

# NORTHERN PIPELINE INTERCONNECTOR PROJECT STAGE 2

## MANAGEMENT PLAN

### Soil and Water Management Plan

Document number: NNA001-A-PLN-011

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27/06/08	Issued For Review	A	Adam Pullen		David Pugsley		Peter Fitzgerald	
02/09/09	Issued For Review	B	Adam Pullen		David Pugsley		Peter Fitzgerald	
15/04/09	Issued For Use	O	Adam Pullen		John Karooz		Ian Clark	

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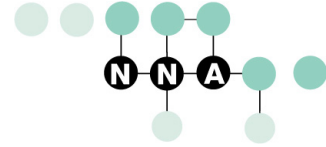
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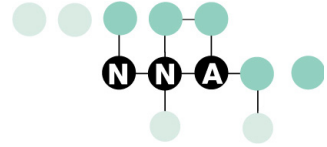
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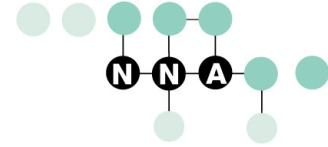
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# 1 INTRODUCTION

This Soil and Water Management Plan is one component of the Construction Environmental Management Plan (CEMP) (NNA001-A-PLN—17) which provides a system and procedures to ensure that Northern Network Alliance (hereafter referred to as the 'Alliance') establishes and maintains best practice controls to manage potential environmental impacts during the construction of the Northern Pipeline Interconnector (NPI) Stage 2 and associated infrastructure (hereafter referred to as the 'Project') and, wherever practicable, realise opportunities for enhanced environmental outcomes.

The Project is a key component of the SEQ grid. Initially, the Project will transport water under existing utilised entitlement (up to 55% or 3600ML/a has been used by Noosa Shire in the past) authorised under the *Water Resource (Mary Basin) Plan 2006* (Mary Basin WRP). This existing entitlement comprises 6500ML/a (18ML/d) interim water allocation (high priority) held by the SEQ Water Grid Manager within the Upper Mary River Water Supply Scheme. However, the pipe will be sized and designed to accommodate flows from future bulk water sources on the Sunshine Coast, including the Traveston Crossing Dam, should it be approved.

The Alliance consists of the following partners:

- LinkWater
- Abigroup Contractors Pty Ltd
- McConnell Dowell Constructors (Aust) Pty Ltd
- Kellogg, Brown & Root Pty Ltd.

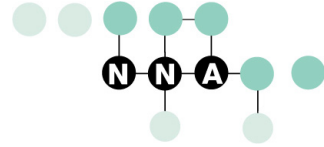
The Alliance is committed to providing the services it offers in a manner that conforms to the contractual requirements and to all relevant regulatory and legislative requirements. To achieve this, the Alliance will plan, implement and control an integrated management system that achieves the stated environmental outcomes.

The Alliance will ensure that controls are properly implemented and regularly monitored and audited to assess their effectiveness. Changes to the controls will be instigated if they are not achieving their objectives.

## 1.1 Project Description

The Project forms part of the drought contingency pipeline to connect existing and future water infrastructure on the Sunshine Coast with the Brisbane network. The Project will be constructed in two stages and will allow the transfer of up to 65ML/d of potable water between the Sunshine Coast and Brisbane. Stage 1 of the Project—between Landers Shute water treatment plant (WTP) and Morayfield—is due for completion by 31 December 2008.

The completed Project (Stage 1 and Stage 2) will supply a target volume of 65 ML/d of portable fresh water to existing facilities at Caboolture for distribution to localities in the greater Brisbane region. The Stage 2 Project will have the capacity to deliver up to 18 ML/d (under existing entitlements for the Noosa Shire).



Subsequent interconnection of Stages of the Project may be constructed to link with the proposed Traveston Crossing Dam and/or other bulk water sources proposed for the Sunshine Coast. These subsequent Stages are not considered in this report. However, the use of a large diameter pipe capable of transporting bulk water is a basis for the design of both Stages 1 and 2 of the Project.

The key components of the Project are as follows:

- approximately 48km of underground pipe between Noosa Water Treatment Plant (WTP) and the termination point of the Project at Eudlo;
- a balance tank with a 5 ML capacity;
- three new pump stations; and
- a new Water Quality Management Facility (WQMF) and upgrades to an existing WQMF at Landsborough.

A number of additional above-ground facilities would be required for commissioning, operation and maintenance of the system. These include:

- water quality maintenance structures
- water branch mains; and
- cleaning and communications stations.

## 1.2 Purpose and Scope

LinkWater has a commitment to effective environmental management and lists the environment as a key component of its overall vision to become an effective partner in delivering water security to South-East Queensland (LinkWater 2008). LinkWater is committed to adding value to the management of the natural and built environments by adhering to all appropriate local, state and federal environmental guidelines, with an underlying principle of sustainability and positive environmental outcomes (LinkWater 2008).

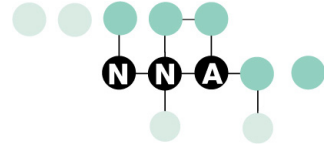
The purpose of this Soil and Water Management Plan (SWMP) is to describe how the Project proposes to manage water quality and the associated erosion and sediment control risks during construction of the Project.

This Plan will address the requirements of all applicable legislation and aims to ensure that the commitments made by the Project within the Project Environmental Impact Statement (EIS) regarding soil and water management are met.

## 1.3 Related Management Plans

The Soil and Water Management Plan (SWMP) forms part of the overall CEMP (*NNA001-A-PLN-017*) for the Project. Where relevant, reference should also be made to the following associated management plans (MPs):

- Vegetation Management Plan (*NNA001-A-PLN-013*)
- Revegetation and Rehabilitation Plan (*NNA001-A-PLN-010*)
- Erosion and Sedimentation Control Plans (ESCPs)



Erosion and Sedimentation Control Plans (ESCPs) will contain detailed erosion and sediment control information for each construction stage (e.g. location of sediment fences, drainage systems, discharge and monitoring specifications, sediment basins size and operation etc). Section 5.3 provides further details.

## 1.4 Objectives and Targets

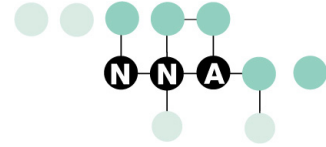
The objectives of this management plan are:

- Minimise impacts on water quality in creeks or drainage lines adjacent to the proposed development, caused by erosion or sedimentation from construction activities
- Prevent accelerated stream bank erosion in creek crossings and sensitive areas
- To implement Erosion and Sediment Control measures in accordance with the Maroochy Manual for Erosion and Sediment Control and achieve compliance with the *EP Act* 1994 and the *EPP (Water)* 1997.

The targets associated with this management plan are:

- Compliance with water quality discharge criteria of 50mg/l of total suspended sediment for controlled discharges out of sediment basins
- No deterioration in water quality in creeks or drainage lines as a direct result from the Project construction activities
- No incidents resulting in environmental harm.

The above performance criteria have been developed for this MP to assist in the delivery of desirable environmental outcomes. The performance criteria will be linked to key performance indicators (KPIs) for the Project.



## 2 LEGISLATION AND REGULATORY REQUIREMENTS

### 2.1 Licenses/Permits

The following permits apply to soil and water management for the Project:

- A Riverine Protection Permit under the *Water Act 2000* will be required for any riparian vegetation destruction or to excavate or place fill in a watercourse. The Department of Natural Resources and Water will be the concurrence agency for these permits.
- The clearing of remnant vegetation will require a permit, which is detailed within the Vegetation Management Plan (*NNA001-A-PLN-013*).

### 2.2 Guidelines/References

Key Legislation relevant to this MP includes:

- *Environmental Protection Act 1994 (Qld)*
- *Environmental Protection (Water) Policy 1997 (Qld)*
- *Water Act 2000*
- *Fisheries Act 1994*
- Maroochy Manual for Erosion and Sediment Control, Maroochy Shire Council, 2007.
- Soil Erosion and Sediment Control, Engineering Guidelines for Queensland Construction Sites (1996) – *Institution of Engineers Australia [IEAUST, now Engineers Australia]*, Queensland.
- Soil Management Guidelines - Potential Acid Sulfate Soils (2002) – (*Dear SE, Moore NG, Dobos SK, Watling KM and Ahern CR*). Department Natural Resources, Mines and Water, Queensland.
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) - *Australian and New Zealand Environment and Conservation Council (ANZECC)*.

### 2.3 Commitments

The following commitments are made in the Stage 2 Project EIS and are relevant to this MP. Table 1 lists these commitments.

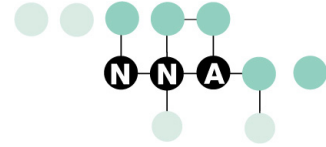
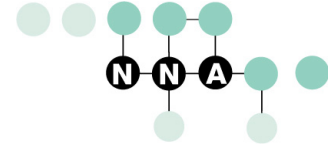


Table 1 Soil and Water Commitments from the Stage 2 Project EIS

NPI 2EIS Section (December 2008)	Requirement/Commitment
2	All planned discharges of water to the environment will be managed in accordance with the <i>Operational guidelines for water discharge</i> adopted by LinkWater for projects of this nature.
3.2	Impacts on good quality agricultural land (GQAL) will be minimised by increasing the depth of cover to the pipe where possible.
3.2	Mitigation strategies will include timing construction to avoid works in steep sections of the route between December and February and implementing site-specific intensive sediment and erosion control measures in risk areas.
3.2	Erosion and sediment control plans will be in compliance with the <i>Maroochy manual for erosion and sediment control (2007)</i> .
3.3	All landforms will be restored as close as possible to their preconstruction contours, including waterway bank slopes.
3.3	Topsoil will not be stockpiled in areas where such material might be expected to cause environmental harm.
3.4	A flood warning system will be developed for construction works in any flood-prone areas.
3.4	During construction, weather forecasts will be checked regularly and construction activities will be timed to avoid extreme weather events wherever possible.
3.4	Any water required for construction and testing purposes will be sourced and released according to agreed principles with relevant state agencies.
3.4	Construction will not result in significant long-term erosion and sedimentation impacts.
3.4	Temporary and permanent sediment and erosion control measures will be used to mitigate potential environmental impacts.
3.4	Clearing of riparian vegetation will only be undertaken immediately prior to construction, especially at streams with moderate or high ecological values, with reinstatement occurring as soon as possible after completion.
3.4	Construction will not result in significant long-term impacts on groundwater levels or quality.
3.4	The Project will establish water quality baseline characteristics prior to construction to allow changes in water quality to be measured during works; the key parameter will be turbidity with other parameters recorded as appropriate.
3.4 & 4	Construction will not result in long-term impacts on water quality.



## 3 EXISTING ENVIRONMENT

### 3.1 General Description

#### 3.1.1 Surrounding Land Uses

The majority of the route is located within existing road reserves (approximately 24%) or public utility easements (approximately 68%). Other affected tenure types include leasehold, reserves, state owned land (includes railways) and unallocated state land present along most watercourses.

#### 3.1.2 Topography, Geology and Soil Characteristics

The preferred corridor traverses the geological formations of the Nambour Basin, Post-Organic Volcanics and Gympie Province. Within these areas, the route generally traverses hills and ridges composed primarily of residual soils overlying sedimentary sandstone or igneous rhyolitic tuff. There are no significant fault structures prone to significant seismic activity within the project area.

The pipeline route comprises four distinct geological units, including the Pomona Beds and the Kin Kin Beds of the early to middle Triassic area in higher terrain around Cooroy and the North Arm Volcanics between Eumundi and Nambour. A small section of the project area around Yandina traverses the western edge of the Maroochy floodplain which is dominated by alluvium associated with fluvial processes.

The hills in the south of the project area form part of the Landsborough Sandstone formation, while sections of the route near Yandina are composed of Myrtle Creek Sandstone. Sections of the project area may contain varying depths of colluvium; however, more detailed geotechnical investigations are required to confirm this.

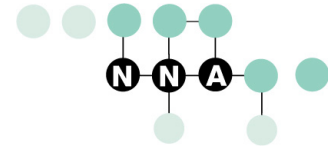


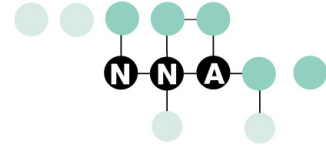
Table 2 presents the land resource areas of the route as interpreted from Capelin (1987).

Table 2 Land Resource Areas along the Project Stage 2 Route (Capelin 1987)

Land resource area	Location	Geology	Landform	Vegetation
Q2	Stream alluvia and floodplains	Undifferentiated Quaternary alluvium of gravel, sand, silt and clay	Level to undulating plains and rises	Forest red gum open forest and tea-tree open forest
J1	South of Nambour to Eudlo	Laterised Triassic to Jurassic Landsborough Sandstone	Undulating to steep low hills and hills	Blackbutt and bloodwood open forest
J3	Southwest and northwest of Landsborough to Eudlo	Triassic to Jurassic Landsborough Sandstone	Undulating to steep hills	Blackbutt and bloodwood open forest
R1	Between Eumundi and North Arm	Laterised Triassic rhyolite	Gentle undulating and rolling hills	Remnants of grey gum and tallowwood open forest
R2	North of Nambour	Triassic andesite and rhyolite; diorite and tonalite intrusions	Undulating low hills	Blackbutt and grey gum open forest
R3	North of Eumundi	Miscellaneous Palaeozoic metamorphics and volcanics	Undulating low hills	Spotted gum and ironbark open forest

The soils of the alignment have been formed from the underlying geological parent materials:

- **Alluvial soils** within the flood plains of the main watercourses are variable in depth, texture, fertility and drainage characteristics.
- **Gravelly loams** can be prevalent in the narrow flood plains adjacent to lower order streams in the upper catchment areas while deep uniform textured or gradational clays (including black earths and prairie soils) are common in the broad flood plains of the major streams. Most alluvial soils are relatively resistant to erosion, due primarily to the low gradient position in the landscape, but may be prone to stream bank erosion.
- **Gleyed podzolic and humic gleys** (poorly drained acid soils) are found in some of the lower terraces of the alluvium.
- **Red and yellow podzolic soils** are texture contrast soils generally associated with Landsborough Sandstone parent material. The soils have a sandy or loam surface horizon with a clay subsoil and there may be a significant gravel component in the subsoil. These soils are highly susceptible to erosion, particularly where slopes exceed 8%. Red and yellow earths are uniform textured soils also associated with Landsborough Sandstone parent material. While still erosion-prone, they are generally less susceptible than red and yellow podzolic soils.



- **Krasnozems** are deep uniform or gradational soils which, within the project area, are confined mainly to the land around Eumundi and North Arm. These soils are relatively resistant to erosion and are used for growing ginger.
- **Lithosols** (mainly shallow gravelly soils with minimal profile development) are common in steeper sections of the project area where grades exceed 10%. They are highly susceptible to erosion although the severity of this risk may be mitigated by the significant stone component within the soil matrix.

Minor sections of the route are located on the floodplains of the major watercourses. Soils of the upland areas are predominantly shallow, texture contrast soils that may have a significant component of stone within the profile.

### 3.1.3 Drainage and Waterways

The Project corridor traverses the freshwater section of the Maroochy River catchment and the south-eastern headwaters of the Mary River catchment within the Six Mile Creek sub-catchment. Sub-catchments within the Maroochy River system traversed by the Project (from north to south) are as follows: the North Maroochy River, South Maroochy River, Upper Maroochy Estuary, Petrie Creek, Paynter Creek and Eudlo Creek.

All surface waterways to be crossed by the pipeline are lowland freshwaters (larger slow flowing freshwater streams and rivers below 150 m altitude) as defined by the *Environmental Protection (Water) Policy 1999* (EPP (Water)). None of the proposed creek or river crossings are located within the boundaries of the Coastal Management District (CMD) or have any tidal vegetation associations.

### 3.1.4 Groundwater

Although there are no known significant aquifers in the region, there is the potential to encounter groundwater tables in low-lying areas adjacent to waterways. The elevation of the Petrie Creek and South Maroochy River crossing locations (less than 5mAHD) in particular, suggest that groundwater may be encountered during trenching activities.

## 3.2 Environmentally Sensitive Areas/Features

### 3.2.1 Drainage and Waterways

A wide range of waterways will be crossed along the proposed pipeline route. All are lowland freshwater systems and many are permanent, supporting remnant riparian vegetation of varying ecological value (see Table 3). Detailed descriptions of the major creek and river crossings including brief assessments of their principal ecological features are contained in Appendix L of the Project EIS (The Alliance 2008).

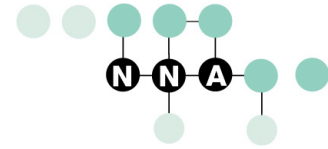


Table 3 Summary of the Characteristics of Significant Waterways within the Proposed Pipeline Corridor

Waterway	Waterway characteristics
South Maroochy River	Freshwater, steep banks, permanent, slow-flowing, rocky substrate, degraded riparian rainforest, potential significant habitat values, regional corridor values
North Maroochy River	Freshwater, permanent, slow-flowing, steep banks, extensive floodplain, degraded riparian rainforest, potential significant habitat values, regional corridor values
Six Mile Creek (left branch)	Freshwater, permanent, narrow shallow channel, significant intact riparian vegetation, significant species habitat and regional corridor values
Petrie Creek	Freshwater, permanent shallow water, narrow channel, narrow riparian zone, potential tidal influence on flood levels for severe storm events, potential for significant habitat values, regional corridor values
Paynter Creek	Freshwater, steep banks, permanent shallow water, narrow channel, endangered remnant vegetation (degraded), potential significant habitat values, regional corridor values
Running Creek, Steggalls Creek, Eudlo Creek	Freshwater, permanent but generally very low base flow, narrow shallow drainage line, narrow riparian zone with some remnant riparian vegetation, supports lesser regional or local corridor values

A large number of small ephemeral tributaries of all of the main creeks and rivers listed above are also intercepted by the pipeline. Almost all have been cleared of their remnant riparian vegetation and have degraded poorly defined drainage pathways. A complete list of waterways and descriptions of their environmental values is provided in the Project EIS (see Section 3.4 (Water Resources)).

### 3.2.1.1 Water Quality Monitoring

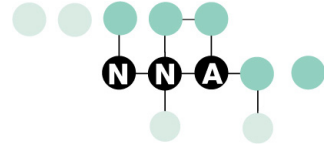
Baseline monitoring will be undertaken at all significant waterway crossing points to record the pre-construction condition of each crossing.

Monitoring of basic water quality parameters will be undertaken before, during, and after construction to record any substantial changes in water quality. Monitoring of water quality upstream and downstream of crossing points will include: observation of sediment plumes and surface sheen; and measurement of turbidity, suspended solids, pH and dissolved oxygen.

### 3.2.1.2 Flooding

Flood modelling data provided by Maroochy Shire Council (now merged into the Sunshine Coast Regional Council) shows that the 2-year ARI flood for Paynter Creek is similar in extent to the 100-year ARI event, with larger events increasing flood depth rather than flooding extent. While the corridor traverses the floodplain for approximately 1 km, there is still a possibility of flooding during construction as a result of low recurrence interval events.

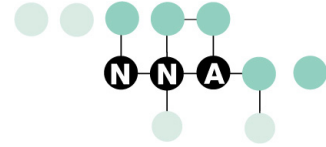
Scheduling construction to avoid high rainfall times of the year will significantly reduce the risk of normal trenching activities interacting with floodwaters. Given the limited length of pipe within the floodplain, the risk is considered low.



### 3.2.2 Flora and Fauna

Impacts on flora and fauna generated by the construction of the pipeline will be related primarily to the clearance of vegetation adjacent to the proposed alignment and consequent habitat loss. It must be noted that vegetation clearance will be only be undertaken as required given that approximately two thirds of the preferred corridor makes use of an existing cleared easement which is generally maintained as low grass.

Further details are provided in the Vegetation MP (*NNA001-A-PLN-013*) and Fauna MP (*NNA001-A-PLN-007*).



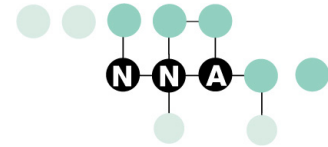
## 4 POTENTIAL IMPACTS

This section identifies impacts with respect to soil and water which have the potential to occur during the construction period.

### 4.1 Environmental Aspects

The aspects of the project works that could contribute to erosion, off-site sedimentation and impact on downstream water quality include the following:

- clearing of vegetation
- stripping of topsoil
- bulk earthworks
- working in waterways (including temporary creek crossings)
- piling and associated platforms, adjacent to and within watercourses
- trenching
- micro-tunnelling and shaft sinking
- traffic access and egress points
- disturbance of contaminated soils
- construction works in high rainfall periods
- slow or ineffective design and/or installation of erosion and sediment control measures or surface water management measures
- ineffective maintenance of environmental control measures
- slow rehabilitation/re-vegetation of works
- fuel and chemical storage and handling
- nutrients from fertilisers, herbicides and pesticides used in landscaping
- pollutants from plant wash down activities
- litter
- oil, grease and fuel from equipment operation and maintenance
- effluent from site offices and compounds.
- water discharge from hydro testing.

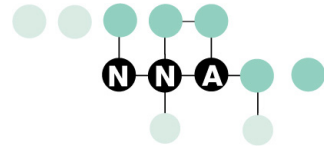


## 4.2 Potential Environmental Impacts

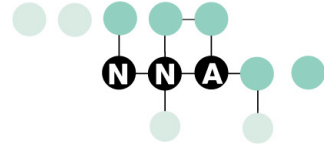
Potential environmental impacts are summarised in Table 4 below.

Table 4 Potential Environmental Impacts

Soil Erosion and Sedimentation	
1	Accelerated erosion may result from vegetation removal and soil loosening and trenching and earthworks for pipeline construction.
2	Higher sediment loads may result from accelerated erosion, and sediment could enter local watercourses, raise turbidity, and adversely affect aquatic flora and fauna.
3	Higher potential for erosion if construction occurs in high rainfall periods.
4	Stormwater flows may become more intense because of a decrease in natural vegetation cover.
5	If intense rainfall were to occur during the construction phase, there is potential for extensive sheet and gully erosion.
6	Erosion of alluvial soils as result of flooding around waterways during construction or destabilisation of creek and river banks.
7	Re-vegetation may be slow because of loss of topsoils and high dispersive soils.
Access Tracks	
1	Access tracks being constructed over waterways may result in sedimentation within creeks or rivers.
Pipe Flush Water	
1	Pipe flush water (hydrotest) may be contaminated and inappropriate disposal may cause environmental harm.
Water Quality and Flow Regime	
1	Water which enters excavated areas is contaminated from upstream sources (i.e. not as a result of construction works) and must be treated and disposed.
2	Discharge of untreated water from construction excavation works may travel downstream causing adverse impacts to farm users, aquatic ecosystems, recreational uses, fishing industries, tourism or conservation areas that may be located downstream from the works.
3	Alteration to channel morphology or introduction of structures associated with piling may potentially alter surface water flow, resulting in morphological impacts or increased flood risk.
Flooding	
1	<p>If flooding occurs;</p> <ul style="list-style-type: none"> <li>• excessive sediment transport from soil stockpiles along the right of way;</li> <li>• reductions in floodplain capacity and floodwater displacement as a result of all-weather access tracks and bunding around work areas; and</li> <li>• displacement of floodwaters where above-ground crossings are proposed.</li> </ul>
Construction Techniques	
1	<p><b>Piling:</b></p> <ul style="list-style-type: none"> <li>• clearing of riparian vegetation for access tracks and pile installation</li> <li>• erosion and sedimentation resulting in a reduction in water quality (increased turbidity and suspended solids)</li> <li>• potential for release of sediment to waterways from work areas in the riparian zone for pile installation</li> <li>• exposure of Acid Sulfate Soils (ASS) during earthworks</li> <li>• disturbance to fauna as a result of construction noise</li> </ul>



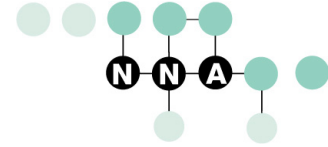
Soil Erosion and Sedimentation	
	<ul style="list-style-type: none"> <li>• potential for localised loss of structural habitat features</li> <li>• possible hydrocarbon spills from construction machinery and vessels working within the watercourse introduction of weed species and management of existing weed infestations.</li> <li>• some disturbance to riparian vegetation, with flow-on effects to physico-chemical habitat features (temperature, dissolved oxygen etc.)</li> </ul>
2	<p><b>Trenching:</b></p> <ul style="list-style-type: none"> <li>• clearing of riparian vegetation for access and construction</li> <li>• erosion and sedimentation resulting in a reduction in water quality (increased turbidity and suspended solids)</li> <li>• disturbance of benthic fauna</li> <li>• direct loss of structural habitat features such as macrophytes and snags</li> <li>• increased turbidity or smothering of habitat features due to increased entrained sediment after the completion of works</li> <li>• disturbance to aquatic fauna due to construction activities forming a barrier to longitudinal movement (e.g. the creation of temporary barriers across flowing waterways with the potential to block fish passage)</li> <li>• disturbance to fauna as a result of construction noise</li> <li>• potential for the exposure of ASS</li> <li>• hydrocarbon spills from construction machinery working within the watercourse that may result in pollution or degradation of waterways</li> <li>• indirect changes to physico-chemical habitat features, such as water temperature, dissolved oxygen etc. as a result of disturbance to riparian vegetation</li> <li>• introduction and spread of aquatic pest species</li> </ul>
3	<p><b>Micro-tunnelling and shaft sinking:</b></p> <ul style="list-style-type: none"> <li>• clearing of riparian vegetation for access tracks and excavation of the shafts</li> <li>• drilling fluids spillage (e.g. bentonite which serves as a support and lubricant for the slurry material surrounding the microtunnel) and 'frac-out' through rock fissures into surface and groundwater causing pollution of waters</li> <li>• erosion and sedimentation resulting in a reduction in water quality (increased turbidity and suspended solids)</li> <li>• potential for the exposure of ASS during shaft excavation</li> <li>• disturbance to fauna as a result of construction noise</li> <li>• hydrocarbon spills from construction machinery working adjacent to the water course</li> <li>• introduction of weed species.</li> </ul>
Geotechnical Aspects	
1	Shallow rock conditions may mean that blasting is required, which could result in structural disturbance, noise and air pollution, and increased site disturbance.
2	Shallow rock conditions at river crossings may make normal directional drilling difficult, prolonging construction time and increasing disturbance of soil and geological properties including an increased risk of acid sulfate leaching.
3	Poor rock foundations may make normal piling technologies difficult to implement. Piles may therefore need to be placed deeper, which may trigger an increase in acid sulfates into the river system.
4	Active clays may lead to differential settlement and expansion, putting the structural integrity of the pipeline at risk.
5	Loose material and steep slopes may lead to slope instabilities.
6	Shallow groundwater levels may lead to the collapse of trench and bore walls.
Use of Good Quality Agricultural Land and Ongoing Farming Practices	
1	A temporary impact on the land and its agronomic systems as the site is disrupted and then rehabilitated.
2	A permanent impact on the type of agronomic production system that can be utilised within the pipeline easement. Although the right to farm is not removed, the application of production systems may be limited.
3	A soil erosion and sedimentation hazard through the construction and rehabilitation phase as the site is cleared, excavated and then settles after construction.



## Soil Erosion and Sedimentation

### Contaminated Land

1	Contaminated soils encountered during the construction period may be mixed with clean material.
2	During and after construction, the increased permeability of the pipeline trench means that contaminants may migrate much more easily to surface groundwater systems.



## 5 ENVIRONMENTAL MITIGATION MEASURES

Strategies for the management of water and soil issues are outlined in this section. Mitigation measures for soil and water quality impacts during construction are discussed.

### 5.1 Water Management Strategy

The proposed water management strategy during the construction of the pipeline and associated infrastructure includes:

- surface water management
- groundwater management
- sewage treatment and disposal
- hydrotest disposal.

Site-specific strategies for water management are detailed in the relevant Work Method Statements (WMSs) and site-specific Erosion and Sedimentation Control Plans (ESCPs).

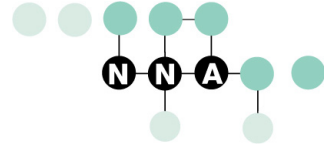
#### 5.1.1 Surface Water Management

There are significant and varying surface water impacts which have the potential to occur throughout the construction period. The effective control of surface water will be achieved through the use of erosion and sediment control (including use of bunding and/or barriers around the construction work site when working within floodplains) and mitigation measures which are discussed in detail in Section 5.3 below. Where possible, water will be diverted around the construction site to minimise the amount of water to be captured and managed. Erosion and sediment controls will be designed and operated to ensure they do not exacerbate existing flood conditions. Permanent drainage systems will be developed where required to ensure that permanent construction features do not cause an adverse flooding effect.

Table 5 in Section 5.8 'Soil and Water Impact Mitigation Measures' provides a summary of the proposed mitigation measures to be implemented to manage surface water throughout the construction period.

Alliance team members and sub-contractors, particularly those who undertake activities that generate or handle potential pollutants will be made aware of their environmental responsibilities during the induction and regular inspections will be undertaken to ensure that they are complying with all relevant legislation. All potentially contaminated wastewater will be contained and disposed of in accordance with industry best practice to ensure no environmental harm is caused, as outlined under section 319 of the *EPA Act 1994*.

Where Acid Sulfate Soil (ASS) or potential ASS is identified, reference will be made to the ASS MP (*NNA001-A-PLN-003*). Pipe Flush Wastewater associated with commissioning will be dealt with in a separate plan to be developed during the commissioning period.



### 5.1.2 Groundwater Management

Works associated with the Project are not anticipated to adversely impact groundwater quality or levels, although trenching, piling and micro-tunnelling may result in a collective need to dispose of groundwater. If groundwater accumulates in construction features (e.g. excavation of shafts, or piling) it will be pumped and appropriately treated or run through existing controls to ensure it does not pose a pollution hazard to any waterways before discharge.

In addition to groundwater being encountered during construction, and although the use of recycled water is the preferred option (due to the drought conditions in Queensland), there is a potential that groundwater (amongst other alternatives) may be sourced for dust suppression provided that it is considered sustainable. Any relevant licences and approvals required for groundwater extraction will be considered and sought prior to potential use of groundwater.

### 5.1.3 Sewage Treatment and Disposal

Site amenities will either be connected directly to the sewerage system or to holding tanks for removal by a licensed contractor. Sites not in close proximity to compound areas may be provided with a port-a-loo that will be serviced by a licensed contractor. These facilities will be located/positioned with consideration of vicinity of water courses, sensitive flora/fauna habitats or residents.

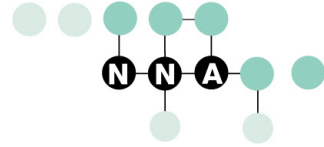
## 5.2 Hydrotest

Various sections or segments of the pipe once connected and laid in the trench will be tested under pressure to gauge if there are any leakages. This water will need to be accessed and disposed of in an environmentally satisfactory way.

Special provisions will be required to manage this aspect of the construction activities, to treat the water to an acceptable standard before release, refer to operational guidelines for water discharge report.

The following procedures will be applied:

- Test water shall be sourced from, and discharged to land in compliance with all regulatory and landholder requirements
- Ensure reagents in hydrotest water are reactive and degrade under aeration or can be treated to comply with water quality objectives for the receiving waters. Otherwise discharge water will have to be held in a receiving dam until appropriately treated (Hydrotest water typically contains high levels of chlorine)
- After appropriate treatment, the hydrotest water released between pipe sections will be discharged onto undisturbed and stable ground in such a way as to prevent flooding or erosion (e.g. against a splash plate or other dispersive device in order to aerate, slow and disperse the flow), and where it will be allowed to aerate and evaporate
- Appropriate controls like inlet and discharge pipe filters will be used to prevent weed infestation from hydrotest practices
- Relevant permits to draw water shall be obtained and the source of hydrostatic test water shall be approved in advance by the Environmental Manager, who will also check and approve the



test water discharge procedures. Prior to discharge of hydrotest water, the Environmental Manager shall be consulted about requirements for water quality testing

- The risk of transferring aquatic weeds from affected to unaffected catchments will be assessed before deciding on whether hydrotest water should be re-used between pipe sections or supplied afresh.

### 5.3 Erosion and Sediment Control Strategy

Erosion and Sedimentation Control Plans will be developed for the construction period to be consistent with the requirements in the Maroochy Manual for Erosion and Sediment Control and where necessary the IEAUST's Soil Erosion and Sediment Control, Engineering Guidelines for Queensland Construction Sites 1996. Where possible controls will be installed prior to the commencement of construction. The following typical controls may be used by the Alliance:

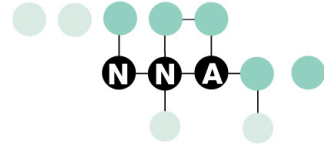
- minimising disturbance as much as possible in the first instance and ensuring progressive rehabilitation
- sediment fences
- catch drains or cross berms
- stabilised site accesses
- earth bunds
- diversion embankments
- use of imported and natural materials for sediment control (eg mulch)
- rock check dams
- sand bags
- sediment ponds basins.

Key controls will be installed during site establishment and, as the site evolves and changes, sediment controls will be adjusted accordingly. The Project Engineers, Environmental Officer and Site Superintendent will liaise to ensure that appropriate controls are always in place and working effectively. Erosion and Sediment Control plans will be issued to supervisors in the Verification Package prior to pre-clearing.

#### 5.3.1 Minimising Disturbance

Erosion will be reduced through the minimisation of the cleared footprint and progressive clearance of vegetation. Progressive revegetation will occur to minimise the area of exposed surfaces following completion of works. Revegetation/Rehabilitation of work areas will be undertaken in accordance with the Rehabilitation and Revegetation MP (*NNA001-A-PLN-010*).

Watercourses requiring works will be left undisturbed until construction has commenced to maximise stream bank stability and to prevent sediment loading in storm waters passing through the watercourse.



## 5.4 Water Reuse

Stormwater collected in sediment basins and compound tanks will be reused on site as much as possible; primarily for dust suppression. Systems will include pump and sprinkler systems for static dust sources and tanker sprays for larger areas. Treated wastewater from local treatment plants will also be considered for dust suppression.

## 5.5 Site Drainage

During design, the Alliance will endeavour to keep clean water separated from turbid runoff from exposed areas. Where possible, clean water will be diverted through the exposed areas using undisturbed drainage paths. Drainage construction will form an integral part of controlling water movement on site and the early construction of semi-permanent sediment control structures (if required) will be undertaken where necessary.

## 5.6 Chemical and Fuel Storage and Wastewater Management

The storage and handling of fuels, chemicals and wastewater has the potential to pollute surface waters and contaminate soils.

Storage areas for fuels, oils and chemicals used during construction will be covered and contained within an impervious bund to retain any spills of more than 120% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. Storage will comply with the relevant Queensland EPA requirements for bunding and spill management and AS 1940-1993 – *The Storage and Handling of Flammable and Combustible Liquids*.

Materials Safety Data Sheets for all chemicals stored onsite will be made available to site personnel. Site personnel will be informed of their location as a part of the site induction.

Refuelling of mobile vehicles, plant and equipment will be undertaken no closer than 50 m from a watercourse and using approval failsafe couplings in hoses.

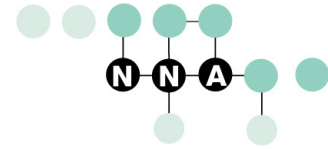
The Emergency Management Plan outlines contingency plans in the event of a chemical spill. In the event water is polluted by chemicals and/or fire fighting materials (e.g. foams) the water will be contained where possible and disposed of appropriately.

## 5.7 Water Usage

Water consumption will be minimised through the use of water saving devices. Where possible construction operations will reuse water from sediment basins and excavations for dust suppression, or consider the use of recycled treated Waste water from Council Treatment Plants.

A water efficiency plan will be implemented through the life of the Project. This plan will be reviewed to identify where efficiencies may be gained, and changes in work practices can be implemented. Where potable water is required, the Alliance Project Manager / Alliance Project Management Team will be responsible for approving this use, subject to a cost-benefit analysis.

Management shall also encourage other water minimisation construction practices (e.g. turning off water when not specifically required).

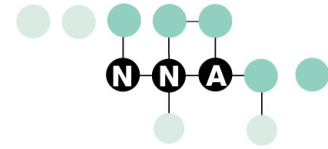


## 5.8 Soil and Water Impact Mitigation Measures

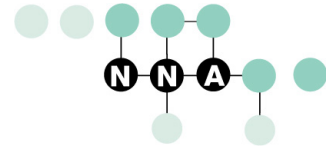
The below table provides a summary of the proposed mitigation measures to be implemented to manage soil and water impacts throughout the construction period.

Table 5 Soil and Water Impact Mitigation Measures

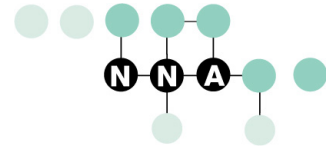
Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
<b>General Construction</b>			
	All personnel are to be inducted, and receive ongoing training via toolbox talks, regarding their responsibilities related to soil conservation issues, erosion and sediment control systems and the need for ongoing maintenance to prevent land degradation and water pollution.	Environmental Manager /OH&S Manager	Pre-construction and Ongoing
	Specific training will be provided to engineers and labour teams responsible for construction and maintenance of drainage, erosion and sediment controls.	Environmental Manager	Pre-construction and Ongoing
	Contact established with the Bureau of Meteorology (by web, fax or email) to ensure that weather forecasts are obtained. Works will need to be scheduled based on weather forecasts. The Site Superintendent must ensure that an inspection of all erosion and sediment controls is undertaken if a significant rain event is forecast and that all are in working order	Environmental Officer/ Construction Manager/ Site Superintendent	Prior to the commencement of construction and ongoing throughout construction
<b>Sediment and Erosion Control</b>			
	Sediment and erosion controls will be implemented and in place in accordance with relevant ESCP's.	Environmental Officer/ Site Superintendent	Pre-Construction
Area with highly erodible soils	Keep the clearing area to a minimum so that the smallest possible ground area is disturbed. Reinststate and rehabilitate as soon as practicable to achieve ground cover.	Environmental Officer/ Site Superintendent	As required
	Place structures such as diversion drains, rock check dams and silt fences at key locations (swales, stormwater pit inlets, around stockpiles) to capture the suspended sediment.	Project Engineer/ Environmental Officer/ Site Superintendent	As required
	Conduct weekly inspections of all ESC's to ensure they are in place and operating efficiently. Additional inspections should be conducted after storm events.	Environmental Officer/ Project Engineer	Weekly
	Divert stormwater away from exposed soil areas to reduce overland flow or channel flow on the vulnerable soils.	Site Superintendent/ Environmental Officer	As required
	In areas where the risk of soil erosion is medium or high, the seeding of appropriate grass species may be required.	Environmental Officer/ Site Superintendent	As required
Acid Sulphate Soils	Where ASS or potential ASS are identified, reference should be made to the Acid Sulphate Soil Management Plan (NNA001-A-PLN-003).	Environmental Manager/ Environmental Officer/ Site Superintendent	As required
Stockpiling	Provide bunding or sediment controls around	Project Engineers/	As required



Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
	stockpiles to prevent the material from being washed away. The height of the bund /containment will depend on the site location, the volume and type of material being stockpiled, and the topography.	Environmental Officer/ Site Superintendent	
	If stockpiling for more than 30 days is proposed, consider stabilising the stockpile with appropriate vegetation. Alternatively, if the stockpile is small, it may be covered instead.	Site Superintendent/ Environmental Officer	As required
	Where practicable, locate the stockpile at least 50 metres away from watercourses. Where less than 50 metres is achievable (eg for river crossing sites etc) then ensure that appropriate containment is implemented.	Site Superintendent/ Environmental Officer	As required
Stormwater drainage pit and drainage channels	Place ESC measures such as silt fences and sand bags at key locations to capture the suspended sediment and gross litter prior to entering the drainage system.	Site Superintendent/ Environmental Officer	As required
	Conduct weekly inspections of all ESC measures to ensure that they are in place and operating efficiently. Additional inspections should be conducted after storm events. Reinstate all drainage pits and clean out accumulated sediment or leaf litter in pits. Reinstate all existing sediment control structures	Environmental Officer /Site Superintendent	Weekly/ On completion of works
	Minimise disturbance to the existing drainage channels. Divert stormwater away from disturbed channels or swales to minimise the flow of water and chance of erosion. If flow modification is necessary during construction, reinstate the drainage channel on completion of works..	Environmental Officer/ Site Superintendent	As required On completion of works
Construction access	Where temporary construction roads and site access points cross channels, sediment control structures should be placed in channels, as appropriate, to capture suspended sediments.	Environmental Officer/ Site Superintendent	As required
	Protect batters and disturbed areas from erosion by constructing small diversion/contour banks on the batter. This prevents sheet flow eroding the soil on the batter.	Environmental Officer/ Site Superintendent	Ongoing
	Stabilise soils by revegetating exposed surfaces. This will be undertaken in accordance with the Revegetation and Rehabilitation MP ( <i>NNA001-A-PLN-010</i> ).	Environmental Officer/ Site Superintendent	On completion of works
Excavations / Trenching / Piling / Micro-tunnelling	Consider meteorological conditions prior to commencement of excavation or trenching works. Where possible works should not be undertaken during inclement weather as it will increase the potential for sediment laden runoff.	Site Superintendent/ Environmental Officer	Ongoing
	Conduct weekly inspections of all ESC measures to ensure they are in place and operating efficiently. Additional inspections should be conducted after storm events.	Site Superintendent/ Environmental Officer	Weekly
	Fluid plants to be used for micro-tunnelling construction must be appropriately banded.	Environmental Officer/ Site Superintendent	During micro-tunnelling



Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
	Discharge of fluid must be at least 25m from any water course, held in a storage pit and regularly monitored to ensure it does not enter watercourse. Spoil stockpiling and laydown areas will be clearly defined. Crews will be instructed to be mindful of a drop in pressure and the risk of a resultant leak ('frac-out') into the environment.		
	During micro-tunnelling beneath water courses, periodically inspect water for evidence of 'frac-out'.	Environmental Officer / Site Superintendent	During micro-tunnelling
	Where ASS or potential ASS is identified during excavation, reference will be made to the Acid Sulphate Soil Management Plan (NNA001-A-PLN-003).	Environmental Manager / Site Superintendent	During excavation
	Where spoil is to be replaced, it should be stored on the upslope side of excavation. If any sediment is washed away it will collect in the excavation rather than be transported off-site.	Environmental Manager / Site Superintendent	As required
Maintenance of Erosion and Sediment Controls	Conduct weekly inspections of all ESC measures to ensure they are in place and operating efficiently. Silt built up behind controls should be removed regularly. Additional inspections should be conducted after storm events.	Site Superintendent/ Environment Officers	Weekly
	Prior to weekend periods, the Site Superintendent will review all ESC measures on site to ensure they are adequate. The Site Superintendent needs to ensure that adequate materials are available on site should additional controls need to be implemented over a weekend period.	Site Superintendent	At all times throughout construction
	A call out system will be established to ensure that any incidents which occur over the weekend period (including significant rain events) can be responded to within the appropriate timeframe.	Site Superintendent/ Environmental Manager	At all times throughout construction
	All sediment basins will be appropriately secured to ensure public access is not possible.	Project Engineers/ Site Superintendent	On-going
	Sediment basins will be constructed as designed (in accordance the 'Institute of Engineers Erosion and Sediment Control Manual') and located as specified in the relevant ESCP.	Environmental Officer /Project Engineer/ Site Superintendent	At all times
	Sediment basin water will only be discharged to receiving waters when confirmed as complying through field tests/observations/ laboratory analyses) tests with discharge guidelines (<50mg/l & pH 6.5 – 8.5).	Environmental Officer/ Site Superintendent	At all times
	Sediment basins will be de-silted as required to ensure design storage capacity is maintained.	Project Engineer/ Site Superintendent	As required
Water disposal	Do not dispose of water unless it is uncontaminated. If uncertain of contamination, testing may be necessary to determine the most suitable method of disposal refer to operational guidelines for water discharge.	Site Superintendent/ Environmental Officer	Ongoing



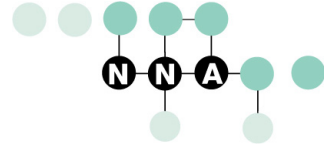
Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
	When releasing uncontaminated waters, spread flows over a large area rather than concentrating in channels, which tends to induce erosion.	Site Superintendent/ Environmental Officer	Ongoing
Sensitive land/aquatic areas	Construction works will be delayed as long as possible in sensitive areas to reduce the risk of bank erosion and sediment release. Monitor water quality at intervals to ensure that the existing water quality does not significantly decrease as a result of construction activities.	Site Engineer/ Site Superintendent	Ongoing
	Where appropriate, a geotextile underlay will be used in riparian zones under work areas such as piling platforms and access tracks.	Environmental Officer/ Project Engineers/ Site Superintendent	On-going

## 5.9 Verification Procedure

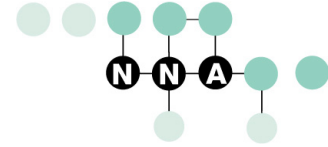
The verification procedure is a mechanism to show that the easement has been inspected, all the environmentally sensitive areas are known and delineated, and the construction supervisor has been advised of and acknowledges environmentally sensitive areas. The verification package is a written record and tangible reminder to the construction supervisor that he has environmental obligations ahead of him; and if he doesn't have signoff, then he doesn't have approval to enter that section of the ROW.

In practical terms, the verification procedure is as follows:

- The Environmental Officer reviews the environmental information available for the easement some days ahead of construction.
- The Environmental Officer identifies from the GIS and alignment sheets all those areas that represent an environmentally sensitive area. These areas may include rare or endangered flora, particular water crossings, habitat of rare or endangered animals, heritage areas [Aboriginal or European], and noise sensitive areas.
- The Aboriginal Heritage Officer (refer Aboriginal Cultural Heritage procedures) will locate and tag known aboriginal heritage sites with construction tape and certify that this task is complete within the designated section of ROW. A 50 metre buffer is to be maintained around aboriginal heritage sites. The Contractor will construct a delineation fence to define the buffer zone. There is to be no activity of any sort within this buffer zone.
- The Environmental Officer should inspect the easement and physically identify all other known sensitive areas with construction tape.
- The details of the site; instructions and description of marking should be recorded and noted in the Verification Checklist process.
- If the Environmental Officer is unfamiliar with a particular environmental aspect [e.g. rare animal capture or plant identification] he should call in suitably qualified personnel who can assist. Sufficient time should be allowed to ensure availability of specialist environmental advisers.



- Once all environmental issues have been identified and flagged out on a specified section of ROW, the Environmental Officer shall point out all the issues in that section with the construction supervisor. The construction supervisor will explain what actions will be taken to protect environmental values and that suitable machinery and material (e.g. spill containment kit) is available to protect flagged out areas.
- The Environmental Officer and the Construction Engineer shall sign off on the verification package prior to the commencement of works. Construction can then commence on that section of the ROW described in the general purpose record.



## 6 CORRECTIVE AND PREVENTATIVE ACTIONS

### 6.1 Community Liaison and Complaint Management

Refer to Section 8.1 in the Construction Environmental Management Plan (CEMP)

*(NNA001-A-PLN-017)*

### 6.2 Environmental Incident/Emergency Reporting

Refer to Section 8.2 in the Construction Environmental Management Plan (CEMP)

*(NNA001-A-PLN-017)*

### 6.3 Incident/Emergency Preparedness and Response

Refer to Section 8.3 in the Construction Environmental Management Plan (CEMP)

*(NNA001-A-PLN-017)*

### 6.4 Incident Investigation

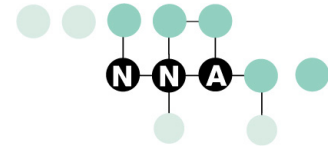
Refer to Section 8.3 in the Construction Environmental Management Plan (CEMP)

*(NNA001-A-PLN-017)*

### 6.5 Non-conformances

Refer to Section 8.3 in the Construction Environmental Management Plan (CEMP)

*(NNA001-A-PLN-017)*



# 7 INSPECTION AND MONITORING

## 7.1 Inspections

A regular auditing, monitoring and reporting program for soil and water management will be conducted in accordance with the specifications of the relevant site WMSs as follows:

- Daily visual inspections of all erosion and sediment control measures by the Site Superintendent and/or Environmental Officer to ensure that controls are functioning correctly.
- Weekly routine inspections by the Environmental Officer and reported on the Weekly Site Inspection Checklist (*Form G-FRM-001*). Any issues that are detected will be reported immediately to the Environmental Manager. No work will be permitted that further exacerbates any issues of non-conformance until corrective actions are prescribed and implemented.
- Inspections after each significant rainfall event that generates runoff which has potential to cause environmental harm. Observations will be recorded on the Weekly Inspection Checklist (*Form G-FRM-001*).
- Post construction - all remaining ESC measures will be monitored for their effectiveness until such time that 70% ground cover is achieved and the relevant QESE lot is verified and closed. Remedial measures will be put in place should any controls fail during construction.

## 7.2 Water Quality Monitoring

A water quality monitoring program will be established and implemented to measure performance against the set targets and to ensure compliance with the relevant legislation. The monitoring will be primarily focused on assessing the quality of surface waters, including upstream and downstream of the corridor.

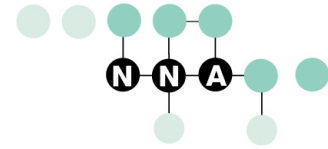
A summary of the water quality parameters that will be tested are outlined in Table 6 below.

Table 6 Water Quality Testing

Parameters	Sampling Method	Analytical Method
Acidity (pH)	Grab Sample	Field Analysis and confirmed as required with lab assessment
Turbidity (NTU)	Grab Sample	Field Analysis
Dissolved Oxygen (DO)	Grab Sample	Field Analysis and confirmed as required with lab assessment
Electrical Conductivity (EC)	Grab Sample	Field Analysis
Total Suspended Solids (TSS)	Grab Sample	Laboratory Analysis (as required to calibrate field analyses)

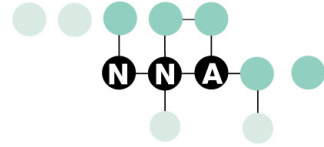
Monitoring will be completed by appropriately qualified personnel who have training and expertise in water sampling techniques.

Monitoring equipment will be operated and maintained according to the manufacturer's guidebook. Monitoring criteria will be in accordance with legal requirements and laboratory analysis will be sought should an environmental incident be suspected. Results of any insitu water testing will be recorded on form (*Form G-FRM-002*) and will be supported by NATA accredited laboratory results.



## 8 DEFINITIONS AND ACRONYMS

Acronym	Glossary
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval
ASS	Acid Sulphate Soils
Aust	Australia
CAR	Corrective Action Request
CEMP	Construction Environmental Management Plan
CMD	Coastal Management District
DNR&W	Department of Natural Resources Mines and Water
EIN	Environmental Improvement Notice
EIS	Environmental Impact Statement
EPA	Queensland Government Environmental Protection Agency
ESCP	Erosion and Sedimentation Control Plan
GIS	Geographical Information System
GQAL	Good Quality Agricultural Land
IEAUST	Engineers Australia (previously Institution of Engineers, Australia)
KPI	Key Performance Indicator
LinkWater	SRWPCo now trading as LinkWater and is 100 per cent owned by the Queensland Government
Mary Basin WRP	<i>Water Resource (Mary Basin) Water Resource Plan 2006</i>
MP	Management Plan
MSC	Maroochy Shire Council
MSDS	Material Safety Data Sheet
NCR	Non-conformance Report
NNA	Northern Network Alliance
NPI	Northern Pipeline Interconnector
QESE	Quality Environmental Safety Engineering database
ROW	Right of Way
SWMP	Soil and Water Management Plan (NPI001-A-PLN-011)
WMS	Work Method Statement
WQMF	Water Quality Management Facility
WTP	Water Treatment Plant



## 9 REFERENCE DOCUMENTS

Acid Sulphate Soils Management Plan (*NNA001-A-PLN-003*)

Australian and New Zealand Environment and Conservation Council (ANZECC 2000) The Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Australian Standard 1940-1993 – *The Storage and Handling of Flammable and Combustible Liquids*.

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*Coastal Protection and Management Act 1995*.

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Environmental Protection (Water) Policy 1997.

*Environmental Protection Act 1994*.

*EP Act 1994 Section 319*

Fauna Management Plan (*NNA001-A-PLN-007*)

*Fisheries Act 1994*.

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