Hyder

Riparian Assessment

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Transitional Part 3A Concept Plan Application

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SIMTA

SIMTA Moorebank Intermodal Terminal Facility

Riparian Assessment

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Glossary of Terms

Term	Meaning
CRZ	Core riparian zone
DCP	Liverpool Development Control Plan 2008
DNSDC	Defence National Storage and Distribution Centre
EP&A Act 1979 (or the Act)	*Environmental Planning and Assessment Act 1979*
LEP	*Liverpool Local Environmental Plan 2008*
NOW	NSW Office of Water
Proponent	SIMTA
Rail Corridor	Land linking the SIMTA site with the Southern Sydney Freight Line
SIMTA	Sydney Intermodal Terminal Alliance (the landowners, being Qube Logistics and QR National)
SIMTA site	The land formerly known as the Defence National Storage and Distribution Centre (DNSDC) land
Southern Sydney Freight Line (SSFL)	Dedicated freight line running to Port Botany
VB	Vegetated buffer
WM Act	*Water Management Act 2000*

Executive Summary

This report identifies and assesses the potential impacts to the Anzac Creek and Georges River riparian zones arising from the proposed development of the Sydney Intermodal Terminal Alliance (SIMTA) proposal. The SIMTA proposal comprises two distinct areas commonly referred to within this report:

- SIMTA site – Refers to the land parcel located, currently occupied by the Department of Defence upon which the Defence Storage and Distribution Centre is situated.
- Rail Corridor – The parcels of land to the south and south-west of the SIMTA site proposed to be utilised for a rail corridor, currently occupied by a number of owners, including the Commonwealth.

This report has been prepared to support the Concept Plan application prepared for the SIMTA proposal, seeking approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as a transitional Part 3A project (Schedule 6A, EP&A Act). As a transitional Part 3A project the SIMTA proposal is exempt from the requirement for controlled activity approval and water management works approvals under sections 89 and 91 of the *Water Management Act* 2000 (WM Act) (Schedule 6A and Section 75U, EP&A Act).

This investigation undertaken to inform this assessment included a review of riparian requirements under the *Water Management Act 2000* (WM Act) and the Liverpool Development Control Plan (DCP), consideration of historic aerial photographs and the Liverpool 9030-2S 1:25 000 topographic map, as well as consultation with the NSW Office of Water (NOW). The review of these documents identified that:

- Neither of the channel systems on the SIMTA site are classified as streams, nor does the riparian corridor of Anzac Creek intrude into the site.
- The proposed rail link (located within the rail corridor) will require works in the riparian corridor of both Anzac Creek and the Georges River. This approval will be provided on approval of the project application.
- The riparian setback for Anzac Creek, as specified by NOW, is 30 metres (20 metre CRZ and 10 metre VB). The riparian corridor for the Georges River is yet to be determined with NOW, however, based on the NOW guidelines the recommended setback is likely to be between 30-50 metres (20-40 metre CRZ and 10 metre VB).

The potential impacts on the riparian corridor of both waterways as a result of the SIMTA proposal were identified to include the removal of riparian vegetation, and impacts on vegetation condition and survival as a result of surface water and stormwater quality and quantity, erosion and sedimentation impacts.The following measures are recommended to minimise and manage impacts upon the riparian zone of Anzac Creek and the Georges River:

- Any works undertaken in the riparian corridor will comply with the controlled activities approval.
- Riparian corridors will be appropriately revegetated to restore and/or maintain ecological, functional and habitat values and impede surface flows and drop sediment before it reaches the waterways.
- Water quality and quantity issues will be managed during the construction phase through the implementation, inspection and maintenance of best practice soil and water management techniques which will be defined in the CEMP for sedimentation and erosion control during construction.
- Water quality and quantity issues will be managed on the SIMTA site during operation through the implementation, inspection and maintenance of Water Sensitive Urban Design (WSUD) measures such as rainwater tanks, grass filter strips, swales and bio retention.

On the basis of the above assessment it is concluded that the likely potential impacts can be effectively managed and controlled so as to have a minimal impact on the riparian environments of Anzac Creek and Georges River.

1 Introduction

The Sydney Intermodal Terminal Alliance (SIMTA) is a consortium of Qube Logistics and Aurizon. The SIMTA Moorebank Intermodal Terminal Facility (SIMTA proposal) is proposed to be located on the land parcel currently occupied by the Defence National Storage and Distribution Centre (DNSDC) on Moorebank Avenue, Moorebank, south west of Sydney. SIMTA proposes to develop the DNSDC occupied site into an intermodal terminal facility and warehouse/distribution facility, which will offer container storage and warehousing solutions with direct rail access to Port Botany. Construction of the rail connection from the SIMTA site to the Southern Sydney Freight Line (**SSFL**) will be undertaken as part of the first stage of works for the SIMTA proposal.

The SIMTA site is located in the Liverpool Local Government Area. It is 27 kilometres west of the Sydney CBD, 17 kilometres south of the Parramatta CBD, 5 kilometres east of the M5/M7 Interchange, 2 kilometres from the main north-south rail line and future Southern Sydney Freight Line, and 0.6 kilometres from the M5 motorway.

The **SIMTA site**, approximately 83 hectares in area, is currently operating as a Defence storage and distribution centre. The SIMTA site is legally identified as Lot 1 in DP1048263 and zoned as General Industrial under Liverpool City Council LEP 2008. The parcels of land to the south and south west that would be utilised for the proposed rail link are referred to as the **rail corridor**. The proposed rail corridor covers approximately 75 hectares and adjoins the Main Southern Railway to the north. The rail line is approximately 3.5 kilometres in length, 20 metres in width (variable width) and includes two connections to the SSFL, one south and one north.

The proposed rail corridor is owned by third parties, including the Commonwealth of Australia, RailCorp, private owners and Crown Land held by the Department of Primary Industries, and would link the SIMTA site with the Southern Sydney Freight Line. Existing uses include vacant land, existing rail corridors (East Hills Railway and Main Southern Railway), extractive industries, and a waste disposal facility. The rail corridor is intersected by Moorebank Ave, Georges River and Anzac Creek. Native vegetation cover includes woodland, forest and wetland communities in varying condition. The proposed rail corridor is zoned partly 'SP2 Infrastructure (Defence and Railway)' and partly 'RE1 - Public Recreation'. The surrounding Commonwealth lands are zoned 'SP2 Infrastructure (Defence)'.

Table 1 shows the lot and deposited plan number of the land parcels that will be impacted by the SIMTA proposal.

Table 1 Land parcels of the SIMTA proposal

Lot	Deposited Plan	Property Address/Description
1	1048263	Moorebank Avenue, Moorebank (SIMTA Site)
3001	1125930	Moorebank Avenue, Moorebank (land immediately south and south-west of SIMTA Site, including School of Military Engineering)
1	825352	Railway land and to the north of East Hills Railway Line
2	825348	
1	1061150	
2	1061150	
1	712701	
5	833516	Privately owned land north of East Hills Railway Line,

Lot	Deposited Plan	Property Address/Description
7	833516	east of Cumberland & South Passenger Line and Southern Sydney Freight line and west of Georges River
51	515696	
52	517310	
104	1143827	
103	1143827	
91	1155962	
4	1130937	Land west of the Georges River, north of the above privately owned land
5	833516	Railway land along shared railway line – Cumberland & South Passenger Line and Southern Sydney Freight Line
101	1143827	
102	1143827	
Conveyance Book 76	Number 361	Main Southern Rail Corridor
NA	NA	Georges River (Crown Land)

This report considers the construction and operational impacts of the SIMTA proposal as a whole for the full operational capacity of 1 million twenty-foot equivalent unit (TEU) throughput per annum.

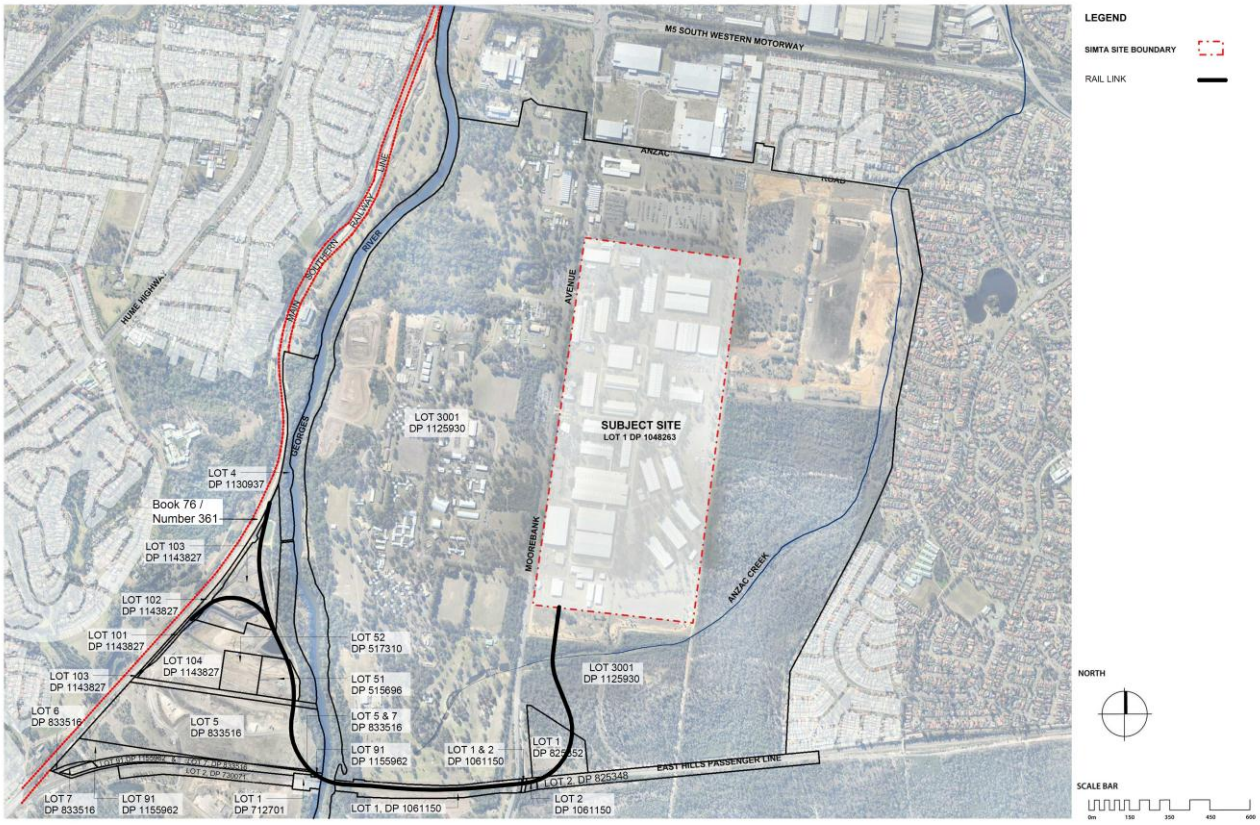

Figure 1: SIMTA Proposal showing the SIMTA site and proposed rail link

2 Riparian Zone Management Requirements

2.1 Water Management Act 2000

Controlled activities carried out in, on or under waterfront land are regulated by the *Water Management Act 2000* (WM Act). The NSW Office of Water (NOW) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. A Controlled Activity Approval must be obtained from the NOW before commencing a controlled activity.

In the context of the WM Act a "**controlled activity**" means:

(a) the erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or

(b) the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or

(c) the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or

(d) the carrying out of any other activity that affects the quantity or flow of water in a water source.

Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

A **river** under the WM Act includes:

(a) any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved, and

(b) any tributary, branch or other watercourse into or from which a watercourse referred to in paragraph (a) flows, and

(c) anything declared by the regulations to be a river, whether or not it also forms part of a lake or estuary, but does not include anything declared by the regulations not to be a river.

The SIMTA proposal is a '**transitional Part 3A project**' under Schedule 6A of the *Environmental Planning and Assessment Act* 1979 (**EP&A Act**). As a transitional Part 3A project the provisions of Section 75U of the EP&A Act continue to apply to the project; hence, controlled activity approvals and water management works approvals under section 90 and 91 of the WM Act are not required for the SITMA proposal. The principles and guidance documents published by the NOW have been considered within this report and will be incorporated as far as practicable into the design of the SIMTA proposal.

When determining an appropriate width for a riparian corridor and the quantity of riparian vegetation that should be protected or re-established on a site, the following three riparian zones (Figure 2) should be considered:

1 Core riparian zone (CRZ): is the land contained within and adjacent to the channel. The CRZ should be retained, or revegetated with fully structured native vegetation (including groundcovers, shrubs and trees). The width of the CRZ from the banks of the stream is determined by assessing the importance and riparian functionality of the watercourse

(see Table 2), merits of the site and long-term land use. Infrastructure such as roads, drainage, stormwater structures, services, etc should not be located within a CRZ.

2 Vegetated buffer (VB): protects the environmental integrity of the CRZ. The VB should be wide enough to protect the CRZ from weed invasion, micro-climate changes, litter, trampling and pollution and the recommended width is 10 metres although this is subject to merit assessment. Infrastructure such as roads, drainage, stormwater structures, services, etc should be located outside the VB.

3 Asset protection zone (APZ): is a requirement of the NSW Rural Fire Service and is designed to protect assets (houses, buildings, etc.) from potential bushfire damage. The APZ is measured from the asset to the outer edge of the vegetated buffer (VB). The APZ should contain cleared land which means that it cannot be part of the CRZ or VB. The APZ must not result in clearing of the CRZ or VB. Infrastructure such as roads, drainage, stormwater structures, services, etc can be located within the APZ.

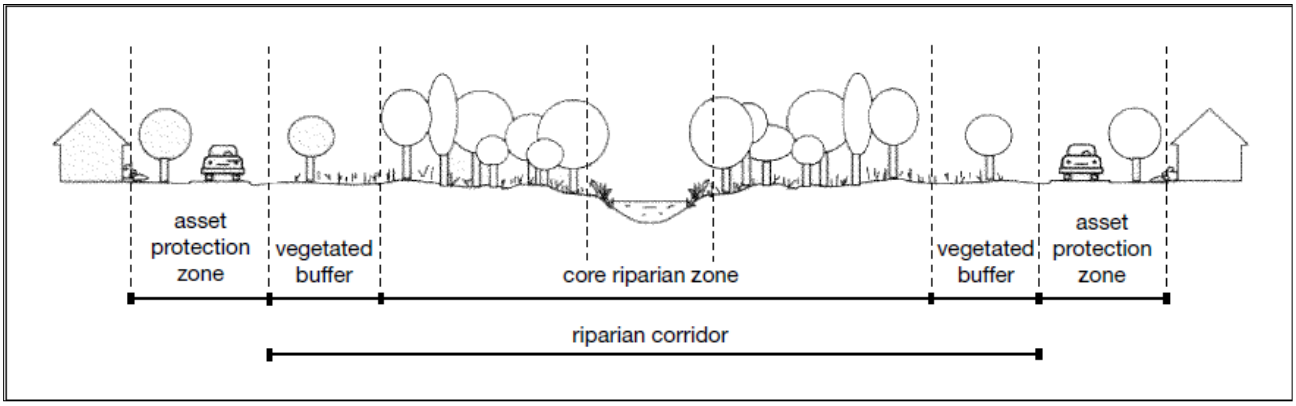

Figure 2: Riparian corridor zones (DWE 2008)

The NOW recommends a vegetated CRZ width based on watercourse order as classified under the Strahler System of ordering watercourses and based on current 1:25 000 topographic maps (Table 2).

Table 2: Recommended CRZ widths

Type of watercourse	Width of CRZ
Any first order watercourse and where there is a defined channel where water flows intermittently or any 'river' not identified on a topographic map.	10 metres
▪ any permanently flowing first order watercourse, or ▪ any second order watercourse and where there is a defined channel where water flows intermittently or permanently.	20 metres
Any third order or greater watercourse, where there is a defined channel and where water flows intermittently or permanently. Includes estuaries, wetlands and any parts of rivers influenced by tidal waters.	20 - 40 metres[1]

[1] merit assessment based on riparian functionality of the river, lake or estuary, the site and long-term land use.

2.2 Liverpool Development Control Plan

Section 7 of the Liverpool Development Control Plan (DCP) 2008 *Part 1.1 General Controls for all Development* specifies the requirements for development near creeks and rivers. The section applies to any development in the LGA:

- Within 50 metres of a watercourse (except where separated by land zoned RE1, E2, E3 and W1).

- That may impact upon bed, banks or stream flow of a watercourse.
- That may involve removal of riparian vegetation.

The DCP provides for a riparian corridor at least 40 metres from the top of the bank of the watercourse, however in this instance the riparian corridor is to consist of:

- A core riparian zone (minimum 20 metres wide) of native groundcovers, shrubs and trees.
- An outer buffer zone (minimum 10 metres wide) of native groundcovers and shrubs.

The above DCP requirements apply only in the absence of a Part 3A approval under the EP&A Act, however they will be taken into consideration during detailed design of the rail link.

2.3 Greater Metropolitan Regional Environmental Plan No 2—Georges River Catchment

The specific aims and objectives of the Greater Metropolitan Regional Environmental Plan No 2—Georges River Catchment (Georges River REP) are:

- To protect and maintain the water quality and flows of the Georges River
- To maintain the regional role of the Catchment with the surrounding environment and associated land uses.

The Georges River Catchment REP establishes a series of planning controls to achieve the aims and objectives. Part 3, Section 11, 21(a) of the planning controls specifies that a 100 metre buffer from the edge of the gorge or the top of the banks of the Georges River must be established for currently forested Crown lands and natural bushland areas that are classified as community land. As the project area is privately owned the 100 metre buffer restriction does not apply. As required by the Georges River REP and the DCP, a riparian corridor buffer of at least 40 metres from the top of the bank of the watercourse has been provided for as part of the SIMTA Project. It is noted that section 75U of the EP&A Act means that these requirements apply only in the absence of a Part 3A approval under the EP&A Act which is being sought for the SIMTA proposal.

2.4 Fisheries Management Act 1994

Under Part 2 and 7 (Division 3) of the *Fisheries Management Act 1994* (FM Act) any works in a waterway may require approval to dredge and/or reclaim any material from the stream bed or riparian zones. As the SIMTA proposal is a transitional Part 3A project under the EP&A Act, section 75U removes the requirement for approval for in stream works under the FM Act. While approval for in stream works, including dredging, reclamation works and temporary in stream structures, is not required under the FM Act for the SIMTA proposal, the objectives and guidelines developed under the FM Act will be considered in the detailed design of the rail link to minimise potential impacts on fisheries resources and riparian areas.

Dredging works (as defined under the FM Act) will be necessary to construct the footings or foundations for the crossing, while reclamation works will include the construction of pylons and abutments for bridges, creation of in-stream construction pads, or the placement of materials in waterways to construct temporary or permanent crossings. Consultation will be undertaken with the Department of Primary Industry (Fisheries) prior to

commencement of all in stream works to develop management strategies to minimise the impacts of these works.

Environmental assessment for crossing design and construction requires the completion of a '7 part test'; a series of seven questions designed to assess the significance of the impact of the proposed works on listed threatened species, populations or ecological communities or their habitat (including 'critical habitat') listed under the FM Act. If the '7 part test' indicates a significant impact(s) then a Species Impact Statement (SIS) may also be required.

Permits may also be required under Part 5 (clauses 112- 115) of the *Fisheries Management (General) Regulation 2002* for any works which may involve the use of explosives, electrical devices or other dangerous substances within waters.

Waterway crossing design and construction will be developed to be consistent with Habitat Protection Plans (HPP) gazetted under Part 7 (Division 1) of the FM Act, in particular, HPP No.1 which outlines the requirements for the management of 'snags' (large woody debris or boulders).

Specific issues relating to works in a waterway and impacts on fish passage and habitat are discussed in the report *SIMTA Moorebank Intermodal Terminal Facility Stormwater and Flooding Environmental Assessment* (Hyder consulting 2011a).

3 Existing Environment

The purpose of this section is to confirm the riparian zones both on the SIMTA site and within the rail corridor.

3.1 SIMTA site

There are currently a number of man-made channels draining from the SIMTA site into Anzac Creek, draining the north-east and south-east sections of the site. Historic aerial photographs from 1930, 1951, 1961 and 2011 were reviewed to investigate the original nature of these channels and the potential applicability of the WM Act, particularly in relation to the classification as a 'river' and riparian corridor requirements.

3.1.1 North-eastern channel system

Stereoscope examination of the 1930 aerial photograph (Figure 3) indicates a broad low depression originating around the midline of the site and extending northeast to Anzac Creek. There does not appear to be any change in the vegetation along the length of this channel. In 1930 the SIMTA site was largely undeveloped with the site being traversed by a series of access tracks. Development is evident to the immediate north and east of the SIMTA site.

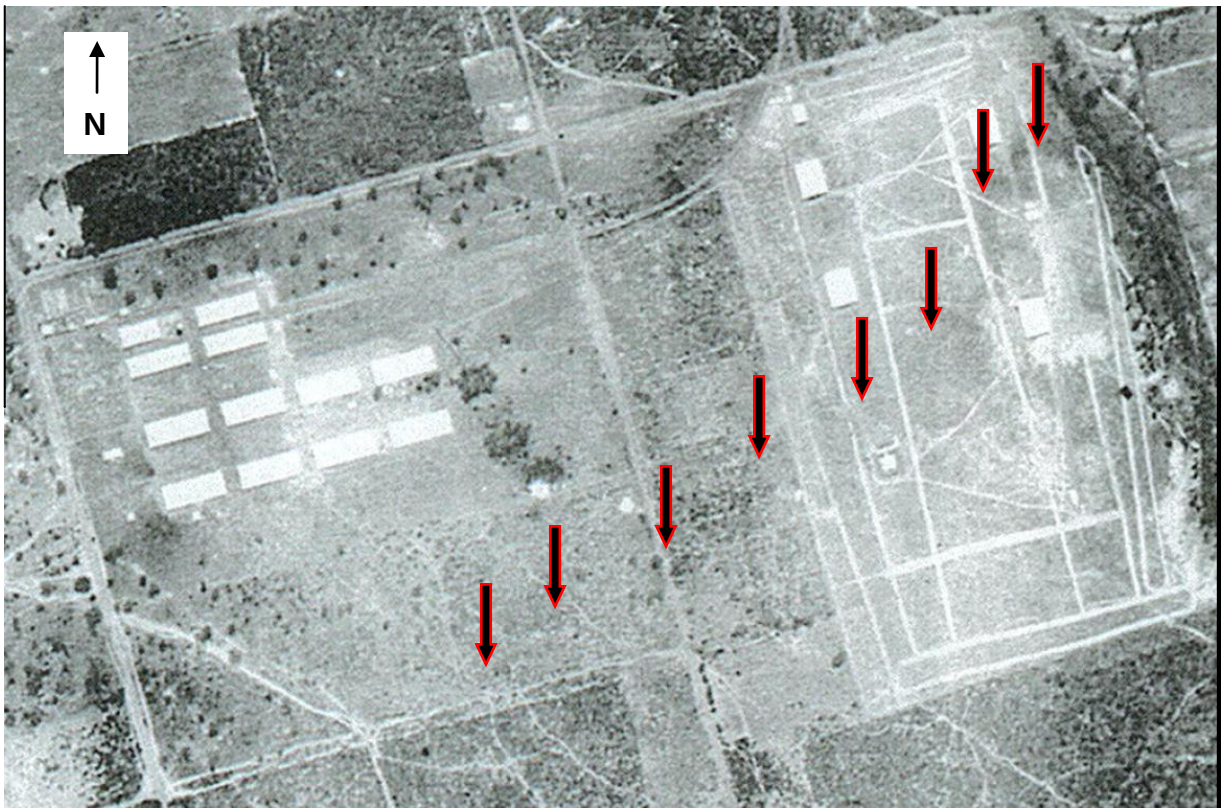

Figure 3: Aerial photograph from 1930 indicating the potential depression line (shown by arrows)

The 1951 aerial photograph (Figure 5) indicates extensive development on the SIMTA site. As a part of this development, a concrete-lined channel has been created which extends east, then north and then east again off the site through the adjacent Department of Defence land to Anzac Creek. It is likely that the channel was installed to drain stormwater from the site as the development likely created an increase in run-off from impermeable surfaces.

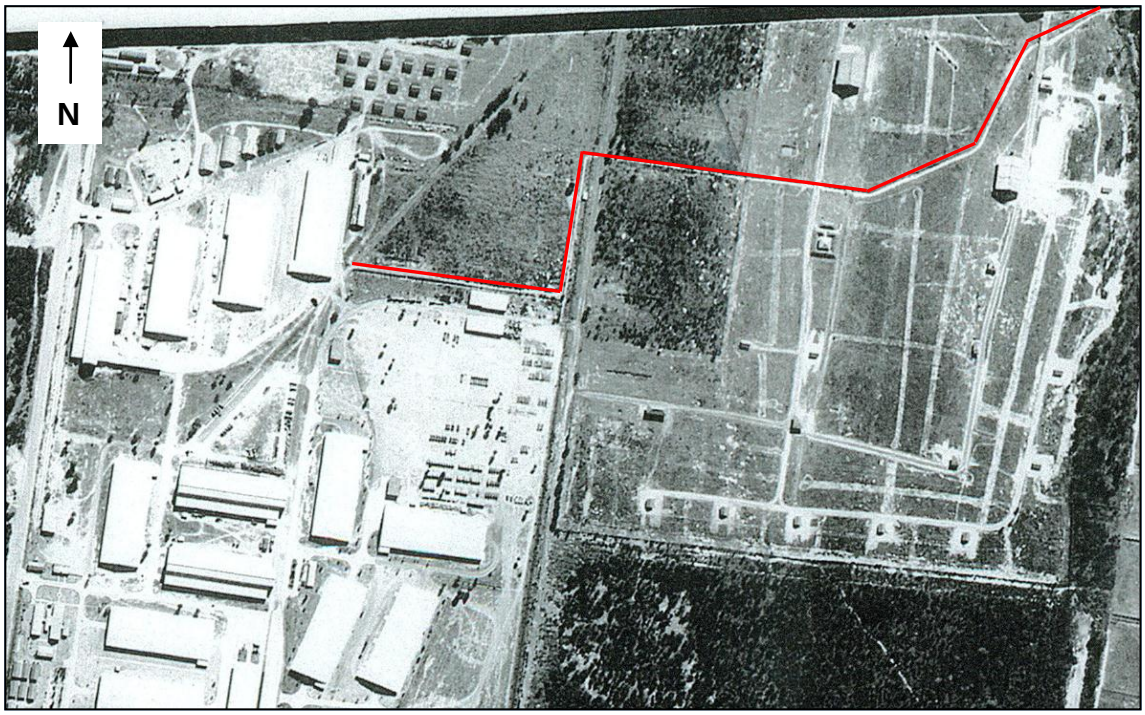

Figure 4: 1951 aerial photograph indicating the concrete-lined channel in red

In the 1961 aerial photograph further unlined channels are evident (Figure 5).

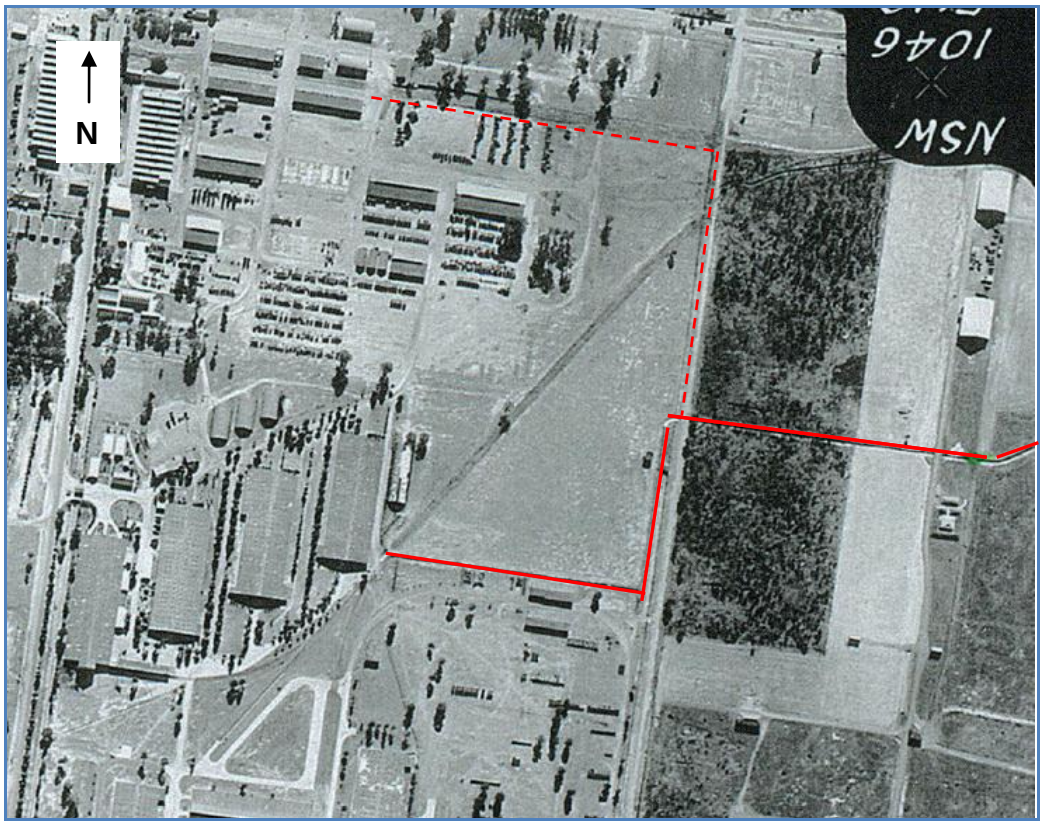

Figure 5: 1961 aerial photograph indicating the concrete-lined channel in red (dirt-lined channels are dashed)

At present, the channel system currently comprises both concrete-lined and dirt-lined open channels that join and drain the site through a single lined channel that joins Anzac Creek below Anzac Rd. This channel is marked as a blue line on Liverpool 9030-2S 1:25 000 topographic map. Based on the map legend the initial section of the channel is defined as a water pipeline and the later section which joins into Anzac Creek an intermittent stream.

Based on the presentation of the review of aerial photographs to Janne Grosse (17th August 2010) at the NSW Office of Water, the following advice was provided regarding whether the watercourse located to the north of the site (red line in Figure 4 and 5) is a 'river' as defined under the WM Act:

"In this locality the watercourse may originally have been a Chain of Ponds. If this were the case the watercourse would be a "river" under the WM Act. Current air photography indicates the watercourse to the north of the site has been piped. Regardless of whether this section of the watercourse (to the north of the site) is historically a river or not, the NOW would not be seeking a watercourse/riparian outcome along the northern boundary of the intermodal site because of the current impediments to this section of creek". A full transcript of the advice provided in emails is presented in Appendix A.

3.1.2 South-eastern channel system

The series of channels in the south-eastern portion of the DNSDC site exhibit defined beds, banks and vegetation along the length of the drainage line.

Based on the site inspection conducted on the 29 July 2010 it was observed that the main channel continued east through the SIMTA site. The channel then proceeds through a culvert located beneath the access track adjoining the SIMTA site to the east. From this point, the channel continues east, eventually discharging to Anzac Creek.

This channel is not marked as a "stream" on the topographic map and historic aerial photos indicated the channel is man-made and follows a differing route than the pre-existing overland flow paths. Like the north-eastern channel, it too is not considered to be a "river" as defined under the WM Act.

3.1.3 Anzac Creek

The south-east section of the SIMTA site is in proximity of Anzac Creek. On a site visit undertaken on 29 July 2010, a series of GPS readings were taken from the top of the highest bank on both sides of the watercourse in order to determine if the 30 metre riparian corridor intrudes into the SIMTA site. Figure 6 provides a scaled map indicting the location of the SIMTA site, Anzac Creek and an indicative 30 metre buffer area on either side of the creek. As evident, the 30 metre riparian corridor falls outside the project area on the south-east corner of the SIMTA site.

Figure 6: Anzac Creek, including a 30 metre riparian corridor

As neither of the channel systems on the SIMTA site is classified as streams, and the riparian corridor of Anzac Creek does not intrude into the site, a controlled activity approval will not be required for construction or operation phase activities on the site.

3.2 Rail Corridor

3.2.1 Anzac Creek

The rail corridor is located to the south and south-east of the SIMTA site and is within the catchment of Anzac Creek, a small tributary of the Georges River. A flood study of the area (BMT WBM 2008) indicated that the Anzac Creek catchment covers an area of 10.6 square kilometres. Anzac Creek is within the Georges River catchment, a sub-catchment of the Liverpool District catchment area. Anzac Creek originates from within the Royal Engineers Golf Course, to the west of Moorebank Avenue, and flows in a north-east direction across the rail corridor, just south of the SIMTA site. The creek flows north past the adjoining suburbs of Wattle Grove and Moorebank before draining into Lake Moore in Chipping Norton, which in turn flows into the Georges River.

Using the Strahler stream ordering method (Strahler 1957) and the Liverpool 9030-2S 1:25 000 topographic map the headwaters of Anzac Creek up to just below Anzac Road, was determined to be a first order stream (shown as a continuous blue line on the topographic map) that originates in the Royal Australian Engineers Golf Course. Anzac Creek has a defined channel where water flows intermittently. The assessment undertaken as part of the Flora and Fauna Assessment (Hyder Consulting 2011b) indicates that Anzac Creek is likely to be classified as Class 3 fish habitat, as described in Table 3. This classification is supported by the results of fish surveys which identified only one species, introduced Gambusia (*Gambusia holbrooki*) Furthermore, the overall AUSRIVAS rating for macroinvertebrates was Band B indicating that the macroinvertebrate community was ‘significantly impaired’.

Table 3: Classification of fish habitat in NSW waterways (Fairfull and Witheridge 2003)

Class	Description
CLASS 1 **Major fish habitat**	Major permanently or intermittently flowing waterway (e.g. river or major creek), habitat of a threatened fish species.
CLASS 2 **Moderate fish habitat**	Named permanent or intermittent stream, creek or waterway with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Marine or freshwater aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area.
CLASS 3 **Minimal fish habitat**	Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats.
CLASS 4 **Unlikely fish habitat**	Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools after rain events (e.g. dry gullies or shallow floodplain depressions with no permanent aquatic flora present).

At the time of the aquatic and riparian habitat assessment, the Anzac Creek site had limited aquatic habitat which included soft substrate pools and extensive macrophyte cover. There was no open or running water present at the site. The creek was obscured by dense growths of *Typha* sp. and *Salvinia molesta*. Water was mostly static and shallow (1 to 30 centimetres deep) with a small pool of approximately 1 metre depth immediately downstream of the culvert tunnels running underneath the disused rail line. Riparian vegetation was dominated by *Melaleuca* sp., *Eucalyptus* spp., and other native shrubs species.

Based on the stream order (i.e. permanently flowing first order watercourse), NOW has recommended a minimum 30 metres riparian corridor (see Appendix A) (as measured from top of bank) be established either side of Anzac Creek. This riparian corridor includes a 20 metre CRZ and a 10 metre VB, as shown in Figure 7.

The proposed rail link to the SIMTA site potentially joining the existing Southern Sydney Freight Line (SSFL) to the SIMTA site will need to cross Anzac Creek. This will require a controlled activity approval under the WM Act as issued by NOW to undertake construction in this area. The riparian corridor of Anzac Creek will need to be discussed with NOW once the siting of the crossing is determined.

3.2.2 Georges River

The Georges River is located within the Georges River catchment and the Liverpool District subcatchments and Mid Georges River catchment. It enters the Liverpool LGA from the south on the western side of the Defence Lands at Holsworthy and flows north, meeting with Glenfield Creek at Casula. From here the Georges River continues to flow north past the Liverpool City Centre, under Newbridge Road, past Lighthorse Park and over the Liverpool Weir. Downstream of the Liverpool Weir, the Georges River becomes slightly salty (estuarine) and is more subject to tidal influences.

At the point where it transects the study area, the Georges River is freshwater until it flows over the Liverpool Weir approximately 3.5 kilometres to the north. The weir, constructed in 1836, defines the upper reach of the Georges River estuary; below the weir the Georges River is influenced by tidal flows. The Georges River meanders south-east from Chipping Norton before draining into Botany Bay.

The aquatic survey, conducted in the proximity of the proposed railway crossing, identified two species of fish, including one specimen of the native Flathead Gudgeon (*Philypnodon grandiceps*) and the introduced Gambusia (*Gambusia holbrooki*) (Hyder Consulting 2011b). The AUSRIVAS macroinvertebrates results for the Georges River rated the sampling site in Band C, suggesting that it is 'severely impaired' with fewer macroinvertebrate families were observed than expected.

At the survey site the Georges River was 40 to 60 metres wide, and the bank dropped rapidly to a depth of 1.2 metres before falling away at a steadier grade. Aquatic habitats present included soft substrate pool habitat, large woody debris and extensive macrophyte cover. Riparian vegetation was dominated by a dense growth of Lantana, with occasional tall *Eucalyptus* spp. Overhanging vegetation, fallen logs, mats of sticks, submerged (*Elodea canadiensis*) and floating aquatic plants (*Azola* sp., *Salvinia molesta*) were present throughout the study and reach along the bank.

Georges River comprises a major permanently flowing river and as such, is classified as Class 1 (Major Fish Habitat) in accordance with Fairfull and Witheridge (2003). Being a third order greater than, permanently flowing watercourse the recommended CRZ for Georges River is 20 – 40 metres (Table 2), pending approval and issue a controlled activity permit. In addition to the recommended CRZ a 10 metre VB will also be required. Figure 7 indicates the maximum corridor width (50 metres) in the main map, with the 30 and 40 metre corridors presented in the inserts.

As the proposed rail link within the rail corridor would also need to cross the Georges River, a controlled activity approval under the WM Act will be required. As per the Anzac Creek crossing, the riparian corridor of the Georges River will need to be discussed with NOW once the siting of the crossing is determined.

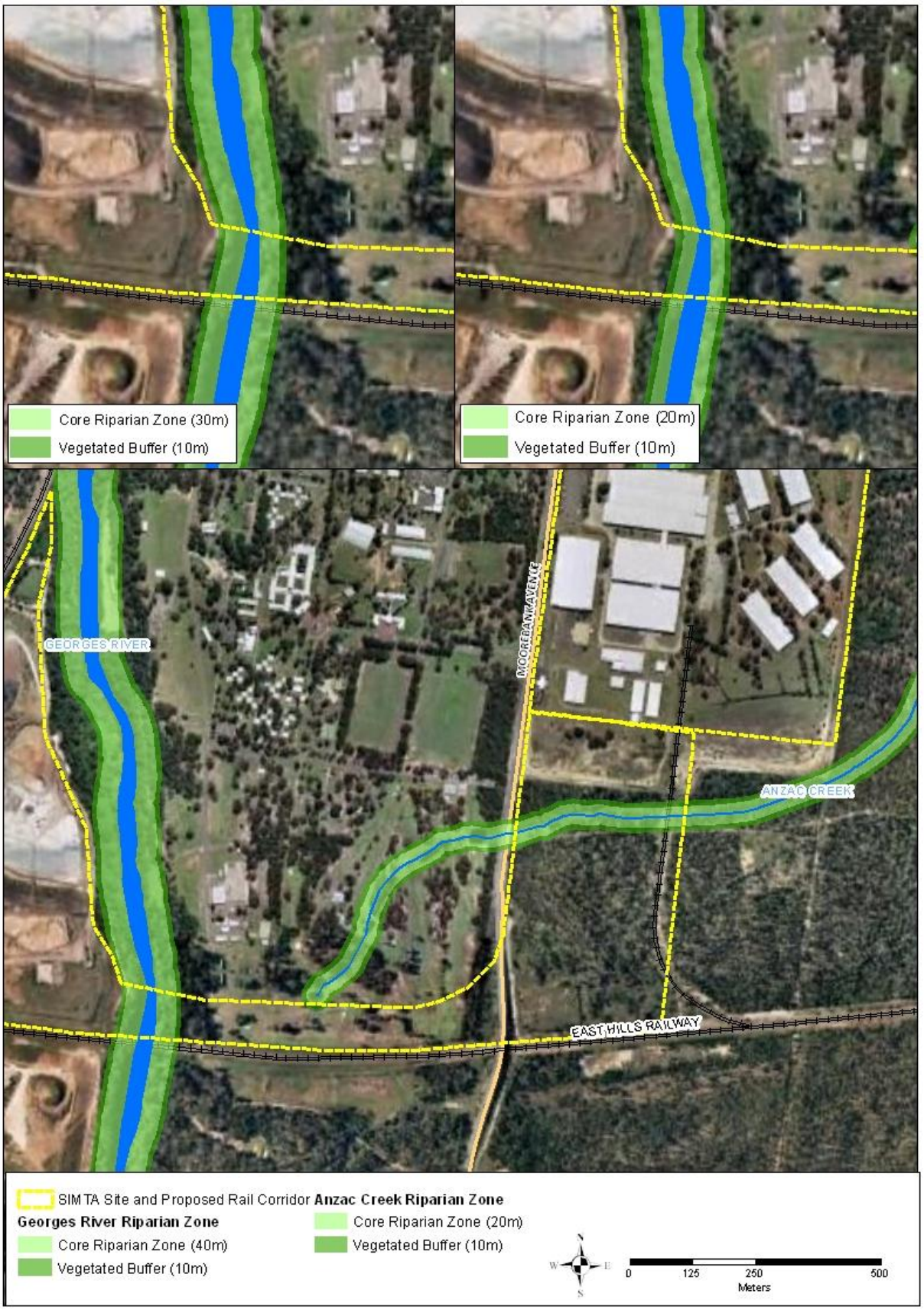

Figure 7: Riparian corridors associated with Georges River and Anzac Creek (indicates the range of potential corridor widths for Georges River)

4 Potential Impacts

Riparian corridors perform a range of important environmental functions such as:

- Providing bed and bank stability and reducing bank and channel erosion.
- Protecting water quality by trapping sediment, nutrients and other contaminants.
- Providing diversity of habitat for terrestrial, riparian and aquatic plants (flora) and animals (fauna).
- Providing connectivity between wildlife habitats.
- Conveying flood flows and controlling the direction of flood flows.
- Providing an interface or buffer between developments and waterways.

This section discusses the potential riparian corridor impacts of the SIMTA proposal on Anzac Creek and Georges River. These impacts will arise from development of the SIMTA site and in the rail corridor, and will occur during the construction and operational phases.

Potential impacts arising from surface water and stormwater quality, erosion and sedimentation during the construction and operational phases are discussed only briefly here, as they are covered in more detail in the report *SIMTA Moorebank Intermodal Terminal Facility Stormwater and Flooding Environmental Assessment* (Hyder Consulting 2011a).

4.1 Construction phase impacts

Construction phase impacts on the riparian corridor include:

- The removal and/or disturbance of riparian vegetation in order to construct the rail crossing across Anzac Creek and Georges River. Vegetation removal can reduce bed and bank stability and lead to increased bank and channel erosion, as well as impact riparian and in stream habitat values and impair flood control functions of the riparian zone.
- Increased sediment load as a result of erosion from exposed surfaces into riparian zone. The source of the sediments may be from construction activities on the SIMTA site and those associated with the rail link in the rail corridor. Increased sediment has the potential to smother ground cover and low vegetation. The accumulation of water in sediments around the trunk of larger trees can also cause rot, leading to tree death.
- Decreased water quality as a result of runoff and erosion from exposed surfaces. This is particularly relevant if the runoff contains contaminants or nutrients in concentrations that are harmful to riparian vegetation.
- Decreased water quantity reaching the surface water runoff also has the potential to harm riparian vegetation, particularly during extended dry periods.

4.2 Operation phase impacts

Operation phase impacts on the riparian corridor include:

- Increased surface water runoff due to impervious surface areas, particularly on the SIMTA site. This can lead to waterlogging of riparian zone vegetation resulting in a decline in condition and/or loss of vegetation if occurring over long periods of time.
- Decreased surface water runoff and quantity due to water retention and diversion/discharge structures on the SIMTA site.

- Decreased water quality due to surface water runoff of hardstand areas picking up contaminants from fuel spills, tyre wear, vehicle emissions and particulate deposition.

5 Management Controls and Mitigation Measures

Potential impacts of the SIMTA proposal can be reduced or removed through the implementation of management controls and mitigation measures during the construction and operation phases.

Approval will be sought to undertake works within the riparian corridors. The riparian setback for Anzac Creek, as specified by NOW, is 30 metres (20 metre CRZ and 10 metre VB). The riparian corridor for the Georges River is yet to be determined with NOW, however, based on the NOW guidelines the recommended setback is likely to be between 30-50 metres (20-40 metre CRZ and 10 metre VB). Mitigation strategies will be adopted in the project design, as well as the construction and operational stages, so that ecological values of the creek and riparian vegetation are protected.

Management controls and mitigation measures arising from surface water and stormwater quality, erosion and sedimentation during the construction and operational phases are discussed only briefly here, as they are covered in more detail in the report *Stormwater and Flooding Environmental Assessment* (Hyder Consulting 2011a).

5.1 Construction phase controls and mitigation

Controls would be implemented during the construction phase to reduce/ameliorate or remove the potential impacts identified in section 4.1 include:

- Revegetation of the riparian corridor to restore and/or maintain ecological, functional and habitat values and impede surface flows and drop sediment before it reaches the waterways. As riparian vegetation along both Anzac Creek and Georges River is currently highly degraded, the aim would be to improve the condition through the selection of local providence species.
- Best practice soil and water management techniques will be implemented. This will include the use of sediment fences, check dams, level spreaders and other devices to mitigate the export of soil from the site. This will be defined through the preparation of a CEMP for sedimentation and erosion control during construction. Control structures will be inspected daily to confirm they are functioning as intended and will be repaired/ maintained as required.
- The primary mitigation measure will be the progressive development of the site allowing for better management and reduced potential pollution through having less exposed material at any one time.
- Disturbed areas will be limited to only those areas which need to be worked on at that point in time, and areas would be rehabilitated and sealed as soon as possible following construction.
- Potentially hazardous activities will be conducted in accordance with best practice environmental protection measures and in areas isolated from stormwater drainage systems or natural watercourses.
- Contaminated materials which cannot be remediated and buried onsite, will be exported from the SIMTA site. These will be disposed at a suitably licensed disposal facility.

5.2 Operation controls and mitigation

Controls to be implemented during the operation phase to reduce/ameliorate or remove the potential impacts identified in section 4.2 include:

These would include:

- Revegetation in the riparian zone will be checked and maintained regularly. Plantings will be watered as required until established and weeds and pests will be managed. Plantings that have not survived will be replaced.
- Water Sensitive Urban Design (WSUD) measures such as rainwater tanks, grass filter strips, swales and bio retention will be incorporated within the site to meet the water quality treatment objectives in accordance with Liverpool City Council's DCP.
- Flows from the site will be managed through the incorporation of onsite detention into the drainage system design. The aim of these works would be to match post-development flows from the site with pre-development flow rates for a range of storm occurrence intervals and durations.
- Management of water quality impacts during operation will focus on the appropriate inspection and maintenance of sediment basins and the landscape treatments within the SIMTA site and railways corridor land. Adaptive management measures would be developed to confirm that the performance of the water quality treatment measures remain satisfactory in the event that future rainfall events increase in either frequency or intensity.
- Management plans for hazardous materials and spill response will be developed. It is anticipated that each operational section and building would have its own spill management system that will prevent ingress into the surface water drainage system. It is also anticipated that there will be a design response to manage potential spills, once the management and spill response has been adequately assessed. This response may include inline treatment, spill sumps or further options of detention on site or within the proposed drainage system.

6 Conclusions

This impact assessment of the SIMTA proposal on the riparian environment of Anzac Creek and Georges River indicated that:

- As neither of the channel systems on the SIMTA site is classified as streams, and the riparian corridor of Anzac Creek does not intrude into the site, a controlled activity approval will not be required for construction or operation phase activities on the SIMTA site.
- The proposed rail link (located within the rail corridor) is exempt from the requirement for an WM Act controlled activity approval from NOW as a transitional Part 3A project; however the detailed design of the rail link will seek to conform to the objects of the WM Act and its associated guidelines.
- The riparian setback for Anzac Creek, as specified by NOW, is 30 metres (20 metre CRZ and 10 metre VB), while for Georges River the riparian setback is likely to be between 30 and 50 metres (20 – 40 metre CRZ and 10 metre VB).
- The potential impacts on the riparian corridor of both waterways as a result of the SIMTA proposal include the removal of riparian vegetation, and impacts on vegetation condition and survival as a result of surface water and stormwater quality and quantity, erosion and sedimentation impacts.
- Riparian corridors will be appropriately revegetated to restore and/or maintain ecological, functional and habitat values and impede surface flows and drop sediment before it reaches the waterways.
- Water quality and quantity issues will be managed during the construction phase through the implementation, inspection and maintenance of best practice soil and water management techniques which will be defined in the CEMP for sedimentation and erosion control during construction.
- Water quality and quantity issues will be managed during the operation phase through the implementation, inspection and maintenance of Water Sensitive Urban Design (WSUD) measures such as rainwater tanks, grass filter strips, swales and bio retention.

On the basis of the above assessment it is concluded that the likely potential impacts can be effectively managed and controlled so as to have a minimal impact on the riparian environments of Anzac Creek and Georges River.

7 References

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Fairfull, S. and Witheridge, G. (2003). *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*. NSW Fisheries, Cronulla, Website: http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/202693/Why-do-fish-need-to-cross-theroad_booklet.pdf

Hyder Consulting (2011a) *SIMTA Moorebank Intermodal Terminal Facility Stormwater and Flooding Environmental Assessment*. Hyder Consulting, North Sydney.

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Strahler, A. N. (1957). *Quantitative analysis of watershed geomorphology*. Transactions of the American Geophysical Union (38):913-920.

Appendix A
Transcript of correspondence with NOW

From: Ian Garrard
Sent: 17 August 2010 10:32 AM
To: 'Janne Grose'
Cc: 'Greg Brady'; Aaron Hui; John Mcdermott
Subject: RE: Moorebank Intermodal : Email 4

Janne,

Thanks for your confirmation and prompt response: confirming that the watercourse located to the north of the Moorebank Intermodal site is not a 'river' as defined under the Water Management Act.

In terms of Anzac Creek, and in the absence of survey information, our ecologies walked the top of bank with a GPS. This map is being prepared and I will forward it to you.

Ys

Ian

Dr. Ian M Garrard,

Director : Water, Environment & Resources

(02) 8907 9031

0418 294 283

From: Janne Grose [mailto:Janne.Grose@water.nsw.gov.au]
Sent: 17 August 2010 10:12 AM
To: Ian Garrard
Subject: RE: Moorebank Intermodal : Email 4

Hi Ian

The NOW's principal geomorphologist has confirmed that the watercourse located to the north of the Moorebank Intermodal site is not a 'river' as defined under the Water Management Act.

kindest regards from

Janne

17/8/2010

Janne Grose

Planning and Assessment Coordinator

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Department of Environment, Climate Change and Water

>>> "Ian Garrard" <Ian.Garrard@hyderconsulting.com> 16/08/2010 18:31 >>>

Janne.

Again thanks for your update.

Are you are able to have an initial response from NOW's principal geomorphologist before COB Wednesday? Happy to teleconference to assist information exchange and understand his/her findings.

I had spoken to Greg, to get some guidance, on the site previously so he is (partially) familiar with the issues.

The northern water course (as build and shown in the 1951 photo) is largely as it appears today. So Near map or Google gives a good indication of its form now, and when created.

As outlined earlier the northern drain is a man- made open concrete channel to carry stormwater resulting from the site development. It is piped below a number of roads, it crosses below.

I'll follow up the Mapping you suggested.

Whilst I appreciate your point about Anzac creek riparian lands, the DNSDC site is the *hole in the Donut* as all surrounding land is under the ownership/management of Defence, including Anzac creek.

Regards

Ian

Dr. Ian M Garrard,

Director : Water, Environment & Resources

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0418 294 283

From: Janne Grose [mailto:Janne.Grose@water.nsw.gov.au]
Sent: 16 August 2010 12:15 PM
To: Ian Garrard
Cc: Greg Brady
Subject: Re: Moorebank Intermodal : Email 4

Hi Ian

Thanks for sending me the background information, including :

* the plan which shows the location of the intermodal site,

* the stream classification map which shows the northern creek and Anzac Creek to the south of the site; and

* the historical air photography.

In relation to the northern creek (located to the north of the intermodal site) and whether it is a river under the WM Act, I have referred the information you provided to the NOW's principal geomorphologist for his advice on this. In this locality the watercourse may originally have been a Chain of Ponds. If this were the case the watercourse would be a "river" under the WM Act.

Current air photography indicates the watercourse to the north of the site has been piped. I have discussed this with Greg Brady this morning. Regardless of whether this section of the watercourse (to the north of the site) is historically a river or not, the NOW would not be seeking a watercourse / riparian outcome along the northern boundary of the intermodal site because of the current impediments to this section of creek.

Anzac Creek has been mapped as a Category 2 watercourse. In accordance with the stream classification map, it is recommended a minimum 30 m riparian setback (measured from top of bank) is established either side of Anzac Creek. The riparian area along Anzac Creek appears to generally be located outside the intermodal site on land to the south of the intermodal site with the exception of the south east corner of the site which appears to partly encroach into the riparian area.

It is recommended the PEA includes a scaled map which clearly shows the location of:

* the site's southern boundary,

* Anzac Creek,

* the minimum 30 m riparian area either side of the creek (measured from top of bank) and

* any encroachment of the proposed development into this riparian area .

Remnant riparian vegetation along Anzac Creek is retained to the south of the intermodal site and better riparian outcomes could be achieved on the adjacent site rather than the intermodal site where the vegetation has already been cleared. Because of this some encroachment into the riparian area on the intermodal site may be possible but details need to be provided and the PEA should address any proposed mitigation measures.

I hope this assists with the preparation of the PEA.

kindest regards from

Janne

16/8/2010

Janne Grose

Planning and Assessment Coordinator

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Department of Environment, Climate Change and Water

>>> "Ian Garrard" <Ian.Garrard@hyderconsulting.com> 13/08/2010 14:50 >>>

Janne,

- 1960 photo.
- The proposed intermodal and its staging
- Explanation/interpretation as to the marked (*Map of Interest* : provided in an eelier email creek lines below .

Potential Water Ways

Map of Interest identifies two such water ways within or neighbouring the DNSDC Site. Firstly, to the north of the site is a man made channel (marked Blue) which then traverses the Defence land to the east, before joining Anzac Creek which flows in a northeast direction prior to its junction to the M5. The second is to the immediate south of the site being Anzac Creek (marked green).

Historic aerial photographs were reviewed with the dominate ones relating to: 1930 and 1951.

The purpose of this historic review was to investigate the potential applicability of the Rivers and Foreshore Provisions of the boarder Water Management Act 2000.

Northern Channel

The historic aerial photographs identify:

1930

- In 1930 the DNSDC site is largely undeveloped and covered with native vegetation though various areas have been under different clearing regimes. It is likely some fencing/grazing had occurred particularly to the east of the site. The DNSDCs site is traversed by a series of access tracks, generally running southeast to northwest. Major development is evident to the immediate north of the DNSDC site and extensive clearing of an area to the northeast is also evident.
- In regard to the northern channel, the 1930 photo indicates that a broad low depression existed in the northern area of the DNSDCs site; generally running parallel to the northern boundary and moving in a west to east direction. This depression is quite broad and is not channelized but rather would carry overland flow on a low gradient towards Anzac creek (to the east).

1951

- The 1951s photo shows extensive level of development on the DNSDC site. Whilst no buildings existed on site in 1930, by 1951 the site is largely developed and /or cleared.
- As a part of this development, a man made channel has been created which is anticipated to function as a stormwater drain for the now largely developed site. The development would have created a significant increase in run off (as a consequence of building development and hard stands). The stormwater has been directed to a man made channel that runs through the aforementioned low broad depression until it reaches the eastern boundary of the DNSDC site. At this point it takes a right angle turn to the north (towards the northern/eastern corner of the DNSDC site). Prior to reaching this corner the channel takes a further right angle turn, to the east, moves over the DNSDC boundary and into the adjacent Defence lands.

Recognising the above it is considered that the northern (blue) line reflects a man made channel generated prior to the 1951 to carry the increased stormwater flow from buildings and hard stand across the DNSDC site. The aerial photographs clearly indicate this is a man made feature, though it is not considered to be a “river” within the definition as of the Water management Act 2000, vis.

> *The current drainage line is a man made feature, and whilst crossing an original depression it is not considered to be a “river” or “creek line” for the purposes of the Water Management Act 2000. Rather, the position of the original drainage depression, being in the upper part of the catchment, was such that whilst overland water would flow into the depression, it is not channelized (that is, not ‘flowing in a natural channel’ as defined by Water Management Act).*

Anzac Creek

Anzac Creek is acknowledged as a ‘river’ under the Water Management Act however the Creek (and some 40m from its top of bank) is close to, but not within the DNSDC property boundary.

Ys

Ian

Dr. Ian M Garrard,

Director : Water, Environment & Resources

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