Great Keppel Island Resort EIS

For GKI Resort Pty Ltd

Erosion & Sediment Control Management

15 July 2011

Opus International Consultants (Australia) Pty Ltd

ABN 79 086 342 065

120 Hanson Road, Gladstone QLD 4680

PO Box 494, Gladstone QLD 4680

+61 7 4972 6515

+61 7 4972 3883

E&SC Management

Great Keppel Island Resort EIS

Revision A

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Prepared By:

ANRI LE ROUX
Civil Manager - Infrastructure
CPESC 5033

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1. INTRODUCTION

1.1 PURPOSE

The following conceptual Erosion and Sediment Control Management Plan has been prepared as part of an environmental impact statement (EIS) for the proposed resort development at Great Keppel Island. The aim of this management plan is to address water quality and sediment runoff issues during the construction phase of the development. It will also aim to provide a description of the techniques to manage the impact of erosion and sediment run-off on the sensitive receiving environment.

1.2 SITE DESCRIPTION

1.2.1 Proposed Development

Great Keppel Island is located approximately 12 km off the coast of mainland Queensland near the town Yeppoon within Rockhampton Regional Council and is the largest of the 16 islands that make up the Keppel Group at approximately 1,450 hectares. The island has hosted the Great Keppel Island Resort and other tourism accommodation establishments since the 1960's. The Client acquired control of the facility in 2007 and intends to renovate and improve the property for future tourism accommodation and amenities.

The project consists of the development of three main areas of the island, which will comprise an eco-tourism hotel and spa with villas and apartments, a golf course with associated facilities and a marina including a research facility.

1.2.2 Existing Site Conditions

The existing Great Keppel Island Resort is located on the western side of the island between Fisherman's Beach and Long Beach. The main resort facilities are situated near Fisherman's Beach and includes swimming pools, a golf course, communal and office buildings, tennis, squash and volley ball courts and villas on a hill to the south of the main resort. A landing strip is located towards the east of the former resort, with staff accommodation nearby. The area between Fisherman's Beach and Putney Beach is occupied by private residences, some retail properties and accommodation facilities including the Keppel Haven Resort and Keppel Island Village.

1.2.3 Site Drainage & Topography

At the time of writing this report, no detailed level survey was available. The following is an extract from the preliminary geotechnical assessment prepared by Douglas Partners:

"The overall topography of Great Keppel Island is relatively steep and is dominated by two south-east to north-west trending ridges with a maximum elevation of approximately 175m AHD. Leeke's, Putney and Blackall creeks drain these ridges to the west of the island and there are some tidal wetlands behind Putney Beach and Leeke's Beach. Other minor, perennial creeks are relatively short and flow directly to the ocean. A flat to

undulating topography is present in the dune sand areas in the north-east and south-west regions of the island. The topography becomes slightly undulating on the eastern side of the island towards Wreck Bay."

1.2.4 Soils

A preliminary geotechnical assessment has been carried out by Douglas Partners, who prepared a report dated December 2010. The report describes the subsurface conditions as predominantly silty sand and sand. Results of the geotechnical laboratory testing indicate an Emerson Class Number of 6 and soils with a medium potential for erosion. Further information in the report indicates fine granular soils, but several other factors need to be assessed to determine the complete erosion hazard assessment prior to construction.

1.2.5 Disturbance Area

The disturbance area of the proposed development should be confined to the works areas only and the disturbance should be limited to a maximum of 2ha. If the proposed work results in a larger area, staging should be implemented to limit the disturbance area.

1.3 GENERAL

All erosion and sediment control measures should be in accordance with the following guidelines:

- International Erosion Control Association (IECA) Best Management Practices (2008);
- the latest version of the Institute of Engineers (QLD) 'Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites' and
- EPA's Best Practice Urban Stormwater Management: Erosion and Sediment Control Guideline.

All erosion and sediment control devices implemented onsite should represent current best management practices and all practical measures applicable to the site. These best management practices must be applied to all stages of the project including installation, operation, and management of the control measures including maintenance and monitoring of the devices.

1.4 ENVIRONMENTAL DUTY

In accordance with the *Environmental Protection Act (EPA) 1994* all personnel must comply with the general environmental controls under Sections 319 and 320.

According to Section 319 of the EPA, all persons involved in the project, from design to construction, have a responsibility to comply with the 'general environmental duty'. This requires all reasonable and practicable measures to be adopted to prevent or minimise environmental harm. Consequently, any erosion and sediment control devices proposed or implemented on site must represent current best management practices and all practical measures applicable to the site.

Furthermore, under Section 320 of the EPA, all personnel have a legally binding duty to notify their employer, their Local Regulatory Authority and the Environmental Protection Agency (QLD) should they become aware of

a potential or actual incident of environmental harm. As such, it is the principle contractor's responsibility to ensure all site contractors and site personnel are aware of and understand their environmental duties.

1.5 RESPONSIBILITY

In addition to the general environmental duty which applies to all persons, it is the contractor's responsibility to implement and maintain all the erosion and sediment control measures on site, until all disturbed areas are reinstated. This management plan present concepts only. The contractor is at all times responsible for the establishment, management and maintenance of the erosion and sediment control measures to ensure minimal environmental harm and best management practices.

2. EROSION AND SEDIMENT

2.1 EROSION RISK ASSESSMENT

The Revised Universal Soil Loss Equation (RUSLE) should be utilised to predict the total soil loss, in tonnes (t), from both sheet and rill erosion from the construction sites. The RUSLE equation is shown below:

Soil Loss (t) = RUSLE x Area of disturbance (ha) x duration of disturbance (years)

RUSLE = Computed Soil Loss (t/ha/yr) = (R x K x LS x P x C)
R = rainfall erosivity factor
K = soil erodibility factor
LS = slope length/gradient factor
P = erosion control practice
C = ground cover and management factor

As shown above, there are several contributing factors that are required to undertake an erosion hazard assessment prior to construction. These factors include:

- the extent of site disturbance (ha);
- the duration of site disturbance (years);
- the rainfall erosivity factor during site disturbance (R);
- a representative soil erodibility factor (K);
- the average slope of the site;
- the area of external catchments (ha).

In accordance with the IECA Best Management Practice Guidelines a soil loss of less than 150 ton corresponds to a 'low erosion risk' site and a soil loss of more than 150 ton corresponds to a 'high erosion risk' site. Due to the sensitive nature of this project and the pristine receiving environment, it is recommended that a Major Erosion & Sediment Control Management Plan be prepared. Each stage of the construction should be assessed and mitigating measures should be implemented accordingly.

Where large areas of land are being cleared, issues of biodiversity conservation will arise that need to be considered by the developer and the relevant approving authority (QLD EPA). All consultants and contractors

involved in preparing the major E&SCP should liaise closely with the project manager or development coordinator to identify the planning needs, constraints and choice of best management practices (BMPs).

The various development design processes should integrate engineering and soil and water management planning. The major E&SCP should be prepared at the same time as engineering design for all construction works and include them as part of the final engineering plans. Once engineering plans are complete, integration can be very difficult to achieve. Cross referencing soil and water management planning with site rehabilitation is also important.

2.2 SEDIMENT BASIN REQUIREMENT

Once the subject site has been assessed utilising RUSLE and the erosion risk identified, the need for a sedimentation basin can be determined. Sedimentation basins are usually implemented as part of major E&SCP's and where the soils are predominantly dispersive. Sediment basins are required for the capture and control of sediment laden site runoff during the construction stage.

The sediment basin should be designed in accordance with the IECA's Best Practice Erosion & Sediment Control Guidelines. Futher reference for more information can be made to the 'Maroochy Manual for Erosion and Sediment Control' (Version 1.2), and Brisbane City Councils 'Sediment Basin Design, Construction and Maintenance Guidelines' (2001). The 'Maroochy Manual for Erosion and Sediment Control' is based on the NSW 'Managing Urban Stormwater: Soils and Construction' (2004), with amendments to suit the current Queensland legislative and planning framework and the local environment. The sediment basin will be rehabilitated once upstream construction is complete and all built-up sediments will be removed from the sediment basins.

Initial soil testing (*Douglas Partners Preliminary Geotechnical Assessment, Dec 2010*) indicates site soils are sandy corresponding to a Type C soil, although medium to high levels of dispersion has been noted in the laboratory test results. Due to the sensitive environment in which construction work will take place, it is recommended that a Type D basin be adopted for the site in accordance with the design objectives detailed in the table below. Further investigation and detail design is required prior to operational works to establish the most appropriate basin type for each stage of the work.

Table 1 Sediment Basin Design Objectives

Basin Type	***Design Objectives***
Type C	• Coarse grained soils, < 33% finer then 0.02mm. • Type C basins allow rapid settling in wet or dry basins, without the use of flocculants. • The settling zone volume is calculated to provide capacity for the design particle to settle in the peak flow expected from the design storm, Q3month (half 1 year ARI). • Storage zone volume either 100% of the settling zone capacity (soil loss class 1-4) or 2-month soil loss (soil loss class 5-7) calculated by the RUSLE equation (see section 1.6). • Minimum depth 0.6m.

Type F	• Fine grained soils, > 33% finer then 0.02mm. • Type F basins require longer residence time (then type C basins) for fine sediment to settle. • The settling zone volume is calculated to provide capacity to contain all runoff expected from the 80th percentile, 5 day total runoff depth. • Storage zone volume either 50% of the settling zone capacity (soil loss class 1-4) or 2-month soil loss (soil loss class 5-7) calculated by the RUSLE equation (see section 1.6). • Average depth 0.6m.
Type D	• Contain a significant proportion of fine (<0.005mm) dispersible materials that will only settle if flocculated. Dispersible soils have >10% of soil materials dispersible. • The settling zone volume is calculated to provide capacity to contain all runoff expected from the 80th percentile, 5 day total runoff depth. • Storage zone volume either 50% of the settling zone capacity (soil loss class 1-4) or 2-month soil loss (soil loss class 5-7) calculated by the RUSLE equation (see section 1.6). • Average depth 0.6m.

The basin should be designed to ensure the water quality discharge criteria (50mg/L Total Suspended Solids) is met for the design storm. However the basin structure and outlets should be designed to ensure stability in the peak flow event (at least 10 year ARI). The sediment basin shape should be designed in accordance with a minimum length to width ratio of 3:1, to reduce short circuiting and average batter slopes of 1 in 3.

2.2.1 Sediment Basin Discharge Criteria

All water discharged from the site must comply with the construction phase performance criteria below. These construction phase criteria are discharge standards and as such are applicable to runoff events or any pumped discharges from the sediment basins:

- Total Suspended Sediment: 90th percentile <50mg/L;
- pH close to that of the receiving water;
- Dissolved Oxygen: 90th percentile >80% saturation or 6mg/L;
- Hydrocarbons: No Visible sheen on receiving waters;
- Litter: No visible litter washed from site.

2.2.2 Water Quality Testing

Water quality testing should be undertaken onsite in accordance, as a minimum, with the procedure detailed below. Water quality monitoring is required to ensure compliance with the sediment discharge criteria and is the responsibility of the contractor.

Any monitoring undertaken should occur at least on a weekly basis and always before basin discharge. All water quality testing should be undertaken by a suitably qualified person.

Table 2 Water Quality Monitoring Procedure

Site/Soil Type	Criteria	Testing Method
Type C Soils	• No visible sediment, hydrocarbons, oils or anthropogenic gross pollutants discharging from site or entering receiving environment	• Visual inspection of site erosion management and sediment control measures/devices. • Visual inspection of drainage discharge points and prior to basin discharge. • Inspections conducted at least on a weekly basis.
Type F Soils	• Discharge turbidity no greater than 10% more than turbidity of receiving water • No visible sediment, hydrocarbons, oils or anthropogenic gross pollutants discharging from site or entering receiving environment	• Manual turbidity recordings on a weekly basis and prior to basin discharge. • Visual inspection of site erosion management and sediment control measures/devices, at least on a weekly basis. • Visual inspection of drainage discharge points, at least on a weekly basis.
Type D Soils (Dispersive)	• TSS < 50mg/L • Discharge turbidity no greater than 10% more than turbidity of receiving water • pH values between 6.5-8.5 • No visible sediment, hydrocarbons, oils or anthropogenic gross pollutants discharging from site or entering receiving environment	• Field samples collected for TSS by suitably qualified professional, for testing at a NATA accredited laboratory prior to basin discharge. • Manual turbidity and pH recordings on a weekly basis and prior to basin discharge. • Visual inspection of site erosion management and sediment control measures/devices at least weekly. • Visual inspection of drainage discharge points, at least weekly.
Major Risk Sites / Sensitive receiving environments	• Water quality monitoring regime undertaken to establish base flows and water quality of receiving environment prior to works commencing. • TSS < 50mg/L • Discharge turbidity no greater than 10% more than turbidity of receiving water • pH values between 6.5-8.5 • No visible sediment, hydrocarbons, oils or anthropogenic gross pollutants discharging from site or entering receiving environment	• Base flow monitoring undertaken by suitably qualified professional, for testing at a NATA accredited laboratory. • Field samples collected for TSS by suitably qualified professional, for testing at a NATA accredited laboratory prior to basin discharge. • Manual turbidity and pH recordings on a weekly basis and prior to basin discharge. • Visual inspection of site erosion management and sediment control measures/devices at least weekly. • Visual inspection of drainage discharge points, at least weekly.

2.3 INSTREAM WORKS

2.3.1 General

Unless adequately managed, instream construction activities can represent a significant environmental hazard. Instream works and works within tidal waters will require approval from the Department of Environment and Resource Management (EPA) and may also require approval by the Department of Primary Industries.

Sediment released from a work site into a waterway or water body can cause an increase in both turbidity and bed load sediment. Turbidity consists of the clay and fine silt particles that generally do not settle until they reach quiescent or saline waters. Bed load sediment consists of the coarses silts, sands and gravels that move along, or close to, the bed of a watercourse.

Unnaturally high turbidity levels can cause adverse affects on aquatic life, such as:

- damage to fish gill membranes;
- reduced ability for aquatic life to feed by sighting food;
- general altering of aquatic habitat and behaviour;
- increased susceptibility to disease caused by stress;
- health problems associated with the transportation of pollutants attached to sediment particles such as nutrients, metals and pesticides.

Some of the potential impacts likely to result from unnaturally high bed-load sediment concentrations are listed below:

- Fine sediments that enter tidal waterways can be constantly resuspended into the water column by tidal movement resulting in increased turbidity levels.
- High water colum turbidity can reduce habitat diversity.
- Settled bed load sediment can increase local flooding problems and reduce the navigational limits of the waterways.
- Coarse sediment can smother aquatic vegetation and bed habitats.
- Fine sediments can settle as a fine dusting over the seabed, causing loss of seagrass through reduced photosynthesis and damage to coral habitats.

2.3.2 Key Management Principles

The key management principles for instream erosion and sediment control are:

- Appropriately plan and organise the work activities.
- Minimise channel or waterway disturbance.
- Control the movement of the water.
- Minimise soil erosion.
- Minimise the release of sediment and sediment-laden water.
- Promptly rehabilitate disturbed areas.

The choice of instream sediment control technique depends on a number of variables including flow rate, water depth, undisturbed water quality and the duration of the works. Furhter investigation is required prior to construction to identify the most appropriate techniques to manage instream works. Recommended site controls may include floating silt curtains or isolation barriers.

3. PROPOSED CONTROL MEASURES

The extent and position of the erosion and sediment control devices should be determined on site by the contractor to suit the construction program.

3.1 BASIC CONCEPTS

The following fundamental concepts shall form the foundation of the site's erosion and sediment control and should be reflected by the implemented measures.

- Erosion control measures favoured over sediment control devices, that is any exposed surfaces shall be stabilised as soon as practicable and sediment control devices used as last defence;
- Limit disturbance by only clearing and disturbing areas necessary for works, disturbance should only extend 2-5m from necessary works areas;
- Minimise the extent and duration of disturbance by staging the works. Disturbed areas should be kept to workable areas less than 2ha;
- Divert all clean upstream stormwater runoff around the site and disturbed areas. Collect all dirty water from work areas for treatment.

3.2 IMPLEMENTATION SEQUENCE

All erosion and sediment control measures are required to be installed and functional prior to works commencing. The following implementation sequence shall be adopted where practicable with the construction program. Plans shall be updated and measures moved and reinstated to reflect site stages and progression of the works. The following implementation sequence is proposed:

3.2.1 Phase 1 – Prior to Works Commencing – Stripping and Bulk Earthworks

- Prior to any demolition, stripping or bulk earthworks on site, all erosion and sediment control measures should be installed and operational.
- Provide a stabilised site access, either wash down area or shake down device at the construction site entrance to minimise the amount of sediment being tracked off the site. Only a single site access point is to be provided, unless specific circumstances warrant and is approved by the local authority.
- Sediment fences (or appropriate barrier fencing) are to be installed adjacent to the access point to confine ingress to and egress from the site to the established stabilised point.
- The wash down area/shake down device is to be drained to a suitable sediment capture device such as a sediment fence installed downstream of the construction entry.
- Inlet protection is to be provided to all gully pits, field or kerb inlets on all adjoining roads.
- All 'clean' upstream water is to be diverted around disturbed areas and stockpiles to minimise the amount of water flowing through the site, the amount of sediment mobilised and the amount of water requiring treatment.
- 'No-go' (restricted access) zones are to be established around areas of native vegetation to be retained and any areas which do not require disturbance, to limit the area of exposed soil.
- Earth banks are to be installed at intervals < 80 metres along slope contours to limit slope lengths.

- Sediment fences are to be installed 2-5 metres downstream of all works areas, including along the downstream property boundaries, downstream of batters and stockpiles, prior to stripping and throughout earthworks operations. All sediment fences are to be monitored and maintained throughout the duration of works.
- All nominated sediment basins and sediment traps are to be constructed with appropriately stabilised diversion structures and emergency spillways.

3.2.2 Phase 2 – Duration of Works

- Works are to be staged so that disturbed areas are kept to workable sizes and exposed for a short a period as practicable.
- All disturbance areas and clearing are to extend no more than 5 metres (preferable 2 metres) from essential works areas to minimise amount of exposed surface. Land outside the essential works areas should remain undisturbed and in its natural condition, ensuring topsoil remains in place. These areas are to be protected by barrier fencing.
- Topsoil is to be stripped and stockpiled for later use onsite. Sediment fences should be established downstream of all topsoil stockpiles.
- Native vegetation required and approved for clearing should be mulched and stockpiled for later use in landscaping, stabilisation and/or site rehabilitation works.
- Any stockpiles remaining on site for more than 10 days must be stabilised. Additionally, all disturbed areas are to be progressively grass seeded and stabilised using mulch, hydroseeding or hardstand to achieve 70% ground coverage within 20 days of inactivity or completion of works (even if works may continue later) for protection against both wind and water erosion.
- During windy and dry weather any unprotected areas are to have sufficient dust control measures implemented including watering, roughening or wind barrier fencing.
- Acceptable receptors and appropriate waste disposal practices should be used for concrete and mortar slurries, paints, acid washers, litter and general waste materials.
- All vehicles departing from the site shall ensure no sediment is being carried or transported off site. Regular inspection of public roads adjacent to the site shall be conducted and any sediment deposits manually removed (not washed down).
- Any vehicle or equipment washing and/or refuelling conducted onsite should be conducted in specific bunded areas away from concentrated flow paths and the stormwater system.

3.2.3 Phase 3 – Finishing Works & Defects Liability Period

- All erosion and sediment control measures, including sediment fences and inlet traps shall be maintained until completion of surface finishes including landscaping and turfing and only removed once the site is stabilised.
- At construction completion, all temporary earth structures including soil stockpiles are to be track rolled and seeded to achieve 70% strike rate within 20 days.
- Final site landscaping is to be conducted as soon as possible and within 10 working days of construction completion.

3.3 INSPECTION AND MAINTENANCE

Inspection and maintenance of the site's Erosion and Sediment Control devices is necessary to ensure the proper and continued function of the measures.

Inspections should be conducted by the site contractor on a regular and informal basis as part of the general site inspections. As a minimum, specific Erosion and Sediment Control inspections should occur as follows:

- Immediately before site closure (i.e. Weekend/Holiday closures);
- Prior to predicted large storm events;
- Following significant storm events (> 5mm);
- Or at least on a weekly basis.

All inspections are to be conducted, as a minimum, in such a way to include the following.

- Record type and location of device/control measure;
- Record condition of each control measure;
- Record sediment volumes removed from the devices/control measures (if required);
- Record details of sediment basin treatment and cleanout;
- Record sediment disposal procedures and location.

A Site Inspection Checklist and suggested inspection guidelines are attached in Appendix A as a guideline.

All repair, maintenance and replacement of the devices/control measures including non-structural measures, structural measures, sediment basins and diversion drains should be conducted as required by the site contractor or as instructed by the Local Authority.

Detailed and legible records of all inspection and maintenance conducted on the Erosion and Sediment control devices are to be kept on site by the site contractor.

3.3.1 Sediment Basin Maintenance

The sediment basins should remain operational until the site is stabilised and should only be decommissioned once the upstream earthworks have been completed and the other stormwater quality controls have been implemented. A maintenance marker post shall be installed in the sediment basin to clearly identify the level above which the design capacity is available.

The sediment basins should be dewatered, utilising a floating inlet pump, and any built up sediment removed from the basin once accumulation of sediment reaches 70% of the storage capacity.

Maintenance of the site's sediment basins shall consist of flocculation, dewatering, sediment cleanout and repair of any scour damage. Regular inspection of the basin shall dictate the frequency at which maintenance is required and preformed. A sediment basin inspection check sheet is attached in Appendix A as an example. As a minimum, sediment basin inspections and reporting should be conducted in accordance with this check sheet.

3.3.2 Sediment Disposal

At completion of the construction phase, with all disturbed areas being stabilised, the sedimentation basins must be removed and rehabilitated. Accumulated sediment removed from the sediment basin should be disposed of in a proper manner.

The proper, lawful and environmentally responsible disposal of the site's waste, including general rubbish and accumulated sediment from the site's control measures is essential. All site waste to be dealt with and disposed of in accordance with the *Environmental Protection (Waste Management) Policy 2000 and Environmental Protection (Waste Management) Regulation 2000*. The disposal of any accumulated sediment shall be conducted to ensure pollution to the downstream waterway does not occur.

Accumulated sediment removed from the sediment basin can be mixed with onsite soil for disposal. Sediment must not be disposed of onsite in concentrated flows or where it can be re-entrained. Additionally, accumulated sediment from the basin dosed with Alum should not be disposed of onsite where the pH of the receiving waterways is < 5.5. At low pH values (< 5.5) alum becomes soluble in water, having the potential to cause aluminium toxicity and damage the aquatic ecosystem of the receiving waterways.

3.4 STABILISATION

Any exposed batters, embankments or fill areas should be stabilised, using mulch, hydromulch, hydroseeding direct seeding or turfing to provide 70% coverage within 20 days of works being completed (even if works will continue later).

3.5 REVIEW AND UPDATE

The approved Erosion and Sediment Control Plan must be updated by the contractor as and when required to reflect construction activities including which modification of site circumstances or construction sequence and/or where objectives/targets are not being met.

Any updates required must reflect current standards, Council Guidelines and current Best Management Practice. All necessary updates should ensure that a reduction in overall control does not result.

If any updates or modifications are likely to result in a potential increase in environmental impacts, the contractor must notify Council/EPA under the *Environmental Protection Act 1994* general environmental duty and duty to notify.

4. REFERENCES

Brisbane City Council (2001). Sediment Basin Design, Construction and Maintenance Guidelines.

Institute of Engineers, Australia Queensland (1996). Soil Erosion and Sediment Control: Engineering Guidelines for Construction Sites.

International Erosion Control Association (IECA) Australasia (2008). Best Practice Erosion and Sediment Control.

Environmental Protection Agency. Best Practice Urban Stormwater Management: Erosion and Sediment Control Guideline

Sunshine Coast Regional Council. Maroochy Manual for Erosion and Sediment Control, Version 1.2.

Sunshine Coast Regional Council March (2008), Contract Standards for Erosion and Sediment Control on Construction Sites, Version 1.0.

APPENDIX A

Example Inspection Sheets

EROSION & SEDIMENT CONTROL – SITE INSPECTION CHECK SHEET

Project:								
Site Location:								
Date:								
Inspected By::	**Name:**					**Signature:**		
Site Coverage (%):								
Rainfall Over Past 24 hrs:								
BMP	**Condition**	**Maintenance Required**		**Maintenance Preformed**			**Sediment Volume Removed**	**Sediment Disposal Procedure/Location**
		Y/N	**Type**	**Y/N**	**By**	**Date**		
Example: *Sediment Fence*	*Poor, fence no longer upright, sediment accumulated*	*Y*	*Sediment cleanout and fence replacement*	*Y*			*10kg*	*Added to existing onsite stockpile*

RECOMMENDED MINIMUM INSPECTION GUIDELINES FOR STRUCTURAL MEASURES

Sediment Retention Basins	
	▪ Has sediment settling zone sufficient capacity? ▪ Is the outflow structure installed as illustrated in the E&SCP? ▪ Are the embankments protected against erosion?
Sediment Filters	
Straw Bales	▪ Are they installed in trenches? ▪ Are they tightly abutting, with material stuffed between the bales? ▪ Are they staked? ▪ Has backfill material been laced on the upstream side? ▪ Is runoff water running around, below or between the bales?
Sediment Fences	▪ Is the filter fabric buried in a trench and backfilled? ▪ Are the stakes installed correctly with proper spacing? ▪ Has sediment accumulated to within 300mm of the top? ▪ Is runoff water running around, below or between the bales?
Continuous Berms	▪ Have the berms been installed correctly? ▪ Is the fabric adequately stapled?
Other	▪ Are barriers causing local flooding problems?

Check Dams	
Straw Bales	▪ Are the bales staked and tight with each other? ▪ Have the bales been installed in a trench and backfilled? ▪ Will water be forced to run over a centre bale and not around the end bales? ▪ Is the ground below where water flows over the bales eroding?
Rock	▪ Is the correct size rock being used? ▪ Will water flow over the middle instead of around the edges? ▪ Has movement of the rock occurred?
Drains / Inlet Protection	
Straw Bales	▪ Are the bales staked and tight with each other? ▪ Have the bales been installed in a trench and backfilled? ▪ Will water be forced to run over a centre bale and not around the end bales? ▪ Is the ground below where water flows over the bales eroding?
Filter Fabric	▪ Is the filter fabric buried in a trench and backfilled? ▪ Is it staked correctly with proper spacing? ▪ Has sediment accumulated to within 300mm of the top? ▪ Is runoff water running around, below or between the fabric joins?
Inserts	▪ Has the insert been installed correctly? ▪ Will the insert prevent runoff water from entering the stormwater system? ▪ Has sediment filled the structure? When will the sediment be removed?

RECOMMENDED MINIMUM INSPECTION GUIDELINES FOR NON-STRUCTURAL MEASURES

Diversion and Containment Banks
▪ Are they protected against erosion? ▪ Have they been constructed to control and divert anticipated flows? ▪ Should the bottom be lined with any material to prevent erosion?
Slope Drains
▪ Will runoff water be diverted into the pipe? ▪ Does sufficient protection exist to prevent failure of piping? ▪ Is the pipe anchored? ▪ Does erosion protection exist where water charges? ▪ Are they functioning in the manner they were designed?
Staging of Construction Activities
▪ Does all the ground need to be disturbed? ▪ How much land is being disturbed and how much can remain in vegetation?
Planting of Perennial Seed
▪ Are drill marks evident that are parallel or perpendicular to land contours? ▪ Has seed tag been checked and the mixture verified? ▪ If seed was applied hydraulically, how much was used? ▪ If seed was broadcast, was the ground raked? ▪ What time of year was the seed planted? ▪ Are weeds becoming established?

Planting of Temporary, Nursery or Cover Crop
▪ What type of seed was used? ▪ How long will the vegetation be in place before planting perennial grass? ▪ When was the seed planted?
Dry / Hydraulic Mulch
▪ Does the mulch cover 80-100% of the bare ground? ▪ If dry mulch is applied, how is it held in place? ▪ Has wind removed the dry mulch and is this a problem?
Soil Binder
▪ What type of material was used? ▪ When was it applied? ▪ Does the material still control erosion?
Hillside Protection
▪ Is the material properly installed at the top? ▪ Are sufficient staples used? ▪ Does the material overlap along the edges? ▪ Does the material need to be repaired?
Channel Protection
▪ Is the material properly installed at the top? ▪ Are sufficient staples used? ▪ Is the material properly stapled or trenched along the edges?

▪ Should a rock check structure be installed on top of the material?
Soil Roughening
▪ How deep are the furrows? ▪ Are the furrows filling up with soil? ▪ Are the furrows perpendicular to the prevailing wind?
Wind Barriers
▪ Have they been installed perpendicular to what is accepted as the prevailing wind direction? ▪ Are they in need of repair or replacement? ▪ Have the structures been placed where maximum deposition of wind-borne particles can occur?
Vegetation
▪ Is the ground bare? ▪ How tall and / or dense is the vegetation?
Hydraulic Mulch / Soil Binder
▪ Is the ground bare? ▪ How tall and / or dense is the vegetation? ▪ Has sufficient material been applied? ▪ How long will the material be expected to control erosion? ▪ Has the material broken down and is it still effective?

*** Reference: Maroochy Manual for Erosion & Sediment Control, Chapter 8, Version 1.0, December 2007*

EROSION & SEDIMENT CONTROL – SEDIMENT BASIN INSPECTION CHECK SHEET

Project:			
Site Location:			
Date Inspected:			
Inspected By	**Name:**	**Signature:**	
Site Coverage (%):			
Rainfall over last 24 hrs:	mm	(from site rain gauge)	
Basin Volume:	m^3	(approximate from basin indicator post)	
Dewatering Required	YES / NO	(required at 50% basin capacity)	
Date of Flocculation:			
Flocculating Agent:			
Flocculating Dosage:	kg		
Water Quality Parameters	**Results**	**Release Criteria**	**Complies**
Suspended Solids	mg/L	< 50 mg/L	YES / NO
pH	pH Units	6.5 - 8.5	YES / NO
Visual Amenity		No Visible Plume	YES / NO
Dewatering Approved By	Name:	Signature:	
Date of Dewatering:			
Accumulated Sediment Volume:	m^3	(approximate from basin indicator post)	
Removal Required	YES / NO	(at sediment storage capacity)	
Disposal of sediment:			
Sediment basin and diversion drains protected:			YES / NO
Emergency spillway stabilised with appropriate erosion protection:			YES / NO