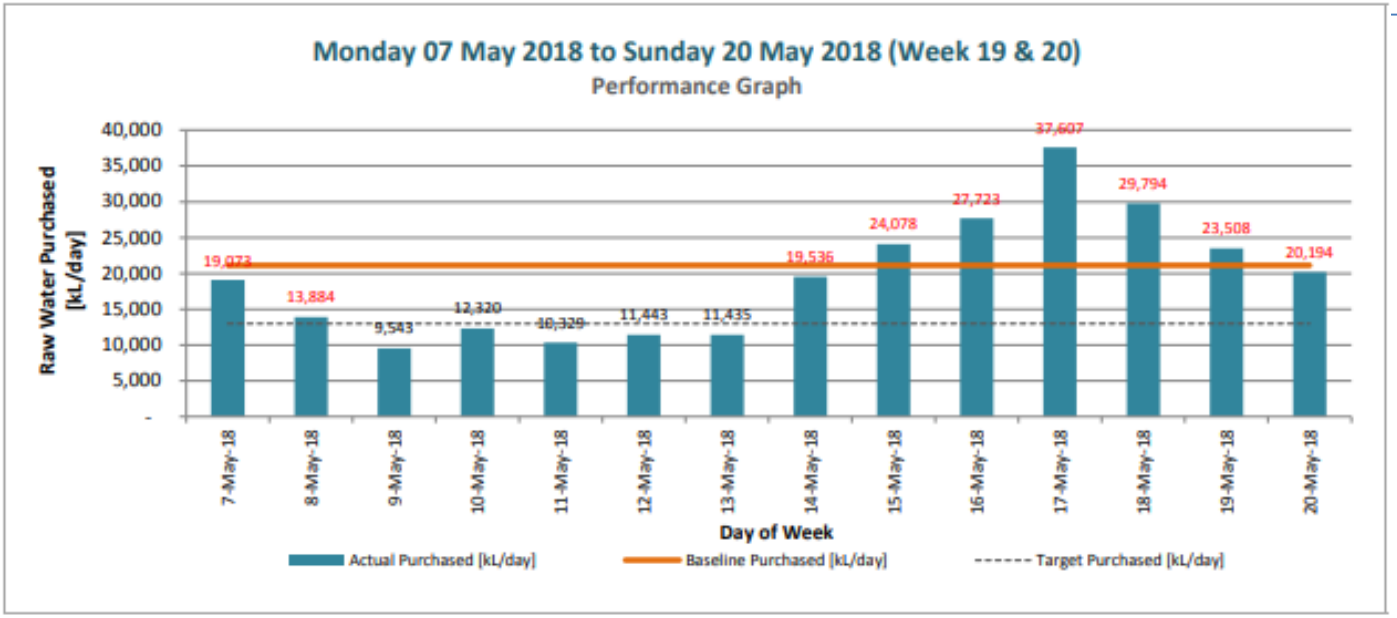


Table 1: Raw Water & Cost Saving Summary: Week 19&20

Description	Raw Water [kL]	Raw Water Cost [ZAR]
Baseline	295,569	R 1,152,720
Actual	270,466	R 1,054,819
Saving	**25,103**	**R 97,901**
Target Saving	113,569	R 442,920
Variance	- 88,466	R -345,019
Variance [%]	-78%	Under-performance

Table 2: Raw Water & Cost Saving Summary, Year-to-date: 2018

Description	Raw Water [kL]	Raw Water Cost [ZAR]
Baseline	2,955,692	R 11,527,197
Actual	2,142,665	R 8,356,392
Saving	**813,027**	**R 3,170,805**
Target Saving	1,135,692	R 4,429,197
Variance	- 322,665	R -1,258,392
Variance [%]	-28%	Under-performance

YTD average consumption	15.3	ML/day

Comments

07 May 2018:	Await feedback from sections with regards to high consumption.
08 May 2018:	On target
09 May 2018:	Under daily target
10 May 2018:	Under daily target
11 May 2018:	Under daily target
12 May 2018:	Under daily target
13 May 2018:	Under daily target
14 May 2018:	Await feedback from sections with regards to high consumption.
15 May 2018:	Await feedback from sections with regards to high consumption.
16 May 2018:	27.7 ML raw water received from Lepelle into head tank. 28.65 ML raw water consumed over 24 hour period of which 15.03 ML raw water was consumed by plant and 13.10 ML raw water drawn through gland service circuit owing to low 4.5 reservior level (unavailability of thickener 1 & 2).
17 May 2018:	37.6 ML raw water received from Lepelle into head tank. 41.30 ML raw water consumed over 24 hour period of which 15.94 ML raw water was consumed by plant and 25.29 ML raw water drawn through gland service circuit owing to low 4.5 reservior level (unavailability of thickener 1 & 2).

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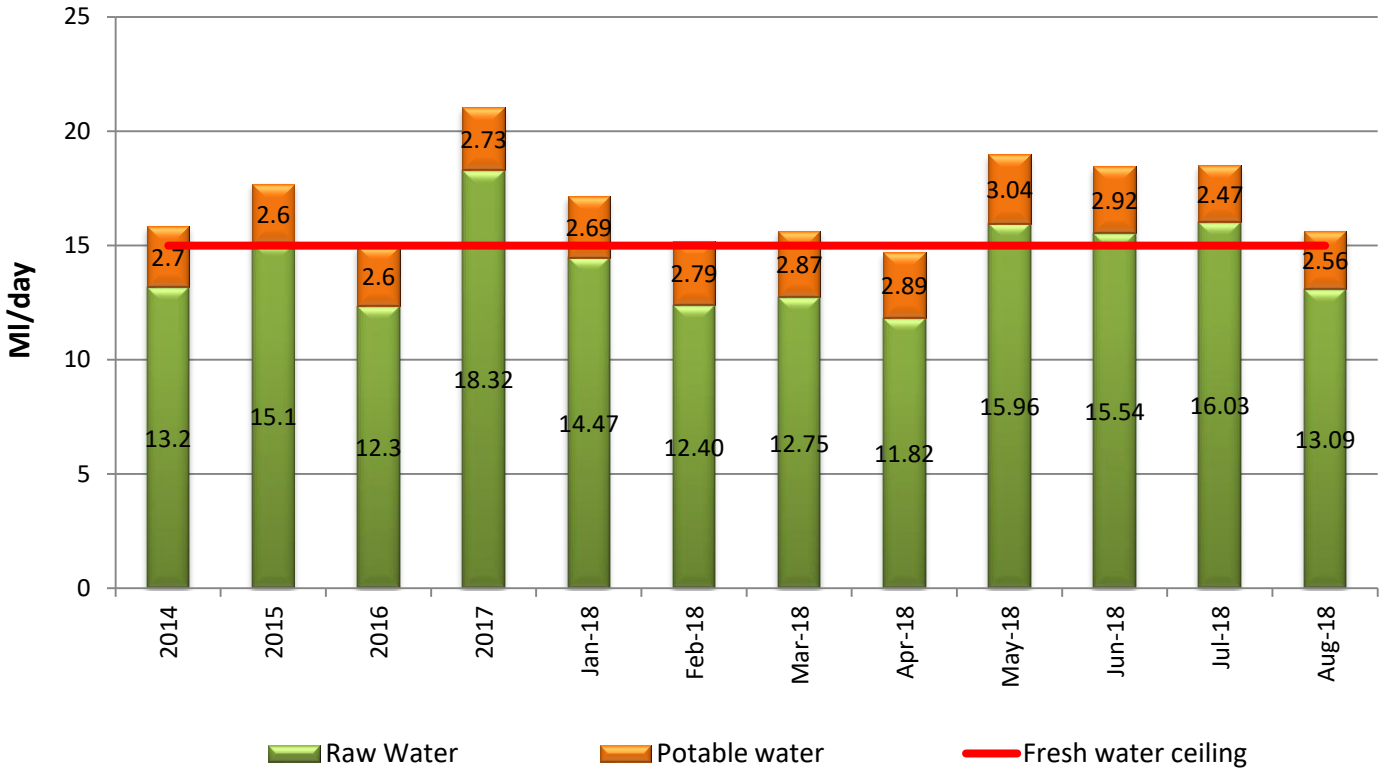
Fresh **Water Consumption**



Summary

The transition to the latest version of ISO14001 has encouraged the business to ‘look’ for opportunities for improvement, even after 20 years.
The ‘top leadership’ do now have a better ‘ownership’ of the SHEQ MS as a whole.
A good understanding of internal and external stakeholders helps with managing the Environmental System holistically.

The analysis and evaluation of data and systems still has room for improvement, especially by the non-SHEQ specialists.

Palabora Copper has a good integrated system, but….
The MS is only as good as the application by all in the business and it starts at the Top – the Executive.