

SOUTHERN RIVER SEDIMENT AND EROSION PROJECT

Report

Prepared for the Swan River Trust
By Essential Environmental Services

March 2010



Essential Environmental Services

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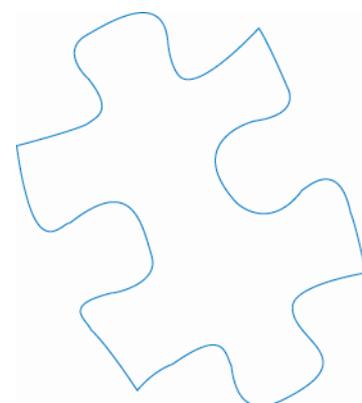
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EXECUTIVE SUMMARY

The process of land development is being increasingly recognised as having significant potential to increase sediment loads to waterways, impacting on aquatic ecosystems and diminishing water quality. Loss of sediments from development sites also has the potential to impact on newly constructed water sensitive urban design treatments, decreasing their effectiveness and increasing maintenance requirements. Although the release of sediment is not generally an ongoing episode, work undertaken in Queensland has estimated that approximately 90% of the sediment that leaves an urban settlement in the first 20 years of its life does so during the construction phase (CEOs Committee for Natural Resource Management in SEQ, 2009).

The planning and development approvals process in Western Australia acknowledges the need to adequately manage and control wind and/or water-borne sediment (dust and sand) from construction activities associated with development. Action is required at several stages including site clearing, bulk earthworks and construction of infrastructure as well as construction of the building/dwelling.

There are statutory mechanisms available at each of these stages to control and manage erosion and sedimentation including scheme provisions, conditions of subdivision and development, building licence requirements and local laws. Current practice and enforcement of these mechanisms is not considered to be achieving the necessary levels of performance, however. This can be attributed to the need for:

- improved understanding of the environmental impact of erosion and sediment on waterways;
- justification of the need for changes in practice by determining more specifically the cause and magnitude of the issue as a result of new development;
- a common understanding regarding the level of performance required for effective erosion and sediment control at each stage of the process;
- consistent enforcement of the existing policy and regulatory requirements; and
- education and capacity building including performance monitoring and feedback

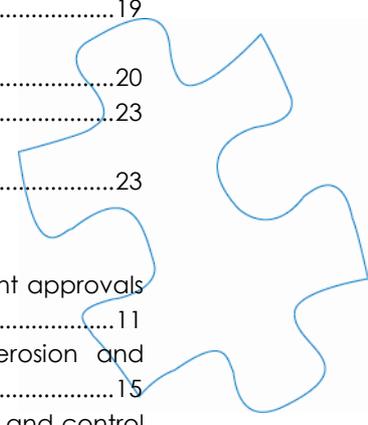
In order to improve the control and management of erosion and sediment from development in Southern River, the following actions are recommended:

- Identify the major source of sediment to the Southern River and its waterways and focus actions towards improving those particular practices;
- Develop example dust management and erosion and sediment control plans for key risk factors (which need to be differentiated) and provide clear guidance about what mechanisms are required at each stage and what level of performance is required to facilitate clearance of the conditions;
- Develop better information for builders which outlines simple, cost effective measures which can be put in place across development sites in the Southern River catchment and actively inform builders of the requirements as part of a pro-active enforcement of the Environment, Animals and Nuisance Local Law; and
- Participate in the Department of Planning's consultation process for model subdivision conditions to improve the wording of the recommended erosion control condition to address the timing issue and to include a standard condition for dust management.



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1 INTRODUCTION

The Swan River Trust (the Trust), through its development of the Local Water Quality Improvement Plan: Southern River Catchment (SRT, 2009), has identified the need to reduce nutrient impact through better management of erosion and sedimentation. Although there is no data to quantify the sediment load or to clarify its source, the Trust believes that a large proportion of the load is contributed from development and building activities, such as from the transport of top soil, fill and building materials by stormwater and wastewater.

A preliminary review undertaken by the Swan River Trust revealed that although erosion and sediment control is well recognised as an issue in existing statutory mechanisms and policy frameworks in Western Australia, there are clear opportunities to improve implementation of existing mechanisms and policies. Accordingly, this project aims to investigate existing planning, statutory and policy mechanisms for controlling and enforcing the management of erosion and sedimentation from subdivisional works, residential dwelling construction and public works, with a view to improving the management of erosion and the control of sediment from development activities. Due to the linkage with the Southern River Local Water Quality Improvement Plan, this project provides recommendations specific to the Cities of Armadale and Gosnells.

2 REGULATORY FRAMEWORK IN WA

As noted by the Swan River Trust, there are a number of existing policy and regulatory mechanisms in Western Australia which provide guidance for the management of erosion and control of sediment from development.

2.1 Policy instruments and guidelines

Policies which are relevant to the control and management of erosion and sediment from planning and development activities are:

- *State Planning Policy 2: Environment and Natural Resources (2003)* – Although there are no specific policy provisions regarding erosion and sediment control, the policy text in section 5.4 recognises that "...wind and water erosion...are particular issues requiring attention."
- *State Planning Policy 2.9: Water Resources (2006)* – contains general measure 5.1(ii) "aim to prevent or, where appropriate, ameliorate...increased erosion, sedimentation and turbidity, particularly at the construction phase of development";
- *State Planning Policy 2.10: Swan-Canning River System (2006)* – contains measure 7.2.2 – "Proposed land use changes should be managed to minimise sediment transport..."
- *City of Armadale Local Planning Policy 2.5: Erosion and Sediment Control* - provides guidance regarding the position of the City of Armadale with regards to sediment and erosion control as part of the planning process and includes an erosion site assessment worksheet.

Other relevant references include:

- *Land development sites and impacts on air quality: A guideline for the prevention of dust and smoke pollution from land development sites in Western Australia*, Department of Environmental Protection, Perth, Western Australia, November 1996. The principal aims of the document are:



- to clearly define the roles and responsibilities of developers, engineers, contractors, local government and the Department of Environment and Conservation in the control of dust and smoke from land development sites;
- to provide a procedure whereby the potential of a development site to cause pollution is assessed before site works start; and
- to put in place measures and contingency arrangements to minimise dust leaving the site during and after development, and to ensure that the potential impacts of smoke from land development sites are recognised and minimised.

The guidelines are also aimed at providing a course of action to be taken by the developer, local government and the Department of Environment and Conservation when complaints related to development site activities are received.

- *Guidance Statement Number 18: Prevention of Air Quality Impacts from Land Development Sites* (EPA, 2000) outlines the minimum requirements for environmental management which the Environmental Protection Authority (EPA) would expect to be met when the EPA considers a proposal during the assessment process. The EPA guidance states that cleared areas on land development sites must be stabilised following vegetation clearance. The statement contains measures for the control of dust and smoke and recommends the implementation of an environmental management system.
- *Draft - A guideline for the development and implementation of a dust management program* (Department of Environment and Conservation, May 2008). Consultation on the draft document has been completed and the document is being finalised. This guideline provides an updated and expanded document for the management and monitoring of dust and other air pollutants and applies to all projects in Western Australia with the potential to generate significant levels of dust from diffuse sources. It aims to provide practical advice for the development and documentation of management strategies, plans and programs aimed at controlling impacts of dust.
- *Better Urban Water Management* (WAPC, 2008) recognises the importance of sediment and erosion control and management at both subdivision (largely via recommendations contained within urban water management plans), and development.
- *Local Government Guidelines for Subdivisional Development, Edition 2* (2009) produced by the Institute of Public Works Engineering Australia includes recommendations regarding the management of dust and sediment (Section 1.15):

Details of dust and sand drift control measures to be adopted during the construction of the subdivision shall be included in the specification and shown on drawings. The measures are to be in accordance with "A Guideline for the Prevention of Dust and Smoke Pollution from Land Development Sites in Western Australia" (Department of Environmental Protection (now DEC), November 1996).

In those locations where climatic conditions are such that wind borne dust and sand drift may cause significant problems the responsible local government may require a Dust Control and Sand Drift Bond to be lodged as a condition of approval of the engineering drawings.



And Section 2.2.1.5.4 Soil Stabilisation Strategy

Prior to the commencement of any works on a development site involving the movement of soil and/or sand, the developer shall submit a site classification and assessment and soil stabilisation strategy in accordance with "A Guideline for the Prevention of Dust and Smoke Pollution from Land Development Sites in Western Australia" (Department of Environment and Conservation, 1996). Consideration shall also be given to DEC's publication: "Land development sites and impacts on air quality".

The stabilisation of topsoil, sand or other material or matter subject to movement over or near the subdivision shall generally be carried out in accordance with the above recommendations and/or requirements of the above documents".

- *Stormwater Management Manual for Western Australia: Chapter 7: Non-structural controls (Department of Water 2004 – 2007) – includes best management practices for land development and construction sites as well as maintenance practices to minimise the pollution of stormwater, whilst maximising the performance of the stormwater drainage system.*
- *Erosion and Sediment Control Guidelines for Local Government (Eastern Metropolitan Regional Council, 2008). The guidelines review best practice in Eastern and Western Australia. They contain a model local planning policy and provide recommendations for best management practice in erosion and sedimentation control, based on an assessment of local soil and rainfall conditions.*
- *Guidelines for Erosion & Sediment Control at Building Sites in the South West of WA (Centre of Excellence in Natural Resources Management UWA, 2008) developed by the Leschenault Catchment Council together with the Shires of Capel, Harvey and Augusta-Margaret River and the Water Campaign. It is based substantially on the "Controlling stormwater pollution on your building site" guideline developed by the Healthy Waterways program in Queensland.*

2.2 Statutory mechanisms

There are several existing statutory mechanisms in Western Australia which are applicable to the management and control of erosion and sediment from development (and planning) activities. These are:

- Planning scheme provisions;
- Conditions of subdivision;
- Conditions of development;
- Building licence requirements;
- Local law provisions;
- Environmental Protection (Unauthorised Discharge) Regulations; and
- River Protection Notices.

2.2.1 Planning scheme provisions

The opportunity exists to require the management and control of erosion and sediment during development via a provision in a local planning scheme. For example, Part 5 (general development requirements) of the City of Armadale's scheme includes the following provision:

Management of construction sites.



In addition to any requirements which may be imposed as conditions of development, construction sites are to be managed so as to minimise soil erosion or the degradation of any water resource due to the action of wind or water and protect as far as practicable, the natural resource values of the site and of the adjacent area.

This provision is supported by a Note as follows:

Note: Where a construction site is, in the opinion of the City, being managed in such a way as to cause undue erosion of soil or the pollution of any water resource, the City may, in accordance with the provisions of clause 11.4, require the owner to take steps to prevent any further erosion or pollution and remediate the site. Such action may include stabilisation of soil or re-instatement of vegetation cover and repair of any damage to the land or water resources.

A proponent (or contractor) must comply with the provisions of Scheme or with any notice issued under the Scheme, as stipulated in clause 11.4 of the City of Armadale Scheme.

11.4.1 A person must not —

- (a) contravene or fail to comply with the provisions of the Scheme or with a notice issued under the Scheme;
- (b) use any land or commence or continue to carry out any development within the Scheme area —
 - (i) otherwise than in accordance with the Scheme;
 - (ii) unless all approvals required by the Scheme have been granted and issued;
 - (iii) otherwise than in accordance with any conditions imposed upon the grant and the issue of any approval required by the Scheme; and
 - (iv) otherwise than in accordance with any standards laid down and any requirements prescribed by the Scheme or determined by the City under the Scheme with respect to that building or that use.

Note:

Section 218 of the Planning and Development Act 2005 provides that a person who -

- a) contravenes the provisions of the planning scheme;*
- b) commences, continues or carries out any development in any part of a region the subject of a region planning scheme or any part of an area the subject of a local planning scheme otherwise than in accordance with the provisions of the planning scheme; or*
- c) commences, continues or carries out any such development which is required to comply with a planning scheme otherwise than in accordance with any condition imposed under this Act or the scheme with respect to the development, or otherwise fails to comply with any such condition,*

and Section 214 (7) of the Planning and Development Act 2005 provides that a person who -

- a) fails to comply with a direction relating to development in contravention of the Scheme; or*
- b) fails to comply with a direction requiring the restoration of a site,*
 - a) commits an offence,*

Penalty: \$50 000 and a daily penalty of \$5 000.

Although this provision exists within the scheme, it has yet to be used by the City for the management of erosion or sediment.



2.2.2 Condition of subdivision

A condition of subdivision outlines the requirements considered necessary by the Western Australian Planning Commission (WAPC) to be completed by the landowner as part of or prior to subdivisional works. A condition of subdivision needs to be "cleared" or approved prior to the issuing of land titles by the WAPC.

Conditions of subdivision allow the management and control of erosion and sediment as part of bulk earthworks, construction of roads and installation of infrastructure.

The WAPC generally places the following condition on a subdivision approval:

Land being graded and stabilised at subdivider's cost to the satisfaction of the WAPC (LG).

This condition allows the local government to advise the developer of the requirements which will enable its clearance by the local government. In the City of Gosnells, an advice note is sometimes requested to be included as follows:

- SA1.2 Dust Control – DEC requirements
The applicant is advised that the Department of Environment and Conservation has prepared dust control guidelines for development sites, which inter alia, outline the procedures for the preparation of Dust Management Plans for development sites;
- SA1.3 Dust Control – Managing Nuisance
Prevention of wind blown dust causing a nuisance to adjoining land owners by the installation of sprinklers, utilisation of water tankers, mulching, or by the adoption and implementation of any other suitable land management system in accordance with Department of Environment and Conservation "Dust Control Guidelines"; or
- SA1.4 Dust Control - Measures
Specification for mulching or other dust control measures are to be provided with construction drawings for approval of the City's Infrastructure Directorate.

Where the local government believes additional guidance is required or that the management and control of erosion is likely to be a significant issue, they may recommend an additional or replacement condition. The City of Armadale Local Planning Policy refers to the following condition and advice note:

No work shall commence until construction and soil stabilisation plans have been lodged with and approved by the Local Government to the satisfaction of the WAPC. The work is to be undertaken in accordance with the approved plans (LG).

Advice to applicant - 1. With regard to Condition 1 the Local Government has indicated soil stabilisation plans should be prepared utilising the Erosion and Sedimentation Control Manual for the Darling Range, Perth WA published by Agriculture WA and the Upper Canning Southern Wungong Catchment Team that is available at no charge from the LG. The plans to include measures for the continuous stabilization of earthworks during and after construction period to ensure all soils will be retained within the bounds of the subject land.

2. Where Condition 1 applies, the LG's advice to the Commission regarding fulfilment of the condition will have regard to whether the procedure has been followed by the developer: (a) An erosion Risk Assessment has been carried out for areas to be disturbed by subdivisional works using the Work Sheet reproduced as Attachment 1 to this policy; (b) The soil stabilisation plan has been prepared consistent with the development approaches identified in Table 3 of the Work Sheet reproduced as Attachment 1 to this



policy; and (c) Erosion and sedimentation control measures described in Section 5.2 of the Erosion and Sedimentation Control Manual for the Darling Range, Perth WA have been considered and applied where appropriate and practical.

2.2.3 Condition of development

Where a development application is required, a condition or requirement may also be placed on any approval. This condition is stipulated by the local government.

City of Armadale Local Planning Policy 2.5 contains the following standard condition:

All soil shall be retained on site and appropriate measures implemented to prevent soil erosion by wind and rain during and after development.

However this tends to be altered to suit the circumstances, for example "Submission and implementation of an Erosion and Sedimentation Control Management Plan detailing all soil being contained on site and out of water courses and appropriate measures implemented to prevent soil erosion by wind and rain during and after development to the satisfaction of the Executive Director Development Services."

A footnote may also accompany the condition as follows:

In relation to Condition 1 above, an advice note (a copy of Section 5.3 of the Erosion and Sedimentation Control Manual for the Darling Range, Perth WA or associated Info Sheet) is available from the City of Armadale describing measures that should be taken to retain soil on-site. Applicants are advised of the need to comply with the City's Local Laws in particular the City of Armadale Environment, Animals and Nuisance Local Laws 2002.

The construction of a single house generally does not require Development Approval, however, except where a Detailed Area Plan exists.

2.2.4 Building licence requirements

A building licence is required to construct the premises. Generally the building licence defers to the Building Code of Australia (BCA) which is ineffective in controlling sediment and dust as it contains no specific requirements for erosion/sediment/dust management; however, some local governments will enforce additional licence requirements in some instances.

The City of Armadale's Health Services require a Dust Management Plan to be submitted for assessment and approval prior to the issue of a Building Licence for any of the following works associated with construction:

- (i) construction of industrial, commercial or multiple-unit residential developments;
- (ii) properties where the land area is equal to or greater than 2,000m²; and
- (iii) the proposed development is close to an existing urban area; and
- (iv) in instances where earthworks, land clearing or other site work is likely to generate dust in adverse conditions.

The standard condition reads: "The developer shall submit to the City prior to the commencement of any site works a dust management plan and the dust management plan shall be implemented to the satisfaction of the Executive Director Technical Services."



An alternate condition (applied by the City of Wanneroo) is:

The Builder is to ensure that dust from the site is kept to a minimum, especially during site works.

Section 377 of the *Local Government (Miscellaneous Provisions) Act 1960* requires that during building operations, streets, footpaths and public places (which includes a Right of Way) are to be maintained clear of obstructions and building materials. If any of these facilities are disturbed or damaged, it is the responsibility of the owner/builder to reinstate them to their original condition.

2.2.5 Local law provisions

Local government may make local laws under the provisions of the *Local Government Act 1995*. Local laws are subordinate powers/restrictions which individual local governments adopt to suit their requirements. Local laws vary considerably across local governments, however. Some have a local law which may be enacted for the management and control of erosion and sediment.

Local Laws may stipulate that contravention of a provision of the local law is an offence, and may provide for the offence to be punishable on conviction by a penalty not exceeding a fine of \$5 000.

Both the City of Armadale and Gosnells have local laws relevant to the control and management of sediment or dust. City of Armadale Local Law: *Environment, Animals and Nuisance Local Laws 2002* – stipulates that it is an offence to commence any works without an approved Dust Management Plan. The owner/occupier (including builders) will be responsible and may be liable to be issued with an infringement notice with a modified penalty of up to \$500.

The City of Gosnells has a newly gazetted local law: *Animals, Environment and Nuisance Local Law 2009*. Part 3 – Building, development and land care, Division 2: Prevention of Dust and Liquid Waste contains the following provision:

21. Containment of Dust and Liquid Waste

An owner or occupier of land must take effective measures to

- (a) stabilise dust on the land;
- (b) contain all liquid waste on the land; and
- (c) ensure no dust or liquid waste is released or escapes from the land whether by means of wind, water or any other cause so as to cause a nuisance.

Enforcement of local laws requires an enforcement officer to be on site and witness the infringement. Depending on the provisions of the local law, a notice may be issued requiring the builder to comply with the local law. This may or may not include an infringement (penalty). The funds raised from the infringements are collected by the local government. However, should the infringement be challenged by the builder, the action will require prosecution by the local government to record a conviction.

2.2.6 Environmental Protection (Unauthorised Discharge) Regulations

Under the *Environmental Protection (Unauthorised Discharges) Regulations 2004*, a person who, in the course of or in connection with a business or a commercial activity, causes or allows a material listed in Schedule 1 to be discharged into the environment commits an offence, with a penalty of up to \$5000. Sediment is listed in Schedule 1.



Enforcement of the *Environmental Protection (Unauthorised Discharges) Regulations 2004* is able to be carried out by local government officers who are authorised under the *Environmental Protection Act (1986)*. All fines issued are collected by the local government.

2.2.7 River Protection Notices

As indicated by the Swan River Trust, Part 6 of the *Swan and Canning Rivers Management Act 2006* allows the issuing of a river protection notice to protect or enhance the ecological and community benefits and amenity of the Riverpark. A river protection notice, which may include a penalty of up to \$50,000, can apply to both land owners and/or occupiers on land in the catchment area. However, as identified by the Trust, as the issuing of river protection notices is currently untested and provides 42 days for the party to respond to it, this tool is unlikely to be effective in the control of sediment and erosion from development.

3 EROSION AND SEDIMENT CONTROL ACROSS AUSTRALIA

Substantial work has been undertaken by various agencies across Australia to determine the most effective way to control sediment and erosion from development. Due to the climate and hydrogeology of these areas, much of this work focuses on the improved management of stormwater, as this is seen as the predominant contributing source of sediment in waterways. Limited effort has focussed on the control wind-borne erosion, as the key issue cited by officers is the control of mud on roads.

The Victorian Stormwater Action Fund provided a significant opportunity to review the issue of building site practices and the impact that this had on the quality of water in receiving waterways. A number of research projects were undertaken to identify the most effective methods to improve the management and control of erosion and sediment from building works. This included a review of the legislative and regulatory tools to identify opportunities to strengthen requirements.

The projects identified available legislation such as the Victorian *Environmental Protection Act* and local laws. A substantial project involving 6 local governments in the south east of Melbourne tested the effectiveness of education combined with enforcement of local laws. The project found that an "information and education program alone is ineffective in bringing about improvements in building-site practices" and that "municipalities need to implement sustained enforcement programs with substantial penalties" (City of Kingston et al, 2003).

The project developed a number of tools which were designed to improve building site practices. These included:

- Keeping our Stormwater Clean – A Guide for Building Sites - This is a set of practical guidelines for builders. The information is extensively illustrated and provides examples of strategies to control litter and sediment on building sites.
- A Sample Local Law and Code of Practice - This is an example of a Local Law that can be adopted by municipal Councils or modified and incorporated into existing local laws.
- Audit Guidelines for Building Sites - The guidelines include a checklist and photographic standards to be used for assessment of building sites.
- Enforcement Guidelines for Local Laws Officers - Instructions for Local Laws officers and photographic standards.
- Promotional Brochure - A brief publication that answers key questions about local government regulation of building-site practices and promotes the adoption of the Guidelines developed by this project.



Although substantial work was done to support the study and implement its findings, recent evidence suggests that the standard of building site management is less than acceptable, with many owner/builder sites not employing any form of erosion or sediment control (pers comm Karen Crowther, Stormwater Protection Officer, City of Kingston; Glen Banks-Smith, Local Law Enforcement, City of Casey).

The magnitude of the infringement (around \$1000 for a first offence) acts as a deterrence; however, this requires a level of awareness by the builder regarding their responsibilities under the local law. The effectiveness of the law in reducing the amount of sediment to waterways is also questioned as infringements can only be issued when the sediment has left the site, which then requires "clean up", rather than focussing on preventative measures.

Although a "model" local law and code of practice was developed, this has been modified by individual local governments resulting in different requirements across the city. This results in a lack of clarity for builders regarding the standard of practice required, for example, some local councils require site fences and some don't. Additionally, as sediment is considered to be litter under the Environment Protection Act, some local governments are moving away from use of the local law towards the use of State Government laws, as they are considered to be easier to police and in some instances, the fines are greater.

Practices in local governments which are bayside are also considered to be generally of a higher standard than those which are not as visually connected to the Bay. It is felt that the larger builders are aware of the need to control sediment and erosion but it seems to be managed as more of a "health and safety" issue rather than as an environmental issue.

Similarly to Victoria and New South Wales (which has undertaken similar work to Victoria), programs in Queensland have also identified a range of policy, regulatory and education measures to improve the control of erosion and sediment from development. The issue is controlled via the issuing of infringements under the Queensland environmental protection act and the use of scheme provisions and conditions on development approvals. One difference of note is the ability to apply the provisions of the Environmental Protection Act where it is likely that an action will result in environmental harm, such as a badly managed site with sand piled in the verge which is likely to escape onto the road if it rained, rather than having to wait for the offence to be committed.

Although it is considered that practices are generally poor in Queensland, the effectiveness of each mechanism is variable across local governments (pers comm Alan Hoban, Program Manager, Water by Design). This is largely dependent on the level of enforcement and support provided for each of the types of mechanisms. A Discussion Paper submitted by the Urban Stormwater Management Working Group to the CEOs Committee for NRM in South East Queensland in July 2009 reported that "land development erosion and sediment control outcomes... are often poor during construction because of failures through the planning process". It also identified the lack of a clearly articulated policy and process link between water quality objectives, planning mechanisms, and the technologies used to reduce environmental impacts during the construction phase of land development.

The issue has reached political prominence in Queensland as it has been estimated that rapid urban development in South East Queensland will cause a 60 percent increase in sediment loads to waterways within the next 15 years if a business as usual approach is maintained. The Urban Stormwater Management Working Group has recommended the development of a statewide program for the control and management of erosion and sediment from development. The proposed joint Partnership Compliance Program would involve local and state government working collaboratively to ensure improved waterway health outcomes, and promote a shared



understanding of the requisite minimum standards and a "level playing field" for monitoring and compliance enforcement in South East Queensland.

Some of the tools currently available around Australia are contained in Appendix 1.

4 EFFECTIVENESS OF THE TOOLS

In undertaking a review of the statutory mechanisms which can be used by the planning and development approvals process, advice was sought from several key stakeholders in both State and Local Government. This information has been used to inform the following discussion regarding the effectiveness of the available tools. All opinions were provided as "officer-level" comment only. The consultant did not obtain the formal position of any agency regarding these mechanisms.

4.1 Planning and development

There are a number of statutory tools available as part of the planning and development approvals system in WA. These include scheme provisions, conditions of subdivision and development (planning approvals) and building licences (building approvals). They are effective in that they require action in order to obtain a clearance of the condition or to move to the next stage of development. However it is the effectiveness of the action which needs to be considered. These issues are briefly summarised in Table 1 and discussed further below.

4.1.1 Planning scheme provisions

The planning scheme provision in the City of Armadale scheme applies to the management of construction sites. Although it provides the opportunity to require a landowner to improve the management of their site, it is unlikely that landowners are aware of the provision in the scheme and therefore it is unlikely to be effective in a preventative way. It does allow the City to request action to prevent further erosion via the issuing of a notice and provides the opportunity to prosecute a landowner where they do not comply with the requirements of the Scheme and/or notice.

The prosecution of the landowner for non-compliance with the scheme for a lack of adequate management of dust or erosion and sediment from development is currently untested. It requires prosecution of the responsible party for breach of the *Planning and Development Act*. This is a lengthy and expensive process and is unlikely to be used except where there is a significant breach to achieve a clean up. As other tools are likely to achieve better outcomes more easily, the use of scheme provisions to improve the management of dust and/or sediment and erosion from development is not recommended to be a focus of phase 2 of this project.

4.1.2 Subdivision conditions

Unless the condition of subdivision (or the advice note) refers directly to the need for a dust management plan and/or an erosion and sediment control plan, it is unlikely that specific measures will be implemented to control sediment and/or dust at the subdivision stage. Even when the condition requires the preparation and implementation of these plans, there is a lack of awareness regarding their effectiveness or even whether the plans are being required to clear the conditions. Anecdotal evidence suggests that particular officers are more stringent than others in requiring and policing plans.



Table 1: Effectiveness of statutory mechanisms in the planning and development approvals process

Mechanism	When it can be applied	Effectiveness	Issues	Responsibility
Scheme provision	Any activity associated with development	Won't change behaviour on the large scale. Likely to be effective only after a significant breach	Not a preventative measure Requires prosecution and is currently untried	Implementation – developer Enforcement – LG planning department
Condition of subdivision	For management during clearing and stabilising of land, and construction of roads and infrastructure. Advice note generally requires preparation of a Dust Management Plan and/or a Sediment and Erosion Control Plan	Controls erosion from whole estate (subdivision). Difficult to control dust during site clearing (water tanks have other sustainability issues). Erosion may still occur where limited LG monitoring/ policing. LG can "withhold" clearance of the condition which delays release of titles.	Management plans must contain adequate measures. May be incorporated into UWMP requirements Requires effective monitoring to ensure ongoing compliance with management plans.	Implementation – developer Enforcement – LG planning department
Condition of development	Where a development application is required	Effective only at the lot level i.e, individual builders. Construction of a single house generally does not require a DA unless in a DAP area	Management plans must contain adequate measures. Requires effective monitoring to ensure ongoing compliance with management plans.	Implementation – developer Enforcement – LG planning department
Building licence	Required to construct the premises. Can require several licences to construct different aspects such as the house pad if desired.	Effective at lot level (individual builders). Requires the LG to request measures additional to BCA requirements.	Requires clear guidance on measures which are required, as well as policing and enforcement to be effective. Lack of support within building industry regarding the additional cost.	Implementation – owner/builder Enforcement – LG building department
Enforcement of local law	At time of infringement (i.e. when sediment or water leaves the site)	Depends on amount of fine/infringement and if a notice is required to be issued first. Is reactive rather than preventative.	Requires policing and willingness to prosecute. Local Laws vary considerably across LGs	Implementation – developer Enforcement – LG EHO/ compliance officer
Enforcement of Unauthorised Discharge Regs	At time of infringement. Fines/revenue (\$) go to the LG	Only applicable where sediment comes from commercial activities. This does not include owner/builders	Untested and the onus of proof is considerable. Requires policing and support from DEC	Implementation – developer Enforcement – LG EHO authorised under EPAct
Education of builders	<ul style="list-style-type: none"> o Guidelines/pamphlets o Information sessions at LG o Site visits o Large building companies and associations o Industry newsletters o Local papers o Presentations 	Education alone is unlikely to change building site practices. Need adequate staff resources to police building sites and a willingness to prosecute	Must be simple, practical, easily achievable and cost effective. Should be broken down into different stages of development (different responsibilities) and based on risk factors.	N/A

Although there are guidelines that are available to aid in the preparation of dust management plans and erosion and sediment control plans, these guidelines are quite lengthy documents and require specialist knowledge to develop appropriate documentation. The City of Armadale has sufficient, easily available advice regarding the management of dust and sediment/erosion (Dust control guidelines for building and construction site management, local planning policy 2.5 and reference to the EMRC erosion and sediment control guidelines). The City of Gosnells has limited information on its website regarding the management of dust and/or sediment and erosion, however.

The wording of the condition is an important consideration in its effectiveness. The Department of Planning is currently undertaking a review of its standard model conditions of subdivision. The *Model Subdivision Conditions Schedule Review Consultation Paper* (WAPC, 2010a) and *Model Subdivision Conditions Schedule Version 10* (WAPC, 2010b) for comment contains a new model condition, in addition to the standard "land being graded and stabilised" condition as follows:

A management plan detailing how risk of erosion and sedimentation impacts will be minimised during subdivision works is to be prepared and implemented prior to the commencement of subdivision works. (Local Government)

This is similar to the condition already recommended and applied in the City of Armadale. The inclusion of the need for a management plan in the condition is supported, as this will ensure that a management plan is actually lodged for clearance, but it does not ensure that no sediment will actually leave the site – it only aims to "minimise" impacts. It may therefore be necessary to stipulate a minimum acceptable standard, such as "installation of an appropriate sediment control fence" rather than just leaving it all up to the management plan. The determination of the "minimum acceptable standard" would need to be undertaken in consultation with stakeholders and industry.

It should be noted that this approach (requiring a management plan) is not consistent with the approach now supported by the Environmental Protection Agency, which is moving towards performance based conditions rather than prescriptive conditions. It may therefore be more effective to propose a condition which states the desired outcome and allows the proponent to then decide how best to achieve the outcome. For example, the condition could be phrased similarly to the recommended condition of development:

All soil to be retained on site and appropriate measures implemented to prevent soil erosion by wind or water, including rainfall, during and after site works.

The advice note could then recommend preparation of dust management and erosion and sediment control plans, which would be approved by the local government. The management plan(s) would need to demonstrate how all soil would be retained on site and include an ongoing program of action which responded to changes in climate (winds) and included maintenance measures where necessary such as fences and hydromulch.

The timing indicated in the draft WAPC condition is also problematic. The condition requires the plan to be "prepared and implemented prior to the commencement of subdivision works". This is fine for the preparation of the plan, but it must be implemented as part of or during subdivision works. The developer is likely to request clearance of this condition too early, and so the local government may be seen to be holding up clearance by waiting until the subdivision works and therefore soil stabilisation works are completed.

It is also noted that the discussion paper does not include a standard condition requiring the preparation of a dust control management plan, even though this is referred to in the IPWEA Subdivisional Guidelines (see section 2.1).

4.1.3 *Development conditions*

Conditions of development are effective only where a development application is required. In the Cities of Armadale and Gosnells, a development application is generally not required for construction of a single dwelling, except where a detailed area plan exists.

Where applicable, the recommended development condition in the City of Armadale requires "all soil shall be retained on site and appropriate measures implemented to prevent soil erosion by wind and rain during and after development." As stated above, this allows the developer to determine the most appropriate way for them to achieve the desired outcome, but doesn't actually require the preparation of management plans unless supported by an appropriate advice note. The footnote to this condition explains that "an advice note is available from the City of Armadale describing measures that should be taken to retain soil on-site." This advice is readily available on the City's website.

4.1.4 *Building licence*

A building licence is required to construct the premises. The local government may decide to separate the building process into more than one part and so may require a separate licence to construct the building pad in areas of high erosion potential. It should be noted that most building licences require compliance with the BCA. Although the management of erosion and sediment control is outside the current BCA, the City of Armadale imposes a dust management condition in some instances.

Similarly to subdivision and development conditions, the effectiveness of the tool is dependent on the wording of the requirement and the awareness within the local government building department and the building industry regarding the requirements and how they should be fulfilled. Building licences could be an effective tool for both management of dust and sediment/erosion, provided an appropriate condition is imposed on building licences and that there is readily available information which explains what is necessary to meet the requirements of the condition. The choice of condition (i.e. to manage dust and/or erosion/sediment) should have consideration of the weather conditions and level of likely impact as a result of site conditions and location (i.e. proximity to drainage infrastructure). A condition that may be effective in most instances is as follows.

The builder shall prevent the erosion of soil by wind or rain during and after site works and building through implementation of appropriate measures to retain all dust and soil on site.

4.1.5 *Local laws*

Local Laws are considered to be an effective mechanism to control dust and/or sediment from development activities. The City of Armadale Local Law: *Environment, Animals and Nuisance Local Laws 2002* stipulates that it is an offence to commence any works without an approved Dust Management Plan. The newly gazetted City of Gosnells local law: *Animals, Environment and Nuisance Local Law 2009* stipulates that an owner or occupier of land must take effective measures to ensure no dust or liquid waste is released or escapes from the land whether by means of wind, water or any other cause so as to cause a nuisance.

Although the local laws provide an opportunity to generate revenue via the issuing of fines, unless the local government has a dedicated compliance officer who is able to be proactive in their assessment of practices across the local government area, the majority of effort is focussed on responding to complaints or the improved management of litter. This results in the lack of a consistent approach to the management of erosion and sediment (including dust)



and a general lack of awareness within the development and building industry about what standard of performance is required.

The existing local laws provisions could provide an effective mechanism to improve the management of dust and sediment/erosion provided that:

- developers and builders are aware of the requirements of the local laws;
- sufficient, readily available and simple information exists on the recommended best management practices that should be implemented in order to meet the requirements;
- building sites are policed by local government enforcement officers to educate and inform building site managers of appropriate practices; and
- local government officers are willing to issue infringement notices and prosecute for non-compliance.

4.1.6 *Environmental Protection (Unauthorised Discharge) Regulations*

Similarly to the use of planning scheme provisions, using the unauthorised discharge regulations for the prosecution of dust or erosion and sediment from development is untried. The opinion of officers from the Department of Environment and Conservation regarding the use of the unauthorised discharge regulations is highly varied. It is noted that these regulations were aimed at controlling discharges from "operational" works/processes which result in sedimentation. It is considered that if the "process of land clearing" is used as the trigger, that this may not be supported in legal challenge. It is also particularly difficult to prove wind blown erosion/sediment, unless it occurs in a developed area where there is no likely alternative cause.

Although their lack of application to date suggests that they are unlikely to be an effective tool to improve practices across industry, they, like the local laws, may be an effective tool where prosecution is sought (although the fines which can be achieved via local laws are generally greater). It should be noted that prosecution under the *Environmental Protection (Unauthorised Discharge) Regulations* is a lengthy and detailed process, and substantial time, resources and funding are required to establish a case and follow it through to prosecution. It is also noted that larger developers are likely to fight the establishment of precedent. It is therefore not recommended that the *Environmental Protection (Unauthorised Discharge) Regulations* are a focus for phase 2 of this project.

4.2 Public works

Public works include works associated with the installation of new services such as drainage, roads, sewer, water, power lines (including underground services), as well as the activities associated with their maintenance or upgrade.

Generally no approval is required for public works as part of the planning and development approvals system (i.e. by the WAPC or local government), except where they have the potential to impact on a Bush Forever Site or on a Parks and Recreation Reserve if it is inconsistent with the approved management plan (Planning Bulletin 53, WAPC 2002). Some new works may be considered by local government as part of engineering drawings but maintenance works or upgrades are rarely seen.

The main utilities such as the Water Corporation, Western Power and Main Roads have environmental management systems for planned works; however, this system tends to focus on the "critical" environmental assets which are recognised as having environmental significance. Some codes of practice exist to guide public works i.e. *Utility Providers Code of Practice (2007)*

however there is no mention of the need to consider or manage erosion and/or sediment. Others have operational guidelines and design specifications which require the control and management of erosion and sedimentation, specifically addressing works within a water course, clearing, earthworks, revegetation and landscaping.

There is concern within local government that many designers make assumptions about the sites which they are working within (or don't consider the site characteristics at all) and so may be unprepared, with insufficient management measures scheduled, particularly in high risk sites. If this occurs in proximity to critical assets, this often results in a large delay to the works, while the necessary actions are identified and agreed on. It could be suggested that if the initial design was planned properly and included necessary erosion and sediment control measures, no delay would occur.

5 BEST MANAGEMENT PRACTICES FOR THE CONTROL OF EROSION

Best management practices for the control of dust, erosion and sediment vary according to the scale of the activity taking place. At subdivision, the control of erosion and water-borne sediment generally occurs as part of stormwater management and the control of wind-borne erosion is part of dust management. Both forms of sediment are more likely to be combined as part of building site management.

Table 2 outlines the practices which are recognised as providing effective management and control of erosion and sediment in Western Australia, and the stage at which they are generally most effective.

Best management practice	Subdivision – site clearing and bulk earthworks	Subdivision – infrastructure & lot construction	Development – building construction
Minimise the clearing of natural vegetation			
Watering			
Construction period/earthworks programmed for periods of light winds			
Works undertaken so that a minimum amount of ground is disturbed at any one time			
Wind break and/or perimeter fencing			
Brushing			
Hydro-mulching			
Seeding			
Use of dust-suppression products			
Replacement of topsoil to encourage revegetation			
Temporary surface water management measures including sediment basins			
Signs and fencing restricting access			
Regular street sweeping			
Stabilised and controlled vehicle access			
Location and protection of stockpiles			
Verge cover			
Geotextile sausage/socks			

Table2: Recommended best management practices for the control of erosion and sediment from development

The choice of management practice is also largely a factor of the slope and soil conditions, with generally a greater level of management required in areas of steep slopes, or where there is a high potential for soil to enter stormwater management systems or receiving waterbodies.

In all instances, a site management plan should be formulated. The complexity of the site management plan will be a factor of the complexity of the site and the construction activity proposed.

More detailed information on these management practices is contained in the documents listed in section 2.1 and appendix 1. It is noted that most guidance from WA State Government sources is non-specific to the stage of development i.e. a list of practices is provided but with few recommendations for which measures should be applied at each particular stage of development. It is recognised that some practices will be appropriate for all stages, however.

Most information that has been developed by local governments across Australia focuses on building, as this is more strongly associated with local government control. Additional information on best management practices is also contained in the "Clean Site" pamphlets and fact sheets, which are generally used by local government officers in Perth to provide advice to builders regarding better site management practices.

Discussion with local government and industry has suggested that the available guidelines including the Clean Site pamphlet may need to be adjusted for local conditions, particularly the placement of building materials on site and methods for controlling access.

It might also be useful to differential the practices which are most beneficial at the various stages of development, such as bulk earthworks; site preparation for development; and building. This is consistent with the guidelines produced by the NSW government. The *Managing urban stormwater: soils and construction* publications provide guidance on erosion and sediment control during construction and other land disturbance activities. Volume 1 provides guidance during the construction of urban subdivisions and Volume 2 provides guidance for erosion and sediment control for a range of other activities. There is also a *Resource guide for local councils: Erosion and Sediment control* which looks at how local councils can develop, adopt and maintain a consistent and rigorous approach to erosion and sediment control across their areas of operations. It is not a 'how to' guide, but rather a collection of recommendations and resources that can be used by council officers who are striving to develop an integrated and effective approach to erosion and sediment control (www.environment.nsw.gov.au/stormwater/publications.htm).

Resources in New South Wales on the urbanwater.info website are also differentiated into:

- Site management;
- Surface stabilisation;
- Flow management;
- Water quality treatment;
- Regulation and education; and
- Built Environment.

The level of performance of the best management practices is also highly dependent on the characteristics of the site and prevailing conditions. It may therefore be beneficial to identify the practices which are most appropriate to key risk factors such as slope, sediment size (sediment fences are less effective where sediments are fine), weather (prevailing winds and rainfall) and within a waterway or directly connected drainage catchment (and therefore requiring all drainage waters to be treated prior to entering the receiving environment including subsoil drains).

6 DISCUSSION

This report highlights the outcomes of Phase 1 of the Southern River Catchment Sediment and Erosion Control Project run by the Swan River Trust in partnership with the Cities of Armadale and Gosnells and the South East Regional Centre of Urban Landcare. It is understood that Phase 2 is to be implemented to address some of the issues raised by this report. The following section aims to highlight some of the issues which have been identified as being relevant to the management and control of erosion and sedimentation as a result of development.

In order to improve the management and control of erosion and sedimentation as part of the planning and development approvals system, the following matters need to be considered.

6.1 Lack of understanding of the environmental impact of erosion and sediment

Almost all stakeholders interviewed asked what effect sediment had on waterways and how was development responsible for it. This suggests that it may be necessary to increase the general level of awareness and provide some simple information about the impact of sediment in waterways and demonstrate the linkage between drains and waterways.

This information should highlight the ecological and social impacts associated with the export of sediment-laden stormwater as well as wind-borne erosion from development sites including loss of aquatic habitats and deterioration in water quality. It may also be effective to note that erosion and the loss of topsoil is likely to increase the maintenance requirements for newly installed drainage systems (including bioretention systems and side entry pits) and may also result in downstream impacts including flooding, which are then the responsibility of the local government.

Increased knowledge about the significance of the issue may increase the level of application and enforcement of statutory mechanisms.

6.2 Defining the cause and magnitude of the issue as a result of new development

In order to focus efforts for Phase 2 on the area of most impact, it is necessary to identify the activity and area from which most of the sediment is being transported into the waterways. There are a number of options which need to be considered:

1. Bulk earthworks (as part of subdivision);
2. Subsequent to bulk earthworks and arising from construction and installation of infrastructure (road, drainage and sewer construction);
3. Subsequent to subdivision and prior to house construction (vacant lots, waiting to be sold or vacant lots, waiting to be built on);
4. Site preparation for building (often a pad is required to be laid in clay areas);
5. Building of the dwelling;
6. After construction of the house and prior to landscaping; or
7. From the existing drainage network from already developed areas or small scale redevelopment.

It is important to establish the cause of the problem so that the responsibility for management of the issue can be identified.

It is also necessary to establish the mechanism by which the sediment is entering the Southern River as the management solutions for wind-borne or water-borne sediment are quite different.

There are 3 main options:

- Blown onto roads and into the drain then washed down as part of the “first flush” or as it rains;
- Runoff from sites and into the drainage system; or
- Blown directly or runoff directly into a waterway.

It should be noted that most new development areas which do not contain an existing surface water system (waterway or drain) are required to be designed to contain all their stormwater on site and to ensure that all drainage waters are treated prior to entering the receiving environment. This effectively “disconnects” the drainage system from the waterway and blocks the transport pathway. Areas that contain a waterway or connect to an existing drain which discharges into a waterway still have the potential to discharge sediment to the Swan Canning Estuary, although best practice stormwater management requires that 1 in 1yr ARI events (over 99% of rainfall) are treated prior to discharge to a receiving environment, including a drain.

The determination of the nature and extent of the problem (i.e. when and how the sediment is entering the system) is necessary to justify any additional measures or costs which are likely to be imposed on developers and/or builders to address the issue.

6.3 Level of performance required for effective erosion and sediment control at each stage of the process

There seems to be a lack of understanding within industry and local government regarding what is necessary to effectively manage erosion and sedimentation from development. This may stem from the fact that there is a general lack of awareness that dust, erosion and sedimentation from subdivision and building has the potential to impact on waterways and the environment and that this can occur from sand entering drainage systems, far away from visible waterways.

The current preferred mechanism for managing dust and sediment is the preparation of appropriate management plans, followed by their implementation. Guidelines are available to aid the preparation of these plans, including methods to stabilise the land, manage stormwater, control soil erosion and dust, and treat sediment laden runoff, but these are generally not well applied. Often the plans, where prepared, are formulated only to obtain clearance of the condition, as detailed and effective plans often require specialist technical advice and recommend expensive procedures, which are both seen as added costs to the developer/builder.

It is not common for both dust and sediment/erosion to be addressed concurrently. Guidance on how to address dust and erosion/sediment control is found in different areas on the City of Armadale website and there is limited information available on the City of Gosnells website. Additionally, dust tends to be managed by the “environmental health” section of local government where as sediment/erosion tends to be managed by the “environmental” section or the “engineering” section. It may not be necessary to consider both at once in short –term proposals, as dust management is required predominantly in the summer months and management of water-borne sediment in winter months; however they are both likely to be a concern in larger, longer-term proposals.

It is also important to consider sediment and erosion control as part of “higher” or earlier planning, such as district and local structure planning. This will help to ensure that the site and risk factors have been considered and that the developer knows what management measures will be required at subdivision stage.

6.4 Enforcing the existing policy and regulatory requirements

The lack of clear guidance regarding the necessary level of performance is exacerbated by a lack of consistency in approval requirements by local government. Most local governments have different standards or no standard at all and even different branches within a single local government may use a different standard, particularly where enforcement is largely based on human health risk rather than environmental risk.

Clear guidance is required for officers at each stage in the planning and development approvals process (as identified in section 6.2) to ensure they are aware of requirements for clearance of conditions, including adaptive measures for changes in weather conditions or to fix damaged or ineffective measures. It is recommended that the standards are enforced consistently across both local governments so it is easier for the development and building industry to become familiar with what is required.

There is also quite a strong demarcation of responsibility in local governments between the various phases of development, as the approval of actions associated with subdivision are generally performed by the subdivisional engineer as part of the planning process, whereas building licences are overseen by the building department and dust management is generally the role of the environmental health officers or compliance officers. This often means there is a lack of understanding of the problem as a whole and limited opportunity for a coordinated program of action which addresses all stages of potential impact.

Additional support should be provided to compliance officers to aid them in their application of the Environment, Animals and Nuisance Local Laws. This may require preparation of a code of practice or guidelines for building site management which are relevant to the cities of Gosnells and Armadale, which also address the management of wind erosion. Enforcement of the local law would be made more transparent by the use of a published audit guideline, which would provide builders with a clear message about the minimum acceptable level of management. It may also be useful to develop a short pamphlet which can be handed out to builders as a "first warning" to inform them about their responsibilities under the local law and to provide them with additional information sources to improve their site management measures.

6.5 Education and capacity building including performance monitoring and feedback

Preliminary discussions with key stakeholders suggests that there is a lack of awareness of the need for and requirements for effective erosion and sediment control, particularly at the building stage. In order to change current practice, it will be necessary to inform industry about the need for improved control, the cost of this control and the cost of not doing it.

The building industry is unlikely to be supportive of additional "controls" or "measures" to be required at the building stage. Community sentiment is considered to be important and if the consumer desires the additional measures, then the builders will do it willingly, however it is acknowledged that the builders are unlikely to absorb any additional cost and that it would be passed on to the homeowner, increasing the affordability of housing.

A capacity building program which informs builders and developers about the measures required at each stage of development will increase knowledge and understanding. This could involve the production of guidelines and pamphlets, information sessions at local government offices, site visits by enforcement officers, engagement of large building companies and associations, information/articles in industry newsletters and local papers and presentations where appropriate.

The capacity building program should be supported by ongoing performance monitoring to determine the impact of the change in practices on waterway health and maintenance of drainage systems. If possible, information on the cost of the measures should be obtained to inform decisions regarding the most effective mechanisms to reduce sediment loads to waterways.

7 SUMMARY

There are sufficient mechanisms which exist as part of the planning and development approvals system for requiring and enforcing the management and control of erosion and transportation of sediment and/or dust from development which can be implemented by State and Local Government in Southern River and the Swan Coastal Plain. These mechanisms tend to operate at different stages of the planning and development process. It is necessary to employ control measures at each stage of the process. The most effective of these are considered to be:

- conditions of subdivision;
- conditions of development;
- building licence requirements; and
- the enforcement of the Environment, Animals and Nuisance local laws.

The enforcement of these mechanisms could be improved by:

- increasing the level of knowledge regarding the need for better erosion and sediment control across industry and the general community including political or strong leadership;
- consistent application of conditions of subdivision and development as well as building licence requirements which necessitate the preparation and implementation of erosion and sediment control plans and dust management plans;
- clear standards of performance to be achieved via erosion and sediment control efforts at all stages of the development process, appropriate to the risk factors on site and which contain measures for ongoing and adaptive management;
- comprehensive guidelines as well as simple information to aid the development of effective management plans and building site practices; and
- well resourced enforcement officers with transparent audit standards and the ability to issue substantial fines.

These recommendations are also summarised in Table 3.

Given the lack of awareness for improved management practices, which could possibly be translated into a general lack of support, it may be necessary to revisit and redefine or simplify the problem. For example, it could be more simply defined as follows.

Problem: How do we reduce the sediment-load from development sources in the Southern River?

Answer: Stop the sediment from reaching the river.

Opportunities for doing this are:

1. Retain all sand/soil on site;
2. Clear sediment from roadways prior to it entering the drainage system;
3. Remove all sediment from the drainage system before it enters the Southern River; and
4. Remove sediment from the waterway itself.

Table 3: Summary of mechanisms recommended to improve the management and control of erosion and sediment from development.

Planning and development stage	Primary mechanism for action	Mode of sediment transport	Requirement to be imposed by LG	Enforcement (who/how)	Issues	Recommendation for SRT involvement
Subdivision – bulk earthworks, road and infrastructure construction	Condition of subdivision	Water-borne	D14: Stormwater being contained on-site, or connected to the local drainage system after passing through an appropriate water quality improvement treatment device. (Local Government)	Enforcement by LG planning department via clearance of conditions. LG can “withhold” clearance of the condition which delays release of titles. Requires effective monitoring to ensure ongoing compliance with management plans.	Requires clear guidance from the LG on what the developer needs to do to clear the condition i.e. prepare and implement an erosion and sediment control plan. LG officers need to ask for the plan and ensure it is implemented in order to clear this condition. May be incorporated into the urban water management plan. Requires effective monitoring to ensure ongoing compliance with management plans	<ul style="list-style-type: none"> Provide input into the DoP review of subdivision conditions Raise awareness of LG officers of need for appropriate management plans and link the need for both issues (wind and water-borne) with the environmental need Develop example management plans for key site parameters to aid assessment
		Wind	D10: The land being graded and stabilised (Local Government). This needs to be accompanied by an advice note requiring preparation and implementation of a dust management plan consistent with DEC guidelines	Enforcement by LG planning department via clearance of conditions. LG can “withhold” clearance of the condition which delays release of titles. Requires effective monitoring to ensure ongoing compliance with management plans.	Requires clear guidance from the LG on what the developer needs to do to clear the condition i.e. prepare and implement a dust management plan. LG officers need to ask for a dust management plan in order to clear this condition. Management plans must contain adequate and ongoing measures. Requires effective monitoring to ensure ongoing compliance with management plans.	
Vacant lots (sold)	Local law	Water-borne	City of Gosnells Local Law: <i>Animals, Environment and Nuisance Local Law 2009</i>	Enforcement (issue fine) by LG compliance officer or EHO at time of infringement consistent with LG guidelines/audit sheet	Requires clear guidance from LG on what is required to manage the issue appropriately, as well as consistent policing and enforcement to be effective.	<ul style="list-style-type: none"> Provide support for LG asset management to enhance street-sweeping programs and education of side-entry pits Provide support for LG EHO/compliance officers to ensure sediment fences are in place and soil is stabilised
		Wind	City of Armadale Local Law: <i>Environment, Animals and Nuisance Local Laws 2002</i> City of Gosnells Local Law: <i>Animals, Environment and Nuisance Local Law 2009</i>	Enforcement (issue fine) by LG compliance officer or EHO at time of infringement consistent with LG guidelines/audit sheet	Requires clear guidance from LG on what is required to manage the issue appropriately, as well as consistent policing and enforcement to be effective.	



Planning and development stage	Primary mechanism for action	Mode of sediment transport	Requirement to be imposed by LG	Enforcement (who/how)	Issues	Recommendation for SRT involvement
Development – site preparation and building construction	Condition of development (where DA required)	Water-borne and wind	All soil shall be retained on site and appropriate measures implemented to prevent soil erosion by wind and rain during and after development	Enforcement by LG development engineers consistent with approved management plan (where required) or LG guidelines	DA generally not required to construct a single dwelling. Requires clear guidance from LG on what is required to meet requirements	<ul style="list-style-type: none"> Develop better guidelines for builders on simple, cost effective site management practices and make them visible via websites and key stakeholders as well as direct contact with builders Provide transparent information on how practices will be assessed (audit guidelines) Support LG enforcement officers to educate and inform local builders of requirements
	Building licence	Water-borne and wind	The builder shall prevent the erosion of soil by wind or rain during and after site works and building through implementation of appropriate measures to retain all dust and soil on site	Enforcement by LG building engineer/surveyor consistent with approved management plan (where required) or LG guidelines	Requires clear guidance from LG on what is required to manage the issue appropriately, as well as consistent policing and enforcement to be effective.	
	Enforcement of local law	Water-borne	City of Gosnells Local Law: <i>Animals, Environment and Nuisance Local Law 2009</i>	Enforcement (issue fine) by LG compliance officer or EHO at time of infringement consistent with LG guidelines/audit sheet		
			Wind	City of Armadale Local Law: <i>Environment, Animals and Nuisance Local Laws 2002</i> City of Gosnells Local Law: <i>Animals, Environment and Nuisance Local Law 2009</i>	Enforcement (issue fine) by LG compliance officer or EHO at time of infringement consistent with LG guidelines/audit sheet	

Not in table (as not recommended for phase 2):

- Planning Scheme provisions
- Environmental Protection (Unauthorised Discharge) Regulations
- River Protection Notices
- Education of builders



As option 4 is not feasible, it is necessary to focus on the first three. Options 2 and 3 can be achieved via local government maintenance practices such as street sweeping or educting side entry pits. An alternative mechanism to achieve option 3 is to install sediment basins at exit points of the drainage system to the waterway, which could, for example, be provided as part of the urban water management strategies.

The principle that "prevention is better than cure" i.e. it is better to stop the sediment from leaving the site at all, is recognised. The mechanisms identified in this report are designed with that objective in mind. However, if an economic argument is to be supported, it is necessary to accurately cost all measures along the treatment train. This requires a cost benefit analysis of individual control (option 1) at subdivision or lot scale versus neighbourhood/catchment control (options 2 and 3). The development industry is more likely to support the latter options as they can be shared across the community and not imposed on the new homeowner.

7.1 Recommendations for Phase 2

Although it is outside the scope of this study, it is noted that some guidance is required to aid in the design of Phase 2 of this project. The following actions are recommended:

- Identify the major source of sediment to the Southern River and its waterways and focus actions towards improving those particular practices;
- Develop example dust management and erosion and sediment control plans for key risk factors (which need to be differentiated) and provide clear guidance about what mechanisms are required at each stage and what level of performance is required to facilitate clearance of the conditions;
- Develop better information for builders which outlines simple, cost effective measures which can be put in place across development sites in the Southern River catchment and actively inform builders of the requirements as part of a pro-active enforcement of the Environment, Animals and Nuisance Local Law; and
- Participate in the Department of Planning's consultation process for model subdivision conditions to improve the wording of the recommended erosion control condition to address the timing issue and to include a standard condition for dust management.

8 REFERENCES

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APPENDIX 1: KEY RESOURCES FOR EROSION AND SEDIMENT CONTROL

There are numerous resources to aid the control and management of erosion and sediment from development. Most focus on building; however, there are some guidelines which are specifically for subdivision. The following is not intended to be an exhaustive list, but provides a range of examples in the various categories.

Regional Design Guidelines

Best Practice Erosion and Sediment Control (International Erosion Control Association, November 2008)

<http://www.austieca.com.au/BestPracticeESCDocumentInfo/tabid/69/Default.aspx>

EMRC (2008) Local Government Natural Resource Management (NRM) Policy Manual, section 5.1.2 Erosion and Sediment Control (WA)

<http://www.emrc.org.au/displayfile-ID-89421.asp>

A Resource Guide for Local Councils: Erosion and Sediment Control (NSW)

<http://www.environment.nsw.gov.au/stormwater/publications.htm>

The Blue Book - Managing Urban Stormwater (MUS): Soils and Construction (NSW)

<http://www.landcom.nsw.gov.au/whats-new/publications-reports/the-blue-book.aspx>

Factsheets

Healthy Waterways Water by Design program factsheet series (Qld)

www.waterbydesign.com.au/content/factsheets

Construction Sites: devices and practices (NSW)

<http://www.urbanwater.info/shortcuts/FactSheets.cfm>

Training Courses

Erosion and Sediment Control Courses are offered through the International Erosion Control Association. <http://www.austieca.com.au/Home/tabid/36/Default.aspx>

Localised Guidance

Brisbane City Council (Qld)

http://www.brisbane.qld.gov.au/BCC:BASE:1302690446:pc=PC_2944 (refer Chapter 12 and Appendix 2 of the Land Development Guidelines)

Sunshine Coast Regional Council (Qld)

<http://www.sunshinecoast.qld.gov.au/sitePage.cfm?code=erosion-sediment-control>

Keeping our stormwater clean: A builders guide (Vic)

http://www.clearwater.asn.au/resources/372_1.pdf

Regulating Building-Site Practices to Reduce Stormwater Pollution – Audit Guidelines (Vic)

http://www.clearwater.asn.au/resources/370_1.pdf

City of Yarra Builders Code of Practice and Waste Management Guidelines (Vic)

http://www.clearwater.asn.au/resources/133_1.pdf

[Frankston City Building and Works Code of Practice - Keep it clean on-site brochure](#)

