i. ABSTRACT

Most mineral processing plants have high water requirements for their operational activities. These plants often function in an environment where water is becoming increasingly scarce. An increase in population will result in an increased demand for water, potentially beyond the limits of supply, and hence increased competition for the resource. In South Africa, Gauteng and the North West Province are likely to be first to experience a shortage of potable water.

The key to a sustainable future lies in understanding and utilising resources more efficiently. This holds especially for industries who seek to minimise water usage through better management of resources. The two tools used in this study are the Water Accounting Framework (WAF) and Water Footprinting (WF) method.

This research assisted a refinery in the North West Province understand its water usage and move towards operating in a more sustainable manner. Site water management was improved and the objective of this research fulfilled by:

(i) Surveying the potable water and the storm water systems with a view to assessing the current water accountability and determining methods to improve accountability;
(ii) Determining the water balance for the site and presenting it in the form of a water balance sheet;
(iii) Reporting water usage in accordance with the Minerals Council of Australia's "Water Accounting Framework for the Minerals Industry";
(iv) Calculating the water footprints of the refinery; and
(v) Evaluating the water usage at the refinery and identifying ways in which water savings could be achieved.

It was seen that the biggest consumer of water was the boilers and utilities section and the biggest loss of water was through evaporation. The refinery potable water requirement (2 280 m^3/y) amounted to 0.16% of the daily water use for the Bojanala Platinum District. Four

reports (outputs) were generated using the WAF. The four reports generated provide a good indication of the movement of water into, out of and during a process. WFs were calculated for the process. The blue WF was calculated to be 832 363 m^3 and the green WF was calculated to be 261 970 m^3. The product WF was 43.9 m^3/t of base metal produced. There was no grey WF as the site does not discharge polluted water.

This research provided an opportunity for the refinery to improve water efficiency onsite as well as improve reporting standards. Water usage was reported using global reporting tools to set a benchmark for the base metals industry.