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# Stormwater impacts on discharge water quality in licensed drains at the Port Kembla Steelworks

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# Stormwater Impacts on Discharge Water Quality in Licensed Drains at the Port Kembla Steelworks

**A thesis submitted in fulfilment of the requirements for the award of the degree**

**Masters of Environmental Science by Research**

**from**

**UNIVERSITY OF WOLLONGONG**

**by**

**Louis Mathew Whant, BSc. (Chem)**

**Faculty of Science**

**2005**

# CERTIFCATION

I, Louis Mathew Whant, declare that this thesis, submitted in fulfilment of the requirements for the award of the Masters by Research, in the Department of Environmental Science, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Louis Mathew Whant

29th September 2005.

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# ABSTRACT

This study encompassed work on four of the Environment Protection Authority (EPA) licensed discharge points at the Port Kembla Steelworks (PKSW). These included the North Gate Drain, the Main Drain, the Flat Products East No.1 Drain and the Ironmaking East Drain. This study incorporated a hydrological study of the drains, and a stormwater discharge water quality study.
The aims of the hydrological component were: to obtain an understanding of the behaviour of each of these drains during rainfall events; to determine fractions of runoff compared to rainfall volume; to determine the influence antecedent precipitation has on the discharge of each drain; and, to relate the findings to catchment type.

The aims of the water quality component were: to determine the concentrations of priority pollutants in licensed drains during wet weather and the first flush; to determine the likely source of any stormwater borne contaminants; and, to use the water quality data to determine appropriate wet weather licence limits. These aims were developed to assist in the design of further investigations involving stormwater management at PKSW. This study encompassed 16 months of stormwater monitoring and involved the collection of over 1300 samples.

The findings were that Flat Products East No.1 Drain and Iron Making East Drain displayed very similar characteristics during rainfall events. Both exhibit 'flashy' hydrographs, with fast response to rainfall, and steep recession curves where return to 'baseline' or process flow is rapid. The fraction of discharge compared to total rainfall volume (falling on the catchment) for both these drains was high (>80%). Their small catchments, containing almost entirely sealed impervious surfaces, led to very small water losses. The Flat Products East No.1 Drain and Iron Making East Drain discharge volumes, during rainfall, were found to be unaffected by antecedent rainfall.

The Main Drain was found to have a delayed response to rainfall. The Main Drain and the North Gate Drain hydrographs displayed slow receding recession curves where the elevated flow continued for hours after the rainfall events had ceased. The fraction of discharge compared to total rainfall volume (falling on the catchment) for the Main Drain was found to be small, indicating large water losses to infiltration and percolation to groundwater recharge via the relatively large grassed and unsealed, pervious areas within the catchment. An anomaly was found in this fraction for the North Gate Drain due to overestimations in discharge rates from online monitoring

equipment and it is recommended this be rectified. Both the Main Drain and North Gate Drain discharge volumes were shown to be affected by antecedent rainfall conditions.

The program for the water quality component of this study, specifically targeted the water quality of the 'first flush', sampling every ten minutes during a storm event. The intensive sampling program allowed for the collection of a diverse wet weather data set not investigated previous to this study. The data showed that pollutant concentrations during wet weather are elevated compared to the historical dry weather water quality data. Confidence limits were calculated and compared to current wet weather licence limits. In some cases, the current wet weather licence limits are inadequate, and recommendations have been made for the revision of wet weather licence limits using the calculated 95% CL as a basis.

This study identified areas were there are contaminant issues during wet weather, e.g., the Main Drain Total Suspended Solids (major component coal) and the Flat Products East No.1 Drain Total Iron (major component iron prills), and also areas where there are no current drain issues during wet weather (North Gate Drain). Monitoring of pH at all specified drains in this study did not identify any pH excursions during wet weather and no evidence of elevated pH in stormwater runoff was identified. However, further monitoring will be required at North Gate Drain after the removal of current saltwater discharge.

This study, whilst specific and extensive, is limited to only four licensed discharge points at PKSW. Extrapolating the findings of this report to the remaining licensed discharge points is not recommended due to vast differences between catchments across the PKSW site, including their size, land usage, plant, associated equipment, activities and salinity. Instead it is recommended that a similar study be commenced on the remaining nine licensed drains.

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