

# Reducing Stormwater Pollution from Building and Construction Sites – An Effective Strategy

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## ABSTRACT

Construction activities can cause soil erosion and sediment generation which can clog stormwater drainage and transport a range of pollutants including oils, heavy metals and nutrients into local waterways. Excessive amounts of sediment can also kill fish and aquatic plants, silt up streams, and block stormwater pipes, which can cause flooding.

There has been a lack of awareness about pollution from building and construction sites. In response, the Tasmanian State Government backed Derwent Estuary Program (DEP) introduced a Sediment and Erosion Control Project (the Project), which looks to prevent pollution from building and construction sites entering our waterways and polluting our environment. The critical elements for such a program include education, training and enforcement.

The Project has improved sediment and erosion management through distribution of information fact sheets, sediment control kits and delivery of training for council work crews as well as the employment of a regional Sediment and Erosion Control Officer.

Three thousand copies of sediment and erosion control information fact sheets were printed and distributed to local councils in Southern Tasmania to better manage building and construction sites.

Sediment control kits and training were delivered to council work crews in Southern

Tasmania. Over 3,500 filter socks and filter bales were issued and several hundred council staff briefed on their use.

Since the employment of the Sediment and Erosion Control Officer in August 2010 there have been several improvements made by councils in sediment and erosion control, especially in conditioning of buildings and subdivisions as well as on-site inspection and enforcement.

This project was supported by several rounds of funding from the Australian Government's grants program including Caring for our Country and regional funding from Natural Resource Management (NRM) South.

## INTRODUCTION

Soil erosion from building and construction sites is a major source of pollution in Southern Tasmanian waterways. An estimated 8,000 tonnes of suspended solids (mostly sediment) is delivered each year to the Derwent estuary via stormwater runoff (data extrapolated from the *State of the*

*Derwent Estuary Report 2009*). A large percentage of this load is attributed to erosion from building and construction sites.

Sediment from building and construction activities seldom receives the attention it deserves, even though its impacts are more pervasive than litter and gross pollutants. Sediment that moves off building and construction sites typically enters stormwater drains untreated, thereby clogging the stormwater system and transporting attached pollutants including oils, heavy metals and hydrocarbons into local waterways. Excessive amounts of sediment can also kill fish and aquatic plants, silt up streams, and block stormwater pipes, which can lead to increased flooding.

There have been efforts to improve soil and water management in Southern Tasmania in the late-1990's with *The Soil and Water Management Code of Practice for Hobart Regional Councils (1999)* and *Guidelines for Soil and Water Management June (1999)*. These standards have become out-of-date and are seldom used on building and construction sites or by councils.

Over the past six years the DEP has coordinated various initiatives with local councils responsible for regulating construction sites to improve soil and water management and promote better use of sediment and erosion controls on construction sites. These initiatives include:

- development and distribution of a new series of best practice soil and water management guidelines – *Soil and Water Management on Building and Construction Sites (2008)*;
- development of enforcement proformas for councils;
- provision of Council training sessions to planning and civil works staff;
- distribution of sediment control kits to Council civil works crews; and
- presentations to Housing Industry Australia and Master Builders Association.

These initiatives have helped raise awareness of sedimentation issues resulting from poor construction practices and are discussed in depth in this paper.

## **PREVIOUS SOIL & WATER MANAGEMENT REQUIREMENTS IN SOUTHERN TASMANIA**

Adherence to previous sediment and erosion control 'Codes of Practices' including the *Guidelines for Soil & Water Management June 1999* and *Soil and Water Management Code of Practice for Hobart Regional Councils* had been extremely poor since the introduction of the codes in greater Hobart in 1999. The codes were not being used effectively either by the building industry or by the regulators (councils). Furthermore, while the requirement for Soil and Water Management Plans had been enforced in some areas, the enforcement of documented plans during on-ground works was virtually nonexistent.

The more detailed document providing advice for councils "*Soil and Water Management Code of Practice for Hobart Regional Councils*" was not used. Availability was an issue with this document only released in a printed format and print numbers limited. It never went through an official print run or distribution and was referred to by councils as a 'draft document'.

A project report entitled *Sediment and Erosion Control on Construction Sites in the Hobart Region: Guideline Review and Recommendations* supported the development and production a Soil and Water Management Field Guide which would be an improved and easy-to-use sediment and erosion control field guide to replace both the *Guidelines for Soil and Water Management June 1999* and *Soil and Water Management Code of Practice for Hobart Regional Councils*.

Recommendations for the Field Guide included:

- making the document easy to navigate through;
- making it applicable to both councils and the building and construction industry;
- including the supply of useful contact lists or links;
- provision of examples of drawn and annotated SWMPs, for subdivisions as well as single building allotments;
- detailed instruction on how to install and maintain sediment erosion control measures; and
- presentation of new best practice soil and water management solutions.

## **NEW SOIL & WATER MANAGEMENT FIELD GUIDE**

As part of the Project a new soil and water management field guide was prepared to replace previous codes of practice for sediment and erosion control. The field guide entitled *Soil and Water Management for Building and Construction Sites* (2009) includes an introduction/overview section, 19 factsheets and a folder. These materials were based on similar materials produced by Sydney Metropolitan Councils.

The factsheets represent best practice guidelines for soil and water management and are divided into sediment control measures and erosion control measures. Erosion control measures hold the soil in place and reduce soil removal by rainfall or runoff. Sediment control measures capture the eroded soil from the runoff preventing it from leaving the building or construction site.

The factsheets developed were entitled:

- Soil & Water Management on Large Building & Construction Sites;
- Soil & Water Management on Standard Building & Construction Sites;
- Soil & Water Management Plans;
- Dispersive Soils – High Risk of Tunnel Erosion;
- Minimise Soil Disturbance;
- Preserve Vegetation;
- Divert Up-slope Water;
- Erosion Control Mats & Blankets;
- Protect Service Trenches & Stockpiles;
- Early Roof Drainage Connection;
- Scour Protection – Stormwater Pipe Outfalls & Check Dams;

- Stabilised Site Access;
- Wheel Wash;
- Sediment Fences & Fibre Rolls;
- Protection of Stormwater Pits;
- Manage Concrete, Brick & Tile Cutting;
- Sediment Basins;
- Dust Control;and
- Site Revegetation.

These factsheets are useful from the planning stage right through to the hand over to the property owner. Councils can condition all the factsheets, or individual factsheets on planning or building permits as appropriate guidelines for soil and water management. Builders and developers then need to implement the appropriate sediment and erosion control measures on site in accordance with requirements on the permit.

Subdivisions or activities creating greater than 250m<sup>2</sup> of ground disturbance may need to submit a Soil and Water Management Plan (SWMP) as a requirement of their planning or building permit. SWMPs are a standard method for planning and implementing sediment and erosion control measures on larger building and construction sites. Fact Sheet 3 provides details for preparing and implementing Soil and Water Management Plans.

Two thousand copies of the field guide entitled *Soil and Water Management for Building and Construction Sites* were printed and distributed to local councils, Master Builders and Housing Institute of Australia in Southern Tasmania throughout 2009 to better manage building and construction sites. These organisations and council can also supply the guidelines either in the field or at their front counters. Electronic copies of the fact sheets are available on the Derwent Estuary Program's web site and now available on the Tasmanian EPA's website. The field guide has also been printed for Northern Tasmanian councils by NRM North.

# Soil & Water Management on Building & Construction Sites



Fact sheets with practical measures to prevent pollution from building & construction sites

**Figure 1. Cover of the new code of practice for soil and water management**

## **DEVELOP & PRODUCE SEDIMENT CONTROL FIELD KITS**

Another project milestone for the Project was to develop and implement sediment control field kits for local council to improve their own soil and water management practices. A range of sediment control products currently available were assessed to determine which were best suited for the construction and maintenance activities conducted by councils.

Different products including temporary stormwater pit inserts, coir logs, hay bale covers, lintel barriers and skirts were assessed for useability and cost. Filter socks and filter bales were chosen as the best products for the council sediment control field kits.

*Filter socks:* are woven tubes filled with compost or bioremediation media that slow water velocity and filter out sediment, hydrocarbons, nutrients and heavy metals from site runoff. They are able to treat runoff at higher flow rates with significantly less ponding.

Filter socks are more effective than sandbags or geotextile sausages filled with gravel which are heavy and cumbersome and do little to remove dissolved contaminants and finer particles. The socks are also more durable than sand or gravel socks and can withstand greater load bearing from heavy vehicles reducing tearing or bursting. Filter socks can be easily shaped to follow almost any contour and be installed in the kerb and gutter below the work site, while longer socks can be used as a barrier around the stormwater pit. For high flow applications the use filter bales in conjunction with the filter socks is recommended to.



**Figure 2. Filter sock installation**

*Filter bales:* are plastic cellular frame tanks with filter cover and filter cartridges full of compost treatment media and are an alternative to hay bales. The cellular internal bale frame allows for extended filtration and the trapping of silt and sediment run-off as leaves, litter and other solids, removal chemical, nutrient and biological contaminants. Multi-stage filtration cleans and polishes the runoff for release downstream.

The bales also lightweight and easy to handle, they can be easily secured in place for long term use using an epoxy mortar-binder, pegs or stakes. They are suitable for a wide range of sediment and water management situations including:

- kerb and gutters;
- culvert entries;
- erosion control areas;
- drainage inlets;
- high gradient slopes;
- clearing grading and filling sites;
- disturbed natural landforms;
- top soil stockpile containment;
- diversion banks and dams;
- sediment basin overflows;



- catchment boundaries; and
- effluent containment and treatment.



**Figure 3. Filter Bale installation**

Sediment control field kits (comprising of the filter socks and filter bales) and training were delivered to council work crews in Southern Tasmania throughout 2009 to improve their practices and strengthen the use and awareness of best practice soil and water management. Over 2,500 filter socks and filter bales were issued and several hundred council staff briefed on their use. An extra supplement of 1,000 filter socks was delivered to some of the councils in 2011.

#### **EMPLOYMENT OF A REGIONAL SEDIMENT & EROSION CONTROL OFFICER**

In August 2010, the DEP employed a Sediment and Erosion Control Officer as part of a 2009 Federal Caring for our Country grant. The role of the Sediment and Erosion Control Officer was to work with councils and the building industry in the greater Hobart region to improve soil and water management practices on construction sites. The first objective was to conduct a series of site audits across the six municipalities that border the Derwent estuary in order to assess the current level of compliance with best practice soil and water management and compare this to the results of an initial review conducted in 2006.

The review conducted by the new Sediment and Erosion Control Officer in late 2010 found that since 2006, soil and water management was still not being widely implemented, inspected or enforced by councils, even with the resources made available to councils and builders over the last four years, further on ground improvement in soil and water management practices on building and construction sites were still needed. It was also identified that an increased on-site regulatory presence and further streamlining of council enforcement procedures that would help improve building site practices.

The Sediment & Erosion Control Officer position is now dedicated to undertaking regular site inspections across six Southern Tasmanian municipalities, the development of a new system for regulating soil and water management on building and construction sites and the creation of new training programs for building practitioners and council staff in regulatory roles.

Over the past twelve months the Sediment & Erosion Control Officer has conducted regular inspections at more than 150 building and construction sites in the greater Hobart region. These have included a range of developments from single lot sites to subdivisions and large commercial building sites. During site inspections the Sediment & Erosion Control Officer indicates where controls are required and educates builders where improvements can be made. Council building compliance staff often attends these inspections.

A third review of on-site practices has recently been completed by the Sediment & Erosion Control Officer, detailing on-site observations over the last twelve months since the last 2010 review. Even over a short time period there was a notable improvement in sediment and erosion control practices in the area. It is clear that an increased regulatory presence on construction sites has facilitated improvement in the local building industry. It is envisioned that construction site soil and water management practices will further improve with continued pressure and education for regulatory bodies and the building industry in Tasmania.

## **STREAMLINING PLANNING PROCEDURES**

Over the last few years councils have applied soil and water management planning conditions to new development applications to varying extents. Some councils have conditioned most developments, whilst others conditioned very few. The specific wording of the planning conditions also varied significantly between councils, making it difficult for developers when undertaking projects in different municipalities. Over the last twelve months the DEP has worked with councils in an effort to review their standard conditions and adopt a more uniform approach across the region. This approach has been adopted by councils, with most now applying a standard condition to the majority of new developments, requiring the submission of a Soil and Water Management Plan (SWMP) prior to building work commencing. An example of the standard planning condition which has been developed to assist councils is provided below:

**Standard Condition:** *Prior to the issue of a building permit or the commencement of works, a drawn Soil and Water Management Plan detailing proposed sediment and erosion control measures must be submitted to Council to the satisfaction of the Council's Development Engineer. The approved control measures must be installed prior to any disturbance of soil or vegetation, be regularly inspected and maintained during the construction/demolition period, and remain in place until such time as all disturbed areas have been stabilised, restored or sealed to the satisfaction of the Council. The submitted SWMP will form part of the building permit for this development.*

**Advice:** *For guidance on preparing the Soil and Water Management Plan, the Derwent Estuary Program has published Soil and Water Management on Building and Construction Sites fact sheets (2009).*



**Reason for Condition:** *To avoid the pollution and sedimentation of roads, drains and natural watercourses that could be caused by erosion and runoff from the development, and to comply with relevant State legislation.*

A SWMP is a site drawing which identifies control measures that will be implemented during the construction phase of a development to prevent sediment loss from the site. If enforced robustly on-site, SWMPs are a very effective, preventative approach to managing sediment issues on construction sites. In most instances the SWMP becomes a part of the building permit for the development, which can then be enforced by council building compliance staff under *the Tasmanian Building Act 2000*. This preventative approach works well as sediment controls can be enforced as soon as building work commences, rather than having to wait to enforce until after an issue occurs.

## **BUILDING REGULATION AMENDMENTS**

In Tasmania, a significant number of building developments are ‘permitted as of right’ provided they meet the requirements of the local council’s planning scheme. This effectively means that council cannot request a SWMP prior to building work commencing for these developments. The Derwent Estuary Program has worked with the Tasmanian Government, building industry representatives and local councils to draft amendments to the *Building Regulations 2004* which will effectively see SWMPs required for all new building developments. This will capture a significant number of developments which would not have been conditioned for soil and water management previously. The amendments will also simplify the conditioning process by utilising a single Council department only (building), rather than both building and planning departments as occurred previously.

The DEP will also be having input into major planning reforms which are currently occurring in Tasmania. It is likely that new schedules will be adopted which will also require SWMPs up-front with all new developments that come through council planning departments. This will tie in well with the proposed building amendments discussed above, as any SWMP approved at the planning stage could simply be re-submitted with the developer’s building application. These changes to building and planning legislation will help ensure that all applicable developments are conditioned for SWMPs allowing proactive enforcement of sediment and erosion controls on the majority of building and subdivision sites.

## **COUNCIL IN-HOUSE TRAINING**

Several training initiatives have been rolled out over the last eighteen months to help councils with enforcement of soil and water management on construction sites. There are staff within several different departments that directly influence council’s ability to effectively enforce soil and water management on construction sites. Planning staff are currently responsible for ensuring SWMPs are conditioned and received prior to building work commencing; engineers are responsible for ensuring that submitted SWMPs are adequately designed; and building compliance staff are responsible for ensuring that SWMPs are implemented on site. An in-house training program has been developed for these staff members and has been delivered to one of the Councils so far, with the rest to be delivered in the near future. The program is designed to be short, focussing on practical, critical

elements that have been learned from the field, in order to maximise attendance and impact for the council staff involved.

Building compliance staff arguably have the most important role in ensuring that soil and water management practices are up to speed. It is critical that building compliance staff are aware of the issues and the practical solutions available to builders. Therefore building compliance staff have been provided with additional training and advice in the form of on-site inspections with the Sediment & Erosion Control Officer. Whilst not all councils have been able to dedicate time to coordinate a regular site inspection regime, regular contact is maintained with all councils to ensure that soil and water management remains a high priority for compliance staff. Two councils are currently committing to regular site inspections, with another two looking to implement a regular site inspection regime with the DEP in the near future.

The DEP has also recently conducted a second round of training with works crews within council depots. These staff are regularly involved in civil projects that have the potential to cause sedimentation issues directly. Historic practices included stockpiling sand and gravel in gutters and wet-cutting concrete and bitumen with no protection of stormwater infrastructure. The DEP recently provided works crews with about 40 re-usable filter socks each, and provided training on how to use them effectively during their work projects.

The DEP also holds regular stormwater taskforce meetings with representatives from each of the six councils bordering the Derwent estuary. Best practice sediment and erosion control techniques are discussed at the meetings and current sediment and erosion control issues are compared between municipalities.

## **ENGAGEMENT WITH A BUILDING INDUSTRY**

As part of the role of the Sediment & Erosion Control Officer, improved soil and water management practices have also been promoted directly with the building industry. This has mainly taken the form of informal advice provided during regular site inspections which occur twice-weekly throughout the greater Hobart region. In many circumstances builders are willing to listen and address issues that are identified on-site. In situations where builders are not willing to listen to advice, enforcement has been necessary and council compliance staff have been able to help.

Advice has also been provided to other professionals in the building industry including project managers and engineers. These professionals are often involved in planning projects and drafting soil and water management plans. The DEP has been able to offer advice on how to best incorporate sediment controls in order to minimise any impacts on the productivity of the site and maximise the effectiveness of the controls. Soil and water management has also been promoted through presentations to the stormwater sector, an information booth at the Tasmanian Home Expo, promotional materials and through building industry publications, including the HIA's Tasmanian e-bulletin.

The DEP has also been organising formal training for the building sector. This training is an accredited course, endorsed by Workplace Standards Tasmania, the authority that administers laws that regulate business in Tasmania. This includes the Building Practitioner Accreditation Scheme where under the *Tasmanian Building Act 2000* building practitioners have taken professional development which is referred as continuing professional development (CPD). Builders are required to complete 12 points (or 12 hours) to retain their accreditation each year. The DEP sediment and erosion course is worth 3 points. The initial training course in February 2012 had over one hundred people attend, with the CPD points a definite incentive for builders to attend. Similar courses are planned for members of building industry organisations including HIA and MBA. These courses will be complimented by a practical on-site training demonstration to be held at a later date.

## CONCLUSION

In Southern Tasmania sediment pollution from building and construction activities is a problem and seldom receives the attention it deserves. To address this issue needs local government to have an effective soil and water management program in place. The critical elements for such a program include a suitable policy framework, planning conditions, education, training and enforcement.

While there was existing an policy and regulatory framework to facilitate effective soil and water management in Southern Tasmania, awareness and understanding of such standards needed to be improve. Soil and water management education, training and enforcement also required significant improvement amongst southern councils.

The Derwent Estuary Program's regional Sediment and Erosion Control Project has improved soil and water management education through the *Soil and Water Management for Building and Construction Sites* (2009) field guide, sediment control kits, employment of a dedicated sediment and erosion control officer, training for council and the building industry. It is an effective model that could be used by other states and councils in Australia to address the issues of sediment and erosion from building sites.

## REFERENCES

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