IMPACT ASSESSMENT REVIEW REPORT

FOR

TWEED RIVER ENTRANCE SAND BYPASSING PROJECT

PERMANENT BYPASSING SYSTEM

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Department of Environment

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SUMMARY

Project Description

To address the worsening navigation at the Tweed River Entrance and continued erosion of the southern Gold Coast beaches, the Tweed River Entrance Sand Bypassing Project was formulated in consultation with New South Wales and Queensland governments.

The works are being carried out in two stages:

Stage 1: Dredging of the Tweed River entrance bar and associated nourishment of southern Gold Coast beaches. An Impact Assessment Review Report published in December 1994 considered the management of impacts for this stage and stage 1 works have since been undertaken;

Stage 2: Construction and operation of a permanent sand bypassing system which will remove sand from the Tweed River Entrance bar for placement on Gold Coast beaches in perpetuity (the subject of this Impact Assessment Review Report).

The Proposal

The proposal for a permanent sand bypassing system is generic and considers a range of feasible sand bypassing methodologies currently available or under development both internationally and locally.

A number of the most likely plant types and possible designs were examined and options selected for detailed environmental assessment in the IAS/EIS based on their ability to meet the project's requirements regarding site conditions, operational requirements and environmental, social and economic factors. These included a number of sand retrieval, sand transport and placement options.

Figure 1 is a map of the areas in Queensland and New South Wales affected by the proposal. The extent of proposed works for the permanent sand bypassing system are indicated in Figure 2 (a **generic compilation plan of different types** of sand bypassing systems).

Approvals Process

The Tweed River Entrance Sand Bypassing Project IAS/EIS was prepared to fulfil the requirements of Section 29 of the ***Queensland State Development and Public Works Organization Act 1971-1981*** and Part V of the *NSW* ***Environmental Planning and Assessment Act 1979.*** The Department of Urban Affairs and Planning (DUAP) is responsible for reviewing the EIS and public submissions and the Minister for Urban Affairs and Planning is the approval authority for the proposal. In Queensland the responsible authority is the Department of Environment (DoE). The terms of reference for the study were prepared by DoE and DUAP.

The IAS/EIS was publicly exhibited from 14 July to 12 August 1997 and two public meetings were held on the proposal. A Submissions Review Report considering all submissions received was prepared by Hyder Consulting, Patterson and Britton, and WBM Oceanics Australia.

Review Objectives

The objective of this report is to review the environmental issues associated with Stage 2 of the Tweed River Entrance Sand Bypassing Project as it relates to Queensland. The report considers the IAS/EIS and the Submission Review Report prepared by Hyder Consulting, Patterson Britton and Partners and WBM Oceanics Australia. These documents are evaluated in terms of the acceptability of potential environmental harm associated with the proposal. Recommendations are provided on environmental management measures to minimise adverse impacts associated with the most likely permanent sand bypassing system arrangement.

Environmental Impacts

The extent of environmental harm from the proposal will depend on the type of sand bypassing system selected by the preferred tender.

The main environmental issues in Queensland are discussed below:

Noise

Local residents in the vicinity of the beach nourishment activities could be affected by noise from construction, operational and maintenance activities. The permanent bypassing system (depending on the option selected), will potentially operate 24 hours a day in perpetuity. Operational noise could intermittently occur from the primary dredging system deposition processes, secondary land based systems, (e.g. booster pumps) and sand spreading operations.

The exact location and choice of plant and equipment for sand dredging and transport are yet to be determined and therefore will require examination regarding noise impacts and management measures following receipt of tenders and detailed design.

Flora and Fauna

The high conservation value of Kirra Reef and its associated biota warrants careful design and implementation of measures to protect this habitat. The principal concern is the possible smothering of habitat from sand dumping in the proximity of the reef. An exclusion zone of approximately 100m is recommended to slow/reduce the extent of reef smothering and ensure that no direct sand placement occurs in the reef area.

Gradual accumulation of sand around the base of the outcrops that form Kirra Reef is an unavoidable impact. This accumulation will be by the movement of sand through natural processes from adjacent nourishment areas and cannot be reversed**.** This accretion will compensate for the existing deficit of sand around the reef from the effect of the Tweed River walls depleting the littoral drift of sand to this area. The

Kirra Reef will likely, over time, be reduced in size to approximately its natural extent prior to construction of the Tweed River walls.

Fines material makes up a small proportion of the source material for beach nourishment. Nourishment operations are therefore unlikely to create a silt plume which would adversely impact upon water quality or Kirra Reef. Further sampling of source material will be necessary as will ongoing monitoring of Kirra Reef to ensure the conservation of this habitat.

Coastal Engineering

The retention and enhancement of beach amenity is a primary objective of stage 2 of the project. The IAS/EIS acknowledges there will be some decline in surf quality at Duranbah Beach which, whilst located in NSW, is probably utilised by Queensland residents and visitors and will potentially impact on the Queensland surfing industry.

Snapper Rocks has been identified as the primary sand discharge location for sand distribution to the other Southern Gold Coast beaches through natural drifts. Secondary discharge areas have been nominally identified in the IAS/EIS. (Refer figure 2).

The objective of the sand nourishment component of the project, is to achieve "a continuing supply of sand to the southern Gold Coast beaches at a rate consistent with the natural littoral drift updrift and downdrift", ie. to mimic nature.

The re-creation of historically observed coastal processes to re-establish the pre-wall conditions of accretion of sand to southern Gold Coast beaches is supported.

Water Quality

Sampling results to-date have shown few fines (which would affect turbidity), no measurable bacteria, heavy metals or pesticides in the material to be dredged. There are no major concerns with the quality of the sand located on Letitia Spit. However, the sediment quality in the lower estuarine shoals and other areas of the Tweed river has not been comprehensively dealt with in any study thus far. Sampling of these areas is needed because the scouring of these sediments during storm events may result in their deposition on the sand bar or on the Southern Gold Coast Beaches.

A monitoring program will also be needed for the sand dredging and dumping operations to ensure that only suitable clean sand is utilised.

Consideration should be given to the appropriateness of continuing dredging and nourishment operations during adverse weather conditions. The increased sediment load, turbidity and potential runoff contaminates discharged by the Tweed River during a major storm event may cause a decline in water and sand quality that is temporarily unacceptable for placement in the nourishment areas.

Land Use

Land use planning and management issues that arise will depend on the system chosen. They may include:

- the possible location of a permanent buried onshore sand pipeline and booster pumping stations;
- potential impacts associated with a jetty mounted system (diffusers accommodated by jetty structures near Frog Beach) including creation of new reef-type habitat, changes to species composition, reduction in benthic invertebrates and interference with migration paths of pelagic fish etc;
- build up of sand from nearby nourishment works at stormwater drainage outlets;
- temporary beach closures; and
- periodic navigational hazards during sand retrieval and nourishment operations if dredges are used.

Cultural Heritage

Consultation with indigenous communities in Queensland has not occurred to date. Where development occurs on, or within existing approved public service facility or public infrastructure no cultural assessment is required. A cultural heritage assessment will be required however for any demolition, surface disturbance, excavation, trenching, cutting or any other earth works or construction outside this area.

Visual Impacts

Visual impact associated with sand transport and placement will vary depending on the components of the sand bypassing system selected. Potential impacts range from relatively high to low. Visual impact mitigation measures as outlined in the IAS/EIS should be adopted for components of the selected sand bypassing system that create a visual impact.

Community Views

Thirty submissions were received on Stage 2 of the sand bypassing proposal. The attached Submission Review Report prepared by Hyder Consulting, Patterson Britton and Partners, and WBM Oceanics Australia contains a summary of the submissions, the submissions in full and recommendations for addressing concerns raised.

The Submission Review Report has addressed the concerns raised by submitters and recommended actioning additional matters which were identified in the report.

Project Program

It is recommended that a project program be produced outlining the anticipated timing for each of the components of the project. Such a program would clarify the roles and appropriate timing for input and necessary approvals from the many stakeholders involved in the project. The detail of such a project program may not be available

until after the receipt of tenders. However, it is an essential exercise prior to the awarding of the contract to facilitate the involvement of all parties.

Environmental Management Plan

Chapter 8 of the IAS/EIS outlines management issues for stage 2 of the proposal. The recommendations in this chapter should be combined with those in the Submission Review and those from the Impact Assessment Review Reports produced by Queensland and NSW and used as a framework for the EM Plan. Examples of the relevant issues that should be addressed in detail by the EM Plan relating to Queensland's concerns are listed below. A detailed and specific EM Plan should be developed once a successful tender has been accepted and the preferred sand bypassing system selected.

EM Plan Issues

- noise mitigation measures for construction and operational phases;
- beach nourishment program and associated works (including water and sand quality and sand movement monitoring, beach closure, etc.);
- control of sand placement adjacent to Kirra Reef (including monitoring of reef biota);
- onshore pipeline construction, operation and maintenance (including waste management, stockpiling, erosion and sediment control);
- accident and emergency response plans from the point of view of environmental harm and risks; and
- public consultation mechanism for responding to enquires and complaints.

To ensure the implementation of the project in accordance with acceptable risk of environmental harm it is essential to design and implement a monitoring program to provide quantitative assessment of performance. This should cover:

- noise monitoring at beach nourishment works and around booster pump locations to ensure acceptable noise levels are achieved at nearby sensitive sites;
- monitoring of Kirra Reef including ongoing surveys of turbidity and aquatic biota; and
- sand and water quality monitoring for the sand dredging and dumping operations to confirm clean suitable sand is being relocated and that no unacceptable environmental harm occurs.

A formal program of review and evaluation of the monitoring results should also be undertaken and corrective action implemented accordingly.

Additional Impact Assessment

The range of options examined by the IAS/EIS does not preclude any tender from proposing specific plant type/combinations and/or *modus operandi* which may not have been fully addressed in the IAS/EIS. The tender documentation will require the proponent to assess whether a specific proposal raises significant new environmental

issues and where this occurs the proponent may be required to carry out supplementary environmental studies. The impact assessment process may therefore not be complete until after the proposal is finalised through selection of the preferred contractor.

Findings and Conclusions

Some smothering of the existing extent of Kirra Reef is anticipated resulting from natural accretion of sand from adjacent nourishment areas. The size of the reef is therefore expected to return to its natural extent prior to the construction of the Tweed River walls. The construction and operation of the permanent sand bypassing system will potentially increase noise levels in the area. Providing implementation of the project complies with the undertakings given in the IAS/EIS, the Submission Review Report and the recommendations contained in this report the project is unlikely to cause unacceptable environmental harm. The consequences (in Queensland) of not undertaking the project would be continued erosion of southern Gold Coast beaches.

SUMMARY OF RECOMMENDATIONS

Noise

- **consideration be given** during tender evaluation **to systems which reduce the project construction time** and therefore reduce the duration of adverse impacts such as noise;

- once a decision is made on the method of sand recovery and pumping, **a more detailed study** should be undertaken into the noise aspects and control measures of the project. This should take into account the findings of the review of the proposed systems in Section 7.6.7.7 of the IAS/EIS, the Stage 1 EM plan and S8.4. of the IAS/EIS regarding minimising noise impacts;

- **a noise management plan**, which involves a detailed operational scheme, any necessary noise mitigation measures and community consultation, should be developed (as recommended in stage 1);

- prior to commencement of operations **noise monitoring** be carried out in the initial stages of beach nourishment at nearby residential locations to ensure acceptable noise levels are achievable both during the day and night and, if necessary, the works program modified if noise impacts are unacceptable;

- **night time operations** of heavy plant and equipment **be restricted** as much as possible to reduce the likely noise impact; and

- **noise levels** be assessed under the terms of the Queensland Noise Environmental Protection Policy regarding negotiated outcomes for noise levels and the criteria in

Table 2 of Department of Environment's Draft guideline N41 *Construction and Building Sites Environmental Noise Guideline.*

Flora and Fauna

- **survey and monitoring of Kirra Reef** should be continued in Stage 2 to ensure conservation of this valuable habitat. A procedure should be put in place for corrective action and for notifying key stakeholders should monitoring reveal unexpected impacts;

- a **contract condition be included in the tender documents** for stage 2 of the sand bypassing project for a buffer zone of approximately 100m surrounding Kirra Reef;

- **stringent control of sand dumping adjacent to Kirra Reef** should be enforced by a sand deposition exclusion zone of 100m from the edge of Kirra Reef (to be identified by marker buoys or navigational positioning systems); and

- **photogrammetric mapping of Kirra Reef** undertaken for phase 1 of the project should be continued with Stage 2 to monitor impacts of smothering on the eastern reef outcrops from natural drift.

Water Quality

- the quality of the material in **the lower estuarine shoals should be sampled and analysed** in accordance with appropriate procedures and protocols (eg. ANZECC *Draft Guidelines for the Environmental Assessment of the Sea Disposal of Dredged and Excavated Material*) and the results communicated to the Department of Environment;

- **the sediment and water quality monitoring program established** for stage 1 of the nourishment project should be continued to confirm that only clean suitable sand is relocated and that no adverse impacts occur from the nourishment operations;

- **the appropriateness of continued dredging** and nourishment operations **during adverse weather conditions** should be addressed by the tender submissions to ensure suitable clean sand is utilised, and to avoid adverse impacts at the nourishment area; and

- **an accident and emergency response plan** for accidents during construction and operation of the permanent sand bypassing system should **be prepared for accidents that may cause environmental harm**.

Land Use

- **the EM Plan should address** management of construction, operational and maintenance activities which may impact on the public and on existing infrastructure; and

- **a detailed program of works** should be prepared (including duration and location of temporary beach closures, temporary removal of shark nets, hours of operation, equipment to be used etc) and relevant permits and approvals obtained.

Cultural Heritage

- Once a bypassing option is selected **a detailed cultural heritage assessment should be undertaken** for any demolition, surface disturbance, excavation, trenching, cuttings or other earth works and construction. The cultural heritage assessment should ensure that adequate consultation with indigenous communities is undertaken to ensure that their concerns are addressed.

Visual Impacts

- **visual impact mitigation measures** as outlined in the IAS/EIS should be adopted for components of the selected sand bypassing system that create a visual impact.

Community Views

- Matters raised for actioning in the public submissions should be listed, cross-referenced to the submission review and incorporated either into the EM Plan or into an action plan depending on responsibility and timeframes for actioning:

- The EM Plan and action plan should be made publicly available; and

- The community liaison program established for phase 1 of the project (consisting of bulletins, contact lines and community group feedback mechanisms) should be continued for phase 2 of the project including continuity of the Community Advisory Committee established under the Deed of Agreement.

Project Program

- It is recommended that a project program be produced outlining the anticipated timing for the components of the project. Such a program would clarify the roles and appropriate timing for input and necessary approvals from the many stakeholders involved in the project.

Environment Management Plan

- **a detailed and specific EM Plan should be developed** once a successful tender has been accepted and the preferred sand bypassing system selected. The

recommendations in chapter 8 of the IAS/EIS should be combined with those in the Submission Review Report and those from the Impact Assessment Review Reports produced by Queensland and NSW and used as a framework for the EM Plan.

- **the project program, monitoring and EM Plan should be developed** in conjunction **with the Project Manager** and the successful **contractor** with input from and approval by **appropriate organisations** including **the Department of Environment**;

- **the EM Plan** conforms with the recommendations of this report and is **prepared and implemented for all components of the project.**

Additional Impact Assessment

- if the proposed activities differ significantly from those identified in the IAS/EIS the revised activities should be reassessed for their environmental implications and management measures identified. This information should be submitted to the Department of Environment prior to finalising design.

1. INTRODUCTION

1.1 Project Description

Safe passage into the Tweed River has long been hindered by the periodic formation of sand shoals at the river entrance. River training works and dredging have been undertaken since late last century in an attempt to improve navigability. These works culminated in the extension of the training walls at the river entrance during 1962-65. Although extension of the training walls improved navigation for a period, in recent years the entrance bar has reformed and again created navigation difficulties. As a result of the construction of the entrance training walls, patterns of erosion and accretion have been altered in the region. Accretion has occurred to the south of the southern training wall, resulting in a build up of sand along Letitia Spit and subsequent significant erosion has resulted along the southern Gold Coast beaches.

To address the worsening navigation at the Tweed River Entrance and continued erosion of the southern Gold Coast beaches, the Tweed River Entrance Sand Bypassing Project was formulated in consultation with New South Wales and Queensland governments.

On 31 March 1994, the Head of Agreement was signed between the Queensland (Qld) and New South Wales (NSW) Governments defining the Tweed River Entrance Sand Bypassing Project (NSW/Qld Heads of Agreement 1994). The agreement commits the Governments to undertake cost sharing of the entrance dredging, beach nourishment and construction and operation in perpetuity of a sand bypassing system. The works are being carried out in two stages:

Stage 1: Dredging of up to 2.5 million m^3 from the Tweed River entrance bar and associated nourishment of southern Gold Coast beaches. An Impact Assessment Review published in December 1994 considered the management of impacts for this stage and stage 1 works have since been undertaken;

Stage 2: Construction and operation of a permanent sand bypassing system which will remove sand from the Tweed River Entrance bar and place the sand on the Gold Coast beaches in perpetuity. The identification of risks of environmental harm and management options associated with nourishing the Gold Coast beaches is considered in this Impact Assessment Review Report. Management of impacts from stage 2 on New South Wales' environmental values is considered in a separate report *The Tweed River Entrance Sand Bypassing System Director General's Report* April 1998 produced by NSW Department of Urban Affairs and Planning (DUAP).

Both Queensland and New South Wales have acknowledged the anticipated benefits of the project. The NSW objective is to establish and maintain a navigable channel at least 3.5 metres below the Indian Springs Low Water level in the approach to and

within the Tweed River mouth training walls. The Queensland goal is to achieve a continuing supply of sand to southern Gold Coast beaches at a rate consistent with littoral drift, together with the supply of additional sand to restore and maintain the recreational amenity of the beaches.

1.2 The Proposal

The affected area is located on the NSW/Queensland border in Gold Coast City Council (Queensland) and Tweed Shire in NSW. Figure 1 is a map of the area.

The proposal for a permanent sand bypassing system is generic and considers a range of feasible sand bypassing methodologies currently available or under development both internationally and locally.

A number of the most likely plant types and possible set-ups were examined which fall into the broad categories of:

- over the water mobile systems;
- fixed systems located in the nearshore zone;
- onshore based mobile systems; and
- other systems.

A qualitative assessment of a long list of alternative plant and equipment sand bypassing systems was undertaken and options selected based on their ability to meet the project's requirements regarding site conditions, operational requirements and environmental, social and economic factors.

Feasible options selected for **detailed** environmental assessment in the IAS/EIS included a number of sand retrieval options and sand transport and placement options. The selected sand retrieval options included:

- trailing suction hopper dredger;
- cutter suction dredger;
- jack up dredger;
- land based plant customised for dredging;
- jetty mounted system; and
- sand fluidisation and transportation technology.

Sand transport and placement options selected for detailed environmental assessment included:

- pipeline and associated ancillary equipment;
- bottom dumping;
- pumping ashore; and
- discharge outlets.

The extent of proposed works for the permanent sand bypassing system are indicated in Figure 2. This figure is a **generic compilation plan** outlining potential work areas required for **different types** of sand bypassing methodologies and plant and equipment systems.

1.3 Approvals Process

The project involves dredging to be carried out in NSW and beach nourishment in Queensland, and is therefore under the jurisdiction of legislation of both States.

The Tweed River Entrance Sand Bypassing Project IAS/EIS was prepared to fulfil the requirements of Section 29 of the ***Queensland State Development and Public Works Organization Act 1971-1981*** and Part V of the *NSW* ***Environmental Planning and Assessment Act 1979.*** The DUAP is responsible for reviewing the EIS and public submissions and the Minister for Urban Affairs and Planning is the approval authority for the proposal. In Queensland the responsible authority is the Department of Environment (DoE). The terms of reference for the study were prepared by DoE and DUAP.

For Stage 2 of the project, comments on the proposed permanent sand bypass system and nourishment operations were initially sought from the local community in June 1996 through local newspaper advertisements and posters at public locations. A public meeting was then held at Tweed Heads Civic and Cultural Centre on 31 July 1996 attended by approximately 40 people including local residents, Councillors, fishermen, surfing community representatives, local media and representatives from local businesses.

The IAS/EIS was placed on exhibition from 14 July to 12 August 1997. The exhibition period was advertised in the following newspapers:

- Brisbane Courier Mail
- Sydney Morning Herald
- Tweed Daily News
- Gold Coast Bulletin

A Public Meeting was held on 28 July 1997 to discuss the IAS/EIS and approximately 90 people attended.

Thirty submissions were received. Following completion of the exhibition period, Hyder Consulting, Patterson and Britton and WBM Oceanics Australia prepared a Submission Review Report to consider the submissions received and recommend measures to address issues raised. Additional work carried out following the outcomes of the Submission Review Report included *Supplementary information Tweed Entrance bypass threatened avifauna assessment* produced by WBM Oceanics, December 1997 and *A cultural heritage assessment of the terrain to be impacted by the proposed Tweed River entrance sand bypassing project"* by S.J Davies November 1997.

1.4 Review Objectives

The objective of this report is to review the assessment of environmental issues associated with Stage 2 of the Tweed River Entrance Sand Bypassing Project as it relates to Queensland. The report considers the IAS/EIS and the Submission Review Report prepared by Hyder Consulting, Patterson Britton and Partners and WBM Oceanics Australia.

The objective of this report is to review the environmental issues associated with Stage 2 of the Tweed River Entrance Sand Bypassing Project as it relates to Queensland. The report considers the IAS/EIS and the Submission Review Report prepared by Hyder Consulting, Patterson Britton and Partners and WBM Oceanics Australia. These documents are evaluated in terms of the acceptability of potential environmental harm associated with the proposal. Recommendations are provided on environmental management measures to minimise adverse impacts.

Currently the proposed plant and equipment systems for the removal and placement of sandy material have not been finalised. Only following the submission of tenders will the details of alternative dredging and nourishment operation proposed by competing contractors be known. Therefore this review considers the most likely systems and combinations of onshore and offshore activities associated with the sand dredging and nourishment works as they have been assessed in the IAS/EIS.

1.5 Existing Environment (Queensland)

The study area is located on the NSW/Queensland border. (Refer Figure 1). The local topography is characterised by a low lying coastal plain with significant areas of higher relief formed by volcanic rock outcrops. Prominent rock outcrops include Kirra Point, Greenmount Hill and Point Danger.

The coastal area is highly dynamic. The key natural coastal sedimentary processes in the region are littoral transport averaging a net northerly rate of 500 000 m^3 per year. High beach variability occurs with extensive erosion caused by storm events and then gradual beach recovery. Strong wind induced dune development occurs (particularly on east facing beaches). The area is subject to a moderate to high energy ocean wave climate with significant seasonal variability.

Limited sediment samples taken from the proposed dredging and nourishment areas indicate that the sand is very clean and mobile with virtually no heavy metals, pesticides or bacterial contamination. More sampling will be required to further substantiate these findings.

The oceanic water quality is generally excellent under dry weather conditions.

The construction of the Tweed River training walls resulted in changes to the natural processes of erosion and accretion. Accretion occurred to the south of the southern training wall along Letitia Spit, and significant erosion occurred along the southern Gold Coast beaches which is being offset by a series of artificial beach nourishment works over time.

The rocky reefs offshore from Point Danger, Snapper Rocks and Kirra Beach support a rich diversity of marine flora and fauna. The ecology of Kirra Reef, located off Kirra Beach is particularly rich considering its nearshore location surrounded by a highly mobile sandy bed.

A rich and abundant fish fauna occurs along the coast and the study area supports a wide range of other marine and aquatic species including oysters, prawns and beachworms.

The foreshore lands adjacent to the proposed nourishment area are zoned by the Gold Coast City Council as "Open Space", behind which is the business district of Coolangatta. Greenmount and Rainbow Beach to the east and Kirra to the west are predominantly zoned for multi-unit residential; including high-density residential. Land along the coast has been predominantly developed with apartment buildings/holiday units. Some small businesses largely serving the tourist trade have developed along the coastal area and along the Gold Coast Highway. Businesses include a regional retail shopping centre in Tweed Heads with other retail activities in the area concentrated along the beachfront at Greenmount and Coolangatta Beach and the Gold Coast Highway in Queensland.

A variety of water-based recreational opportunities are provided as a result of the beaches and Tweed River system. The ocean and the beaches provide visual amenity, opportunities for swimming, surf board riding, boating and fishing (recreational and commercial), a whole spectrum of water-based and beach activities as well as walking, cycling and jogging.

The southern Gold Coast beaches affected by the proposed nourishment operations are Rainbow Bay, Greenmount, Frogs, Coolangatta, North Kirra and Kirra Beaches (Refer to figure 2). These beaches are of enormous importance to the region as recreational assets. Recreational activities such as Surf Life Saving Clubs provide a social and recreational focus which is utilised by the community and in particular the youth of the area.

Kirra Reef is a series of basalt outcrops offshore from Kirra Beach that is a popular diving location. Parts of the rock outcrops are easily accessed from shore by snorkellers and more offshore parts of the reef are utilised by scuba divers. The reef supports a variety of aquatic flora and consequently is a valuable habitat and recreational asset.

Tourism is one of the most important industries in the area of the proposal for both Queensland and NSW. The beaches are natural attributes that drive tourism. The area is subject to competition from other areas in the region for the tourism market and therefore, the preservation and enhancement of natural attributes is important in maintaining tourism in the area.

2. ENVIRONMENTAL ISSUES

The extent of environmental harm will depend on the type of sand bypassing system selected by the preferred tender.

The main environmental issues in Queensland for the Tweed River entrance maintenance dredging and associated nourishment of the southern Gold Coast beaches proposal are:

- the noise generated from potentially 24 hour a day sand transport and deposition;
- the effects of sand placement on the flora and fauna of Kirra Reef;
- the retention and enhancement of beach amenity and surfing conditions;
- the retention of existing high water quality;
- ensuring the dredging and placement of only suitable clean sand; and
- construction impacts of pipelines, booster locations, discharge outlets and associated activities (e.g. storage and waste disposal) as well as disturbance for maintenance activities.

A key objective of the impact assessment review process will be the drafting of a site specific Environmental Management Plan describing acceptable levels of environmental harm and strategies to achieve those levels.

2.1 Noise

The proposal has the potential to generate noise from:

- construction activities;
- the primary dredging system deposition processes;
- secondary land based systems, e.g. booster pumps at Boundary Street and Kirra Point Groyne;
- sand spreading operations which are likely to involve earthmoving machinery such as a bulldozer and a loader on the beach and sand pumping either from a barge offshore or an onshore pipeline; and
- maintenance activities such as maintenance of pipelines, etc.

All of these activities may cause noise nuisance for local residents in the vicinity of beach nourishment activities. The construction phase may generate significantly greater levels of noise than the operational phase. The permanent bypass system will potentially, depending on the option selected, operate 24 hours, in perceptivity.

The exact location and choice of plant and equipment for sand dredging and transport are yet to be determined and therefore will require examination regarding noise impacts following receipt of tenders and detailed design.

It is recommended that:

- **consideration be given** during tender evaluation **to systems which reduce the project construction time** and therefore reduce the duration of adverse impacts such as noise

- once a decision is made on the method of sand recovery and pumping, **a more detailed study should** be undertaken into the noise aspects and control measures of the project. This should take into account the findings of the review of the proposed systems in Section 7.6.7.7 of the IAS/EIS, the Stage 1 EM Plan and S8.4. of the IAS/EIS regarding minimising noise impacts;

- **a noise management plan**, which involves a detailed operational scheme, any necessary noise mitigation measures and community consultation, should be developed (as recommended in stage 1) prior to commencement of operations;

- **noise monitoring** be carried out in the initial stages of beach nourishment at nearby residential locations to ensure acceptable noise levels are achievable both during the day and night time and, if necessary, the works program modified if noise impacts are unacceptable;

- **night time operations** of heavy plant and equipment **be restricted** as much as possible to reduce the likely noise impact; and

- **noise levels** be assessed under the terms of the Queensland Noise Environmental Protection Policy regarding negotiated outcomes for noise levels and Table 2 in the Department of Environment's Draft guideline N41 *Construction and Building Sites Environmental Noise Guideline.*

2.2 Flora and Fauna

The high conservation value of Kirra Reef and its associated flora and fauna warrants careful design and implementation of measures to protect this habitat. The principal concern regarding Kirra Reef is the proximity of sand dumping and the possibility of smothering the reef habitat. A buffer zone of approximately 100m surrounding the reef as a designated area in which plant is prohibited was included in contract conditions for Stage 1 nourishment activities. This exclusion zone is expanded from the original 50m buffer proposed in the IAS/EIS, for both Stage 1 and Stage 2. The 100m buffer was described in the tender documents for stage 1 as 'a plant exclusion line" from the edge of the reef of generally greater than 100m (the minimum distance from the reef to the adopted exclusion line is 85 meters). The same contract condition is recommended for stage 2. The enforcement of this contract condition will slow/reduce the extent of reef smothering and ensure that no direct sand placement

occurs in the reef area. All sand nourishment operations should aim to minimise turbidity in the nourishment areas.

Gradual accumulation of sand around the base of the outcrops that form Kirra Reef is an inevitable impact of the project . This accumulation will be by the movement of sand through natural processes from adjacent nourishment areas and cannot be reversed. The IAS/EIS does not raise this as a major concern because slow accretion around the base of the outcrops have always occurred in the past and will compensate for the existing deficit of sand around their bases from the effect of the Tweed River walls depleting the littoral drift of sand to this area. The Kirra Reef will therefore, over time, be reduced in size to approximately its natural extent prior to construction of the Tweed River walls. The extension of the exclusion zone from 50m to 100m would help to minimise the rate of this potential impact.

The IAS/EIS indicates that there is a low fines fraction (ie. silt and clay), in the marine sand forming the Tweed bar. The nourishment operations are therefore unlikely to create a silt plume which may adversely impact upon water quality or Kirra Reef biota. More sampling will be required to further substantiate these findings.

Extensive baseline monitoring providing quantitative information on the fauna and flora of Kirra Reef was recommended for stage 1 of the project to serve as a meaningful benchmark for ongoing monitoring of Kirra Reef. This monitoring should continue for stage 2 to assist in the identification of any adverse impact upon the reef resulting from nourishment activities and to help to ensure the conservation of this habitat.

It is recommended that:

- **survey and monitoring of Kirra Reef** should be continued in Stage 2 to ensure conservation of this valuable habitat. A procedure should be put in place for corrective action and for notifying key stakeholders should monitoring reveal unexpected impacts;

- **a contract condition be included in the tender documents for stage 2** of the sand bypassing project for a buffer zone of approximately 100m surrounding Kirra Reef;

- **stringent control of sand dumping adjacent to Kirra Reef** should be enforced by a sand deposition exclusion zone of 100m from the edge of Kirra Reef (to be identified by marker buoys or navigational positioning systems); and

- **photogrammetric mapping of Kirra Reef** undertaken for phase 1 of the project should be continued with Stage 2 to monitor impacts of smothering on the eastern reef outcrops from natural drift;

2.3 Coastal Engineering

The retention and enhancement of beach amenity is a primary objective of stage 2 of the project. Concerns have been raised that the sand nourishment will adversely affect wave break and impact on surfing conditions.

The IAS/EIS acknowledges there will be some decline in surf quality at Duranbah Beach which, whilst located in NSW, is probably utilised by Queensland residents and visitors and will potentially impact on the Queensland surfing industry.

The extent of the impact will depend upon the characteristics of the chosen bypass scheme. A "leaky" scheme could allow significant quantities of sand to feed the Duranbah shoals and lessen the impact whereas a scheme with little natural bypassing would adversely affect the high quality surfing characteristics of the site.

One of the anticipated positive impacts of the project is higher quality surfing conditions between Snapper Rocks and Kirra as a result of refining and controlling the sand supply for beach nourishment.

The objective of the sand nourishment component of the Project is to achieve "a continuing supply of sand to the southern Gold Coast beaches at a rate consistent with the natural littoral drift updrift and downdrift", ie. to mimic nature.

Snapper Rocks has been identified through detailed numerical modelling of the distribution of longshore transport and analysis of hydrographic survey data as the primary sand discharge location for sand distribution to the other Southern Gold Coast beaches through natural drifts. Secondary discharge areas have been nominally identified in the IAS/EIS. (Refer figure 2)
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The project objective is to supply sand to Snapper Rocks at a rate consistent with the natural sand transport capacity of waves at Snapper Rocks. This will be reflected in the performance criteria for the bypass system.

Monitoring of previous southern Gold Coast beach nourishment campaigns has indicated that sand is most efficiently redistributed into an equilibrium beach profile by natural coastal processes. The design philosophy behind the project is to replicate coastal conditions that existed prior to the Tweed River walls construction..

The re-creation of historically observed coastal processes to re-establish the pre-wall conditions of accretion of sand to southern Gold Coast beaches is supported.

2.4 Water Quality

The IAS/EIS indicates that significant water pollution resulting from proposed nourishment works is not anticipated. Sampling results showed few fines (which would affect turbidity), no measurable bacteria, heavy metals or pesticides in the

material to be dredged. Evaluation of the information associated with this project has indicated there are no major concerns with the quality of the sand which is located on Letitia Spit and no further analysis of this material is needed. However, it is expected that the rate of sediment flow to the Tweed shoals will increase as a result of improved hydraulic efficiency of the entrance to the Tweed estuary from the widening and deepening of the entrance channel. The sediment quality in these lower estuarine shoals and other areas of the Tweed river has not been comprehensively dealt with in any study so far. Further sediment sampling and testing is necessary because the scouring of these sediments during storm events may result in their deposition on the Southern Gold Coast Beaches. Options to manage any contaminated material identified would have to be developed.

A monitoring program should also be established for the sand dredging and dumping operations to ensure that only suitable clean sand is utilised. Such a program would need to detail procedures as to the frequency of sampling and the testing methods applied to dredged material. The sand and water quality monitoring program should provide results prior to sand placement to ensure no unacceptably contaminated sand or water is imported to the nourishment area. The monitoring, sampling and reporting methods will need to be submitted by the successful contractor to DoE for approval. The project EM Plan should detail the monitoring program.

Consideration needs to be given to the appropriateness of continuing dredging and nourishment operations during adverse weather conditions. The increased sediment load, turbidity and potential runoff contaminates discharged by the Tweed River during a major storm event may cause a decline in water and sand quality that is temporarily unacceptable for placement in the nourishment areas. This issue should be addressed and submitted with the tenders and if necessary guidelines to ensure clean suitable sand is used during operations be included in the tender submissions.

Pollution control devices and remediation measures should be readily available in the event of accidents such as fuel or oil spills. An emergency response plan for accidents should be in place throughout the construction and operation phases.

<u>It is recommended that</u>:

- the quality of the material in **the lower estuarine shoals be sampled and analysed** in accordance with appropriate procedures and protocols (e.g. ANZECC *Draft Guidelines for the Environmental Assessment of the Sea Disposal of Dredged and Excavated Material*) and the results communicated to the Department of Environment;

- **the sediment and water quality monitoring program established** for stage 1 of the nourishment project should be continued to confirm that only clean suitable sand is relocated and that no adverse impacts occur from the nourishment operations.

- **the appropriateness of continued dredging** and nourishment operations **during adverse weather conditions** should be addressed by the tender submissions to

ensure suitable clean sand is utilised, and to avoid adverse impacts at the nourishment area; and

- **an accident and emergency response plan** for accidents during construction and operation of the permanent sand bypassing system should **be prepared for accidents that may cause environmental harm**.

2.5 Land Use

The major land use planning and management issue relates to the possible location of a permanent buried onshore sand pipeline and booster pumping stations. These would be subject to Gold Coast City Council approvals and the booster pumping stations would need to be designed and positioned to minimise visual and noise impacts.

Potential impacts associated with a jetty mounted system (e.g. diffusers accommodated by jetty structures near Frog Beach) include creation of new reef-type habitat, alteration of the species composition of the marine faunal communities and reduction in benthic invertebrates in the immediate proximity of the jetty. The jetty system may possibly cause interference to the migration paths of pelagic fish;

Stormwater drainage outlets could be affected by a build up of sand from nearby nourishment works. The maintenance of these outlets needs to be addressed in the Environmental Management Plan to ensure blockage does not occur.

Temporary closure of a section of beach may be necessary during construction of the permanent bypassing system and during beach nourishment operations for dredging and nourishment activities associated with mobile systems. A program of works should be provided in the detailed design with the objective of minimising disruption to beach user's activities.

Should the temporary removal of shark nets be necessary for the beach nourishment operations this activity must be co-ordinated with Queensland Boating and Fisheries Patrol.

If dredgers are used as a system option, their periodic presence also presents navigational hazards during sand retrieval and nourishment operations.

The detail of dredging and nourishment operations needs to determine whether it is necessary and feasible to exclude fishing trawlers from certain areas for the duration of the activities.

It is recommended that:

- **the EM Plan address** management of construction, operational and maintenance activities which may impact on the public and on existing infrastructure; and

- **a detailed program of works** be prepared (including duration and location of temporary beach closures, temporary removal of shark nets, hours of operation, equipment to be used etc) and relevant permits and approvals obtained as outlined in section 2.4 of the IAS/EIS.

2.7 Cultural Heritage

Consultation with indigenous communities in Queensland has not occurred to date. Where the proposed development occurs on, or within existing approved public service facility or public infrastructure cultural heritage assessment is not required. However, outside of this area a cultural heritage assessment is required for all parts of the proposal that involve demolition, surface disturbance, excavation, trenching, cutting or any other earth works or construction. This survey must be conducted under permit pursuant to the *Cultural Record (Landscapes Queensland and Queensland Estate) Act* 1987.

It is therefore recommended that:

- Once a bypassing option is selected **a detailed cultural heritage assessment should be undertaken** for any demolition, surface disturbance, excavation, trenching, cuttings or other earth works and construction. The cultural heritage assessment should ensure that adequate consultation with indigenous communities is undertaken to ensure that their concerns are addressed.

2.8 Visual Impacts

Visual impact associated with sand transport and placement will vary depending on the components of the sand bypassing system selected. Potential impacts range from relatively high to low.

Recommendation

- **visual impact mitigation measures** as outlined in the IAS/EIS should be adopted for components of the sand bypassing system that create a visual impact.

3. COMMUNITY VIEWS

Thirty submissions were received on Stage 2 of the sand bypassing project. The attached Submission Review Report prepared by Hyder Consulting, Patterson Britton and Partners and WBM Oceanics Australia contains a summary of the submissions, the submissions in full and recommendations for addressing concerns raised.

The following is a summary of some of the main issues raised by Queensland respondents. (Some of these concerns related to impacts outside the Queensland border):

- navigation hazards associated with dredging;
- concern regarding the impact of the project on the surf quality of Kirra and Duranbah beaches;
- potential socio-economic impacts if the beach conditions at Duranbah are adversely affected in terms of negative impacts on the surfing community/industry and recreational opportunity for the unemployed;
- potential impact on Kirra Reef from sand deposition;
- lack of coverage of safety and visual amenity of the discharge points in the IAS/EIS;
- potential impact of fixed bypassing systems on commercial fish species;
- timing of construction activities to avoid impacts on commercial net fisheries as well as migratory shore birds;
- the need to consider the possibility of separating construction sand from the extracted material;
- noise mitigation is required for both construction and operational phases of the project;
- the need for discussions with Queensland Aboriginal groups with affiliation to the study area and investigation of the possibility that native title exists over the land;
- the need for further investigation of heritage values;
- potential impacts on property owners, proposed development, commercial and recreational fishing industry and public use of site;
- concern regarding erosion at Letitia Spit reducing recreational and visual amenity;
- concern regarding maximum doubling wave height into Tweed River;
- need to enhance wildlife habitats through this project especially for birds;
- several respondents suggested preferred systems/options and sand outlet locations. Suggestions included options that would achieve:
  - improved surf conditions and/or
  - minimise environmental effects (e.g. on fisheries).

The Submission Review Report has addressed the concerns raised by submitters. Views with regard to preferred systems are to be taken into account by the Project Principals when developing evaluation criteria for the tender for detailed proposals along with other selection criteria relating to cost effectiveness and minimising environmental impacts. These submissions indicated there was no one system option clearly preferred by regulatory agencies or the local community.

Considerations of alternative suggestions for **sand discharge points** were largely constrained by the Deed of Agreement as well as natural coastal engineering processes. This could perhaps have been made clearer during the public consultation period.

One of the outcomes from the submissions was that further work in relation to compliance with the *"Threatened Species Act"* (NSW) be undertaken. The outcome of this work is covered in the NSW Director General's report.

Recommendation

The Submission Review Report recommended actioning the additional matters which were identified in the review. This is supported. However, it did not state how this would occur or how accountability for actioning these matters would be achieved.

It is therefore recommended that:

- Matters raised for actioning in the submissions be listed, cross-referenced to the submission review and incorporated either into the EM Plan or into an action plan depending on responsibility and timeframes for actioning:

ACTION PLAN

Submission Review Ref	Action	Timeframe	Responsibility	Date/s enacted
1.2	Notice to marinas on dredging commencement and timeframes	Prior to dredging	System operator	

Example of an action plan format.

- The EM Plan and action plan be made publicly available; and

- The community liaison program established for phase 1 of the project (consisting of bulletins, contact lines and community group feedback mechanisms) should be continued for phase 2 of the project including continuity of the Community Advisory Committee established under the Deed of Agreement.

4. PROJECT PROGRAM

It is recommended that a project program be produced outlining the anticipated timing for the components of the project. Such a program would clarify the roles and appropriate timing for input and necessary approvals from the many stakeholders involved in the project. The detail of such a project program may not be available until after the receipt of tenders. However, it is an essential exercise prior to the awarding of the contract to facilitate the involvement of all parties.

A sample of the types of activities that need to be programmed are outlined below:

- tender period;
- tender review;
- baseline studies;
- awarding of contract;
- detail design;
- consultation with local community (noise, landuse);
- monitoring programs (noise, water quality, coastal engineering);
- EM Plan (beach closure, emergency response, public enquires);
- review and conditions of approval of detail design;
- construction; and
- review monitoring and reporting.

The above list is by no means exhaustive, but it does indicate the types of activities to be programmed. Particular consideration should be given to the organisations which should be afforded the opportunity to contribute to each activity and to the issuing of necessary approvals.

5. ENVIRONMENTAL MANAGEMENT PLAN

Chapter 8 of the IAS/EIS outlines management issues for stage 2 of the proposal. The recommendations in this chapter should be combined with those in the Submission Review and those from the Impact Assessment Review Reports produced by Queensland and NSW and used as a framework for the EM Plan. Examples of the relevant issues that should be addressed in detail by the EM Plan relating to Queensland's concerns are listed below. A detailed and specific EM Plan should be developed once a successful tender has been accepted and the preferred sand bypassing system selected. A suggested preparation guideline of an acceptable EM Plan is contained in Appendix A.

EM Plan Issues

- noise mitigation measures for construction and operational phases;
- beach nourishment program and associated works (including water and sand quality and sand movement monitoring, beach closure, etc.);
- control of sand placement adjacent to Kirra Reef (including monitoring of reef biota;
- onshore pipeline construction, operation and maintenance (including waste management, stockpiling, erosion and sediment control);
- accident and emergency response plans from the point of view of environmental harm and risks; and
- public consultation mechanism for responding to enquires and complaints.

To ensure the implementation of the project in accordance with acceptable risk of environmental harm it is essential to design and implement a monitoring program to provide quantitative assessment of performance.

A noise monitoring program should be developed prior to construction commencing. Noise monitoring will be necessary at beach nourishment works and around booster pump locations to ensure acceptable noise levels are achieved at nearby sensitive sites.

Monitoring of Kirra Reef needs to be undertaken. Ongoing surveys of turbidity and aquatic biota should be conducted to ensure conservation of this valuable habitat and popular recreation asset.

A sand and water quality monitoring program is required for the sand dredging and dumping operations to confirm clean suitable sand is being relocated and that no unacceptable environmental harm occurs.

A formal program of review and evaluation of the monitoring results should be undertaken. Unanticipated outcomes or variance from design expectations during construction and operation may be identified by the review process and corrective action implemented accordingly.

It is recommended that:

- **a detailed and specific EM Plan be developed** once a successful tender has been accepted and the preferred sand bypassing system selected. The recommendations in chapter 8 of the IAS/EIS should be combined with those in the Submission Review and those from the Impact Assessment Review Reports produced by Queensland and NSW and used as a framework for the EM Plan.

- **the project program, monitoring and EM Plans be developed** in conjunction **with the Project Manager** and the successful **contractor** with input from and approval by **appropriate organisations** including **the Department of Environment**;

- **the EM Plan** conforms with the recommendations of this report and is **prepared and implemented for all components of the project.**

6. ADDITIONAL IMPACT ASSESSMENT

The range of options examined by the IAS/EIS does not preclude any tender from proposing specific plant type/combinations and/or *modus operandi* which may not have been fully addressed in the IAS/EIS. The tender documentation will require the proponent to assess whether a specific proposal raises significant new environmental issues and where this occurs the proponent may be required to carry out supplementary environmental studies pursuant to the impact assessment process under the *State Development and Public Works Organisation Act*. The impact assessment

may therefore not be completed until after the proposal is finalised following selection of the preferred contractor.

It is recommended that:

- if the proposed activities differ significantly from those identified in the IAS/EIS that the revised activities are reassessed for their environmental implications and management measures identified. This information should be submitted to the Department of Environment prior to finalising design.

7. FINDINGS AND CONCLUSIONS

7.1 Findings

The Gold Coast beaches involved in stage 2 of the nourishment operations are of enormous importance to the region as natural attributes that provide recreational opportunities which support tourism. The IAS/EIS did not identify any exceptional natural values or endangered species of flora or fauna associated with the southern Gold Coast beaches. The ongoing depositing activities associated with the nourishment of southern Gold Coast beaches are unlikely to cause unacceptable environmental harm in the short or long term.

The ultimate objective of the proposal is to supply sand to, and restore the amenity of, southern Gold Coast beaches, as well as to achieve a continuing supply of sand at a rate consistent with the littoral drift which has been interrupted by the artificial action of the Tweed River entrance breakwaters.

Nourishment of the southern Gold Coast beaches will improve beach amenity and provide greater protection to Gold Coast foreshore development against storm erosion.

The consequences (in Queensland) of not undertaking the project would be continued erosion of southern Gold Coast beaches.

7.2 Conclusion

Some smothering of the existing extent of Kirra Reef is anticipated resulting from natural accretion of sand from adjacent nourishment areas. The size of the reef is therefore expected to return to its natural extent prior to the construction of the Tweed River walls. The construction and operation of the permanent sand bypassing system will potentially increase noise levels in the area. Providing implementation of the project complies with the undertakings given in the IAS/EIS, the Submission Review Report and the recommendations contained in this report the project is unlikely to cause unacceptable environmental harm.

APPENDIX A

PREPARATION GUIDELINE

ENVIRONMENTAL MANAGEMENT PLANS

FIGURES

PREPARATION GUIDELINE
ENVIRONMENTAL MANAGEMENT (EM) PLANS

How an EM Plan Relates to Impact Assessment (IA)

Impact assessment is an established process for:

- ensuring that proponents take primary responsibility for protection of the environment which may be affected by their proposals;
- evaluating the potential environmental (biophysical, social and economic) impacts of a proposal;
- forming a basis for statutory decisions on whether a proposal should proceed, ie. following timely and sound environmental advice;
- including community views in the assessment and decision making process;
- ensuring that ecologically sustainable development (ESD) can be achieved by a proposal; and
- determining the basis for ongoing environmental management and monitoring, during construction and operation, should the proposal proceed.

The IA process determines the issues applicable to the proposal and results in appropriate strategies to control or avoid environmental harm. The IA process allows design modifications and mitigation measures to be developed to address identified environmental impacts.

The essential components of an IA are:

- description of the proposal and its objectives;
- assessment of any viable alternatives which may be realistically available to meet the objectives;
- description of the directly and indirectly associated environment;
- prediction of environmental impacts of the proposal on the environment;
- evaluation of the significance of impacts and risk of environmental harm;
- options for mitigation measures to control predicted impacts to ecologically sustainable levels;
- proposals for management and monitoring of predetermined parameters as indicators of the adequacy of control measures; and
- proposals for auditing of environmental management performance and options for corrective actions that may be required.

Public and stakeholder input is essential in the IA process at key stages such as development of terms of reference for the IA and review of the draft IA. If undertaken properly, this process enables proponents, the community and decision makers (or regulators) to observe and manage predicted impacts: the process is outcome oriented, management focused and proposal specific.

Mitigation and management measures for all environmental management topics are consolidated in an Environmental Management (EM) Plan [some DoE regional offices refer to this as a "site based Environmental Management Plan"]. An EM Plan can be given statutory effect through formal approvals. The EM Plan comes into effect when a decision is made to proceed.

The EM Plan has the following characteristics:

- **The EM Plan flows from the IA and continues through the life of the project ie. through pre-construction, construction, operation and decommissioning phases;**
- **It allows for the integration of the various regulations pursuant to any development approval in an ordered, flexible and integrated format that is audible by the proponent and regulatory agency;**
- **It enables operational approvals, such as licences, to be integrated with planning and development approvals;**
- **It facilitates developer planning for protection of the environment and can be used for operational guidance and compliance monitoring; and**
- **EM Plans are consistent with and can form part of a company's Environmental Management System (EMS) (term used by International and British Standards: ISO 14001 and BS 7750) or Integrated Environmental Management System (term used by Environmental Protection Act) or Quality Assurance system (business term).**

Post-approval monitoring is an essential component of an EM Plan, because it:

- enables improvements in predictive capacity by providing a means of measuring the success of design and mitigation measures (developed through a comprehensive IA process) in protecting the environment;

- improves the public accountability of the outcomes of the IA process; and

- ensures that the impact assessment process will result in the protection of the environment and identifies any remedial actions required to ensure a project achieves ESD.

Purpose of EM Plan

The intention of an EM Plan is to provide life of development control strategies in accordance with agreed performance criteria for acceptable levels of environmental harm. The purpose of an EM Plan is to specify all potential environmental impacts, performance criteria, and mitigation strategies together with relevant monitoring, reporting and, if an undesirable impact or unforeseen level of impact occurs, the appropriate corrective action.

An EM Plan contains clear commitments, framed in a way which enables later assessment of the extent to which the commitment has been met. The commitments must be audible.

An EM Plan is structured to address the key elements of environmental management on-site and in proximity to the site for the life of the development. Performance criteria for all elements are determined in the process of formulating an acceptable EM Plan.

The **aims** of the EM Plan are to provide:

1. evidence of practical and achievable plans for the management of the project to ensure that environmental requirements are complied with, by producing an integrated planning framework for comprehensive monitoring and control of construction and operational impacts. Specific commitments on strategies and design standards to be employed should also be given;

2. local, State and Commonwealth authorities and the proponent with a framework to confirm compliance with policies and conditions; and

3. the community with evidence of the management of the project in an environmentally acceptable manner.

Format of an EM Plan

The following is a suggested format designed to ensure adequate detail has been provided to demonstrate that the proposed mitigation of potential impacts will result in appropriate management strategies. The EM Plan development process is outlined in the attached flow diagram.

Essential components are:

- establishment of agreed **performance criteria and objectives** in relation to environmental and social impacts;

- detailed **prevention, minimisation and mitigation strategies (including design standards)** for controlling environmental impacts at specific sites;

- details of the proposed **monitoring** of the effectiveness of remedial measures against the agreed performance criteria in consultation with relevant government agencies and the community;

- details of implementation **responsibilities** for environmental management;

- **timing** (milestones) of environmental management initiatives;

- **reporting** requirements and **auditing** responsibilities for meeting environmental performance objectives; and

- **corrective actions** to rectify any deviation from performance standards.

Notes:

1. The EM Plan consists of one or a number of elements to address specific management issues each of which includes the above components. [See attached "Example of Contents of an EM Plan (for a water storage development)" for typical elements of an EM Plan.]

2. The EM Plan provides some of the components of an Environmental Management System as described by ISO 14000 series.

3. The acceptable EM Plan may be given effect by relevant licences and permits required pursuant to legislation.

The recommended structure of each element of the EM Plan is a follows:

Element/Issue:	Aspect of construction or operation.
Operational Policy:	The operational policy or management objective that applies to the element.
Performance Criteria:	Performance criteria (outcomes) for each element of the operation.
Implementation Strategy:	The strategies or tasks (to nominated operational design standards) that will be implemented to achieve the performance criteria.
Monitoring:	The monitoring requirements which will measure actual performance (ie. specified limits to pre-selected indicators of change).
Auditing:	The auditing requirements which will demonstrate implementation of agreed construction and operation environmental management strategies and compliance with agreed performance criteria.
Reporting:	Format, timing and responsibility for reporting and auditing of monitoring results.
Corrective Action:	The action to be implemented in case a performance requirement is not reached and the person(s) responsible for action (including staff authority and responsibility management structure).

Review of EM Plan

An EM Plan is reviewed and periodically updated to reflect knowledge gained during the course of operations and to reflect new knowledge and changed community standards (values). Changes to the management plan are intended to be developed and implemented in consultation with relevant authorities.