# PORT MACQUARIE INDUSTRIAL AREA STORMWATER POLLUTION CONTROL - INTEGRATED SOLUTIONS FOR SUSTAINABLE OUTCOMES

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## Paper Summary

The Port Macquarie Industrial Area was identified as a stormwater 'hotspot' in the Hastings Urban Stormwater Management Plan. Council was successful in acquiring a $600,000 grant from the NSW Government's Stormwater Trust to carry out a program to improve stormwater quality discharging to SEPP 14 wetlands and a large nature reserve. A variety of structural and non-structural measures were successfully implemented to provide a cost-effective solution which met community values and Council's commitments. This paper discusses the outcomes of all measures implemented with particular emphasis on tools used to implement and evaluate the education program. Lessons learnt through various project phases are also discussed. The importance of a coordinated and integrated approach, applied learning and community involvement to achieve sustained performance were key features in the success of this program.

## Introduction

Port Macquarie industrial area's 94-hectare catchment (Figure 1 Appendix A) essentially drains to the Lake Innes nature reserve, Kooloonbung Creek and its SEPP14 associated wetlands and has the potential to cause significant environmental degradation. This area has been identified as a stormwater pollution 'hotspot' in the recently adopted 'Hastings Urban Area Stormwater Management Plan (SMP)' (Hunter Water Australia, 2000).

A multi faceted approach utilising a variety of structural and non-structural techniques to improve water quality was implemented to achieve a long-term sustainable solution.

Cardno Willing Pty Ltd were engaged to design the preferred measures and project manage the implementation of the works. WaterWise NSW were the education consultants for this project.

## Port Macquarie Industrial Area

The Industrial area has a total of about 270 properties and is a mix of a variety of businesses as depicted in Figure 2.

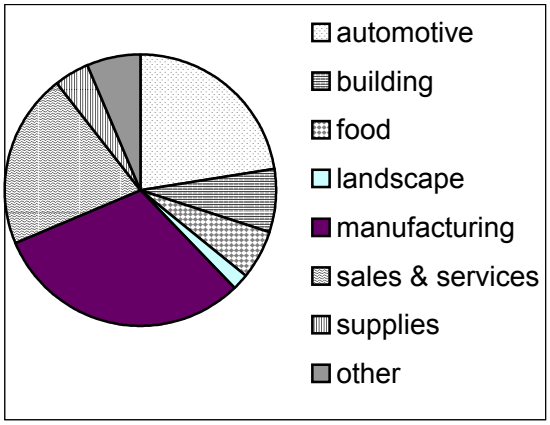


**Figure 2. Distribution of Industry Categories**

80% of the businesses fall into one of four categories: automotive, building, manufacturing and sales and service. The likely pollution potential of each industry category was estimated and it

was determined that 82% of the businesses had the potential to pollute (Cardno Willing, 2001). The industries are randomly distributed across the catchment, hence the pollutants were assumed to be equally dispersed throughout the catchment.

## Issues

The Hastings Urban SMP (Hunter Water Australia, 2000) identifies and ranks stormwater issues for the Port Macquarie catchment. A second, informal ranking specific to the industrial area was carried out at a workshop of stakeholders and results are presented in Table 1.

**Table 1. Ranking of Stormwater Issues**

| Issue | Ranking | |
|---|---|---|
| | **Port Macquarie** | **Industrial Area** |
| Erosion | 1 | 6 |
| Decreased water quality | 2 | 1 |
| Planning and infrastructure | 3 | 5 |
| Insufficient community awareness | 4 | 2 |
| Localised flooding | 4 | 3 |
| Impact on habitat | 5 | 2 |
| Impact on health and safety | 6 | 4 |
| Impact on aesthetics | 7 | 7 |

Decreased water quality, insufficient community education and impact on habitat were the top three issues for the industrial area as determined by stakeholders.

Environmental auditing of businesses in the industrial area was carried out in 1999. This identified stormwater contaminants varied from gross pollutants such as packaging materials, paper, plastic, hydrocarbons, paints and solvents. Observational monitoring in the area has also shown evidence of litter and gross pollutants along the stormwater drains. The results of the audit illustrated that very few measures were being taken to prevent stormwater pollution.

Limited water quality sampling was carried out in drains discharging main catchments of the industrial area to Kooloonbung wetlands during the preparation of the Hastings Urban Stormwater Management Plan. This data was enhanced by a 3-month program of baseline water quality monitoring undertaken at a few sites in the industrial area (Greenspan Technology, 2001). This included continuous automated sampling at sites A and D and grab sampling at other locations (Figure 1). Key results are as follows:

- Most values are within expected ranges for urban stormwater;
- Levels of some heavy metals appear to be high;
- High values of TN and TP occurred at site A (Figure 1) during runoff events such as on 25th July 2001. These high values were not experienced at other locations.
- Incidences of high suspended solids (SS) loading also occurred at site A.

## Objectives

The principal objective of the project was to reduce pollution from stormwater emanating from the

industrial area by using a combination of measures best suited to the issues and pollutants identified. This would include a variety of stormwater quality improvement devices (SQIDs), a multi-objective education program and providing information and support to the industrial area community for improving on-site stormwater management through source control and spill management action planning. Monitoring and evaluating all project components to recognise strengths and weaknesses and utilising this information in future works was also a significant objective.

## Project Planning

The project was undertaken in 6 stages as described below. Community and Council stakeholders were involved at various levels throughout the planning and implementation stages.

- Stage 1 Project Inception – official launch and inception meeting;
- Stage 2 Review of existing conditions – examination of existing conditions, assessment of available options and identification of preferred options for further study;
- Stage 3 Concept Plan and Options ranking– Concept plans for stormwater pollution control measures and their relative ranking including Stormwater Quality Improvement Devices (SQIDs), education program. Preparation of Review of Environmental Factors and approvals from relevant Government Departments;
- Stage 4 Detailed Design – Detailed design and documentation of SQIDs and detailed education and monitoring program plan;
- Stage 5 Implementation – Installation/Construction and commissioning of SQIDs and implementation of the non-structural measures program;
- Stage 6 Performance Monitoring – Assessments of the effectiveness structural and non-structural measures.

## Options Evaluation

Based on the results of the auditing, monitoring, review of background data, detailed modelling and analysis (quality and quantity), a number of potential stormwater management options were developed, costed and ranked. Flooding considerations were also taken into account wherever practicable and cost effective.

Evaluation of the potential management options was carried out in terms of their social, environmental and economic benefits and costs. A preliminary ranking of all options considered was carried out using a spreadsheet method developed by the EPA for RTA. The spreadsheet analyses and weighs up the benefit cost and impacts of each strategy using catchment characteristics, likely pollutant contribution of industries, catchment values and performance of management measures and treatment devices (Cardno Willing, 2001).

Following a preliminary options ranking, a workshop involving the Consultants, Council officers, Government Agency staff and key community stakeholders was facilitated to finalise the ranking.

Results of the final stormwater quality control options ranking are presented in Table 2.

Council made a decision to proceed with the detailed design of all ranked options. Initial cost estimates indicated that it was feasible to implement only

options 1 to 9 within the available budget.

**Table 2. Ranking of Stormwater Quality Control Options (Cardno Willing, September 2001)**

| Site | Measure | Rank |
|---|---|---|
| Catchment-wide | Drain stencilling | 1 |
| Catchment-wide | Community education program | 2 |
| A, Jindalee road culvert | Major GPT, wetland cells, flow spreader | 3 |
| Catchment-wide | Emergency spill response plan | 4 |
| All industrial properties | Source Controls | 5 |
| B, 750mm pipe off chestnut road | Proprietary GPT | 6 |
| E, 450mm pipe, Lake road near central road | Proprietary GPT | 7 |
| C, 1050mm Acacia Avenue and drain along Milton Circuit | Proprietary GPT, channel improvement, landscaping | 8 |
| D, 750mm pipe south side of lake road | Proprietary GPT | 9 |
| F, end of Blackbutt road | Pit and Pipe drainage, Nettech Litter sock | 10 |
| H, Acacia Avenue | Kerb and Gutter, pavement sealing | 11 |
| Area wide | In pit litter baskets | * |

*Option not recommended due to high cost of maintenance

## Structural Measures

The Construction of Stormwater Quality Improvement Devices (SQIDs) was carried out under two separate contracts due to the different nature of works and in order to fast track the project.

Contract 1 covered the construction of four proprietary gross pollutant devices at sites B, C, D and E. Council received five tenders and the selected tender was by CDS Technologies Pty Ltd at a total value of $243,800. Installation was completed in 3 months. A training session was held for Council's maintenance staff in the best practice of servicing and maintaining all installed units.

**Figure 3. CDS Unit being installed at site B**

Contract 2 covered general civil works at sites A and C, including GPT and wetlands at site A and landscaping/channel improvements at site C. Due to tenders received being higher than the allowed budget, the scope of the contract was revised and Council entered into a contract with Fernandes Constructions Pty Ltd at a lump sum price of $308,277. Construction is underway at site A with expected completion by the end of September 2002.

## Education and Awareness Program – Be Part of the Stormwater Pollution Solution

Non-structural measures received a higher rating than most structural measures in the options evaluation (Table 2) because of their cost effectiveness, low maintenance and sustainability of outcomes.

An awareness campaign limited to distribution of educational material supplied by the NSW EPA was conducted in the area in conjunction with the 1999 environmental auditing.

This education program encompassed all non-structural measures and focussed on community preferred and evidence based tools for improving awareness of stormwater issues/impacts and encouraging ownership of stormwater pollution management in the industrial area community.

***Outcomes***

The education program was developed to achieve the following outcomes:

- Establishment of a mechanism to direct and monitor the program;
- Collection of baseline data on community knowledge about the issue;
- Developing community preferred education strategies which linked with existing programs and were consistent with NSW EPA campaign messages;
- Improving community awareness and influencing community behaviour;
- Encouraging the community to be involved and assume some responsibility of the issue;
- Helping the community to improve onsite/ at source stormwater pollution;
- Providing recommendations for sustained performance.

***Strategies***

In order to obtain maximum benefit from the project, the variety of educational tools and strategies were designed to complement each other. Media releases and television coverage was used to promote and publicise the project throughout its life.

Establishment of a steering committee comprising key stakeholders from the industrial area, DLWC, NSW Fisheries, Estuary Management Committee, Council officers from all relevant sections (Technical services, environment, maintenance, trade waste).

Baseline data was collected by a pre-test survey of 200 businesses in the industrial area. Information collected through this survey included community attitudes and level of knowledge. The door-to-door approach used to undertake surveys not only ensured a better quality and quantity of information gathered, but was also taken as an opportunity to raise awareness.

Results of the survey revealed that less than half the respondents were aware of the fate of stormwater from the area and there was considerable uncertainty about the sources of stormwater pollution. 55% were either unsure or thought that stormwater was treated in someway similar to sewerage as opposed to 45% who correctly identified that stormwater from the industrial area discharged to Kooloonbung wetlands and Creek. Issues identified through the survey were targeted by the education strategies.

Signs addressing key project concerns were erected at all major access roads to the industrial area. Regular news bulletins informed businesses on project progress, type and location of SQIDs responded to other queries raised by the community in the pre test survey.

Stormwater Action Plans were developed for each main industry category to provide advice on ways to

better manage and reduce stormwater pollution at source. This information not only provided sample action plans but also included general information on stormwater pollution, legislative responsibilities, penalties for offences and a self-assessment checklist for all businesses. Emergency spill response posters were also distributed.

Manufacturers/suppliers of trade waste products, spill equipment, pollutant traps were invited to a trade day to present more detailed information on source control techniques to the industrial area community.

## Monitoring and Evaluation

Monitoring and evaluation provide important information on the performance of a project and helps identify opportunities for future improvement.

### *Structural Measures*

Since construction and installation has completed recently, no water quality monitoring results are available yet. It is proposed that automated flow monitoring and sampling be conducted for a three month period upstream and further downstream of site A. This will provide data to assess the treatment efficiency of the structural measures at site A as well as provide a judgement of the four upstream CDS units.

The amount and type of gross pollutants and sediment captured by the CDS Units will be recorded during routine maintenance.

### *Education and Awareness Program*

**Impact evaluation**. Pre and Post program surveys to estimate change in knowledge and behaviour. Environmental auditing carried out by Council officers in 2003 will provide data for comparison with the 1999 audit and enable judgements to be made about the success of the program.

**Process evaluation**. This mainly involved documenting project activities and processes and examining them as the project progressed. Discussions were held with the steering committee members, participation rates were monitored for the trade day, general observations by the community and Council officers were recorded. Project progress was reported through television and local newspapers and also through the Hastings Estuary Management committee, which includes community members and Councillors.

Results of monitoring and evaluation indicate that the education campaign has been well received and there has been a significant shift in the level of awareness of stormwater pollution issues. Where before less than half of the people knew that stormwater went directly to Kooloonbung Creek, now 85% are aware. The industrial area community expects Council to spend time and money on stormwater pollution prevention, primarily through awareness raising but some indicated stricter reinforcement of legislation and fines. The community is more willing to take responsibility of the issues and be proactive in acquiring information on stormwater pollution management. Local signage, drain stencilling, media releases were very effective in reaching people (Price, 2002).

The door-to-door approach used for surveying was an ‘outreach’ tool in itself and also helped improve the partnership approach between community and Council.

## Lessons Learnt

Lessons learnt from this project highlight the importance of the following:

- Importance of involving all stakeholders at the planning and decision making level of a program. This not only enhances the planning process but builds trust and partnership, promotes ownership and hence contributes to sustainability of outcomes.

- The value of education and awareness campaigns. Stakeholders ranked non-structural pollution control measures higher than structural measures for achieving project objectives.

- Using a variety of techniques/components to achieve the objectives and opportunities to effectively integrate all project components.

- Designing programs that link with previously conducted campaigns and ongoing activities in various Council sections as well as being consistent with statewide messages. Education programs and material was modelled after existing Council and EPA material wherever possible.

- Developing a good relationship with the media is a cost-effective way of delivering messages to the community.

- Correct timing of activities is important but not always possible. Council had difficulty in receiving competitive tenders for construction at site A and C because of a high level of construction activity already in the LGA.

- Time constraints. Due to the complicated, multi faceted nature of the project which involved consultation, education, structural design, construction and evaluation, the original project duration was found to be an under estimation of actual time spent. The 15-month time frames specified by the Stormwater Trust are not realistic for all projects.

- Number of educational activities. Delays and a tight time schedule left little time for project implementation, which resulted in many activities occurring in parallel. A similar outcome could have been achieved by fewer activities than originally planned.

## Future Direction

This project provides good baseline data to carry out future work in the Port Macquarie Industrial area as well as other industrial areas in the LGA. Lessons learnt through the planning and implementation will and have already been used in developing other stormwater education initiatives in the Hastings.

The successful outcomes of this project will be preserved through ongoing education, environmental auditing and maintenance of SQIDS.

## Conclusion

This program has been successful in achieving all outcomes of the education and awareness program and although the efficacy of structural measures has not yet been assessed, previous experience with such structures indicates high pollutant removal. This has been achieved through implementation of multi-faceted techniques, integrated planning, applied learning and community involvement. It is vital to sustain the outcomes achieved through best practice operation and maintenance of SQIDs and ongoing education / awareness activities to strengthen the messages delivered during this project.

## Acknowledgement

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The work done by Consultants Cardno Willing Pty Ltd and WaterWise NSW is acknowledged.

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## Appendix A

**Figure 1. Plan showing Port Macquarie Industrial Area and Locations of Pollution Control Measures (Phillips *et al*, 2002)**

## Author Biography

Dr Mehreen Faruqi is a Civil engineer with 14 years research, consulting and local government experience in the fields of Civil and Environmental Engineering. Mehreen has worked as an engineering consultant with local (Sinclair Knight Merz Pty Ltd) and overseas firms in the fields of structural design and analysis, environmental engineering, sewerage and wastewater management, solid and hazardous waste management, drainage and irrigation and water reuse. She has been working with Hastings Council since July 2001 coordinating estuary, stormwater, flood and coastal management programs.

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