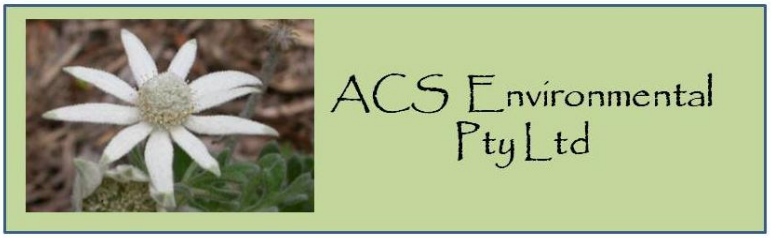

RIPARIAN ISSUES,

ASSESSMENT & MANAGEMENT

AT

NO. 20 SHEPHERD STREET, LIVERPOOL

Prepared for:

CORONATION PROPERTY CO. PTY LTD
C/- NATURALLY TREES

JULY 2015

ACS Environmental P/L

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Consultants experience

The directors of 'Actinotus Consultancy Services (ACS) – Environmental P/L' (formerly Actinotus Environmental Consultants) have collectively worked in the area of biodiversity impact and bushfire hazard assessment services for a period of greater than 20 years. They also have over 30 years of experience in scientific research (ecological, genetic) and teaching in biological science.

The principals of the former 'Actinotus Environmental Consultants' have completed the NSW Consulting Planners Bushfire Training Course organised by the Planning Institute of Australia NSW Division for planning consultants and allied professionals relating to the implementation of 'Planning for Bushfire Protection', in June 2003.

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ABBREVIATIONS

DECCW – State Department of Environment, Climate Change and Water

DoE – Commonwealth Department of Environment

EPA Act – Environment Protection Act

EPBC Act – Environment Protection and Biodiversity Conservation Act

FM Act – Fisheries management Act

NPWS – State National Parks and Wildlife Service

OEH – Office of the Environment and Heritage

RC - Riparian Corridor

SMCMA – Sydney Metropolitan Catchment Management Authority

SREP - State Regional Environmental Plan

SREP No. 2 - Greater Metropolitan Region No. 2 - Georges River Catchment

TSC Act – Threatened Species Conservation Act

VRZ - Vegetated Riparian Zone

RIPARIAN ISSUES, ASSESSMENT AND MANAGEMENT AT NO. 20 SHEPHERD STREET, LIVERPOOL

1. Location and description:

The site occurs along a section of the western perimeter of the Georges River (Figure 1) and has been developed for industrial purposes since well before 1943.

Figure 1 - Site location at No. 20 Shepherd Street, Liverpool, the eastern boundary contiguous with vegetation along a section of the western embankment of the Georges River at Liverpool (image from SIX Maps). (Note that the digitised property boundary overlay is not exactly in line with the actual property boundaries).

2. Riparian setbacks and management of riparian corridors according to NSW Office of Water Guidelines (2012)

According to the NSW Office of Water (2012) the Riparian Zone or Corridor is defined as:

> 'A transitional zone between the land, also known as the terrestrial environment, and the river or watercourse or aquatic environment. 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'.
>
> The riparian corridor consists of:
>
> - the channel which comprises the bed and banks of the watercourse (to the highest bank), and
> - the vegetated riparian zone (VRZ) adjoining the channel.

Riparian corridors may 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
- providing passive recreational uses.

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 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.

As such, a controlled activity approval must be obtained from the NSW Office of Water before commencing the development activity.

Changes to Controlled Activities within Riparian Corridors

On 1 July 2012 new rules commenced regarding controlled activities within riparian corridors. The new rules amend the riparian corridor widths that apply to watercourses, providing more flexibility in how riparian corridors can be used and making it easier for

applicants to determine the Office of Water controlled activity approval requirements. Key aspects of the changes include:

- Provision of greater flexibility in the allowable uses and works permitted within riparian corridors.
- The core riparian zone and vegetated buffer have been combined into a single vegetated riparian zone (VRZ).
- The width of the VRZ within the riparian corridor has been pre-determined and standardised for first, second, third and fourth order and greater watercourses.
- Where suitable, applicants may undertake non-riparian corridor works or development within the outer 50 per cent of a VRZ, as long as they offset this activity by connecting an equivalent area to the RC within the development site.
- A new 'riparian corridors matrix' enables applicants to determine what activities can be considered in riparian corridors.

These changes will simplify the controlled activities application and assessment process, provide greater flexibility, help make more land available for housing, support floodplain, stormwater and bush fire management, and allow riparian corridors to be used for public amenity whilst continuing to deliver environmental outcomes required under the WM Act (NSW Office of Water 2012).

Objectives for Riparian Corridor Management

The overarching objective of the controlled activities provisions of the WM Act is to establish and preserve the integrity of riparian corridors.

Ideally the environmental functions of riparian corridors should be maintained or rehabilitated by applying the following principles:

- If a watercourse is present, define the RC/VRZ on a map.
- Seek to maintain or rehabilitate a RC/VRZ with fully structured native vegetation.
- Seek to minimise disturbance and harm to the recommended RC/VRZ.
- Minimise the number of creek crossings and provide perimeter road separating development from the RC/VRZ.
- Locate services and infrastructure outside of the RC/VRZ. Within the RC/VRZ provide multiple service easements and/or utilise road crossings where possible.
- Treat stormwater run-off before discharging into the RC/VRZ.

The Office of Water however, does allow for a range of works and activities on waterfront land and in riparian corridors to better meet the needs of the community, so long as they cause minimal harm.

The section of the Georges River that forms the eastern boundary of the subject site at No. 20 Shepherd Street, Liverpool, is a 3rd Order watercourse as defined by the Strahler system of classifying the various watercourse systems (NSW Office of Water 2012).

As such a riparian setback (VRZ) of 30m from the riverbank is taken as a guideline to the distance incorporating a vegetated buffer zone to development (NSW Office of Water 2012).

At No. 20 Shepherd Street, Liverpool, the location of the nominal 30m riparian setback (VRZ) as recommended by the guidelines of the NSW Office of Water (2012) is indicated in Figure 2.

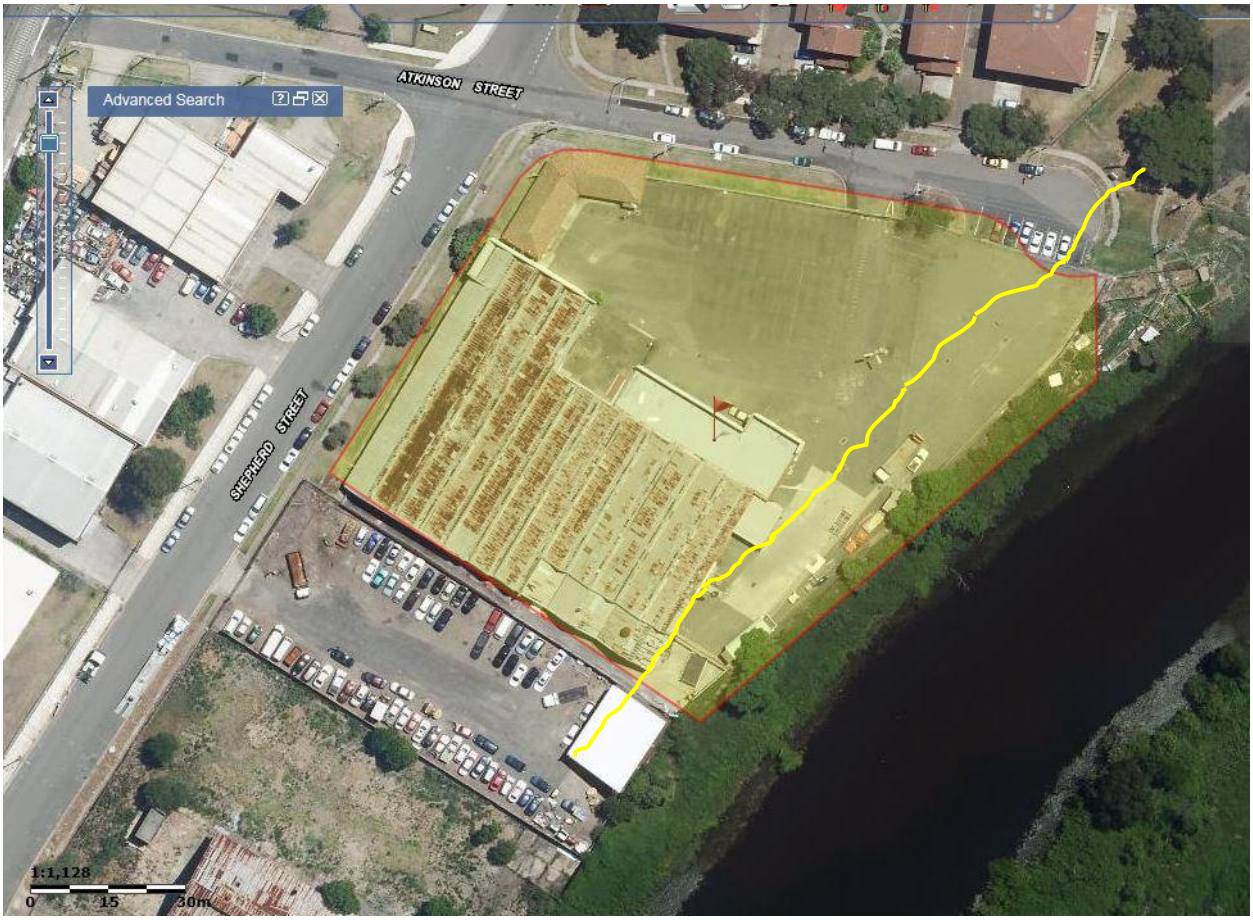

Figure 2 - Nominal riparian setback at No. 20 Shepherd Street, Liverpool (yellow shading) representing a setback of 30m from the top of the regular river embankment as recommended by the guidelines of the NSW Office of Water (2012)

3. Environmentally significant land (from Liverpool LEP 2008)

Figure 3 indicates the setback as depicted in the Environmentally Significant Land Map (Sheet ESL-012) of the Liverpool LEP (2008).

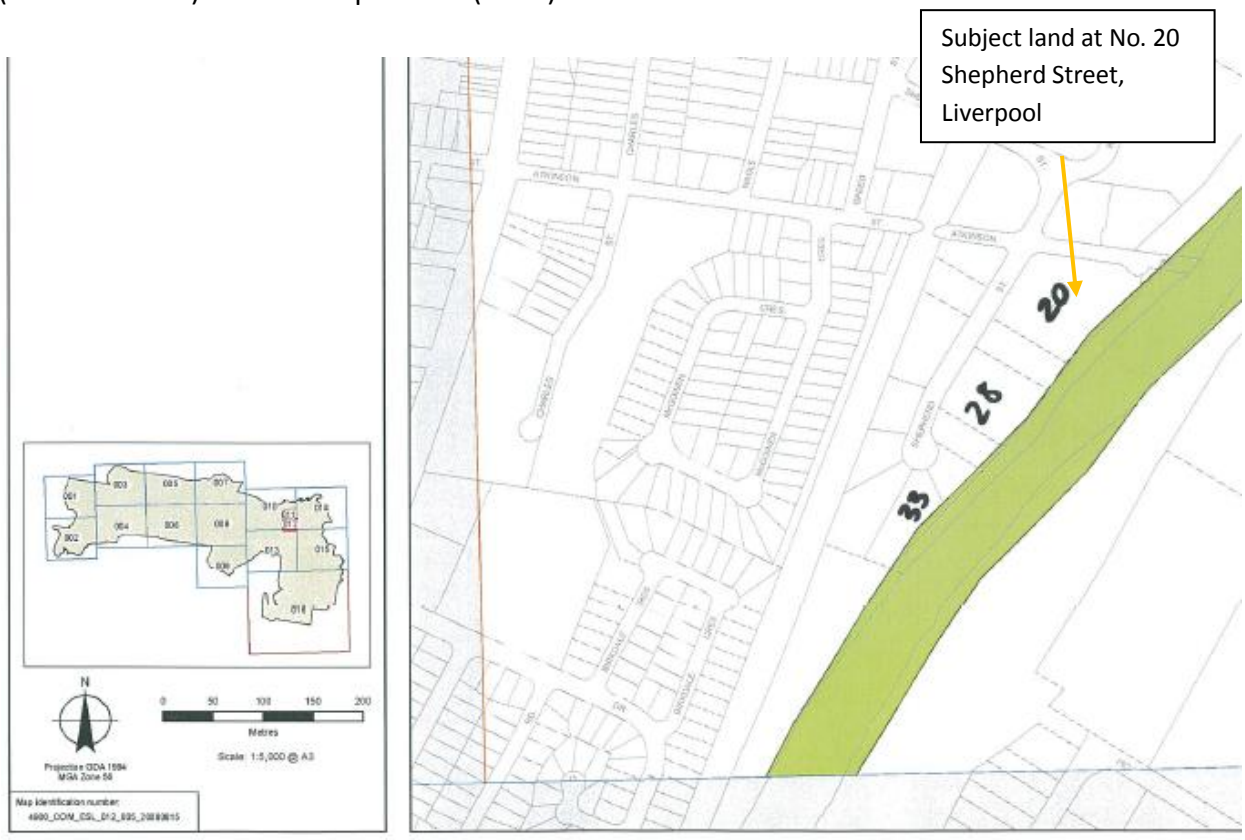

Figure 3 - The Environmentally Significant Land (shown in Sheet ESL-012 of the Liverpool LEP 2008) indicated by the olive green shading

The 30m setback recommended by the guidelines issued by the NSW Office of Water (2012) for the section of the Georges River at Shepherd Street, Liverpool, closely approximates that indicated by the mapping of the Environmentally Significant Land in Liverpool LEP (2008) shown in Figure 3.

The vegetation comprising the current foreshore plant assemblage is comprised mostly of noxious and environmentally invasive woody weeds and vines such as Lantana, Green Cestrum (Green Poisonberry), Morning Glory and Balloon Vine (Figure 4) (ACS Environmental 2015 in process). An over-mature individual of Snow-in-Summer (*Melaleca linariifolia*), remnant of a former Alluvial Woodland ecological community has been retained at the river edge, the individual occurring in poor condition and smothered in noxious weedy vines (Figure 5).

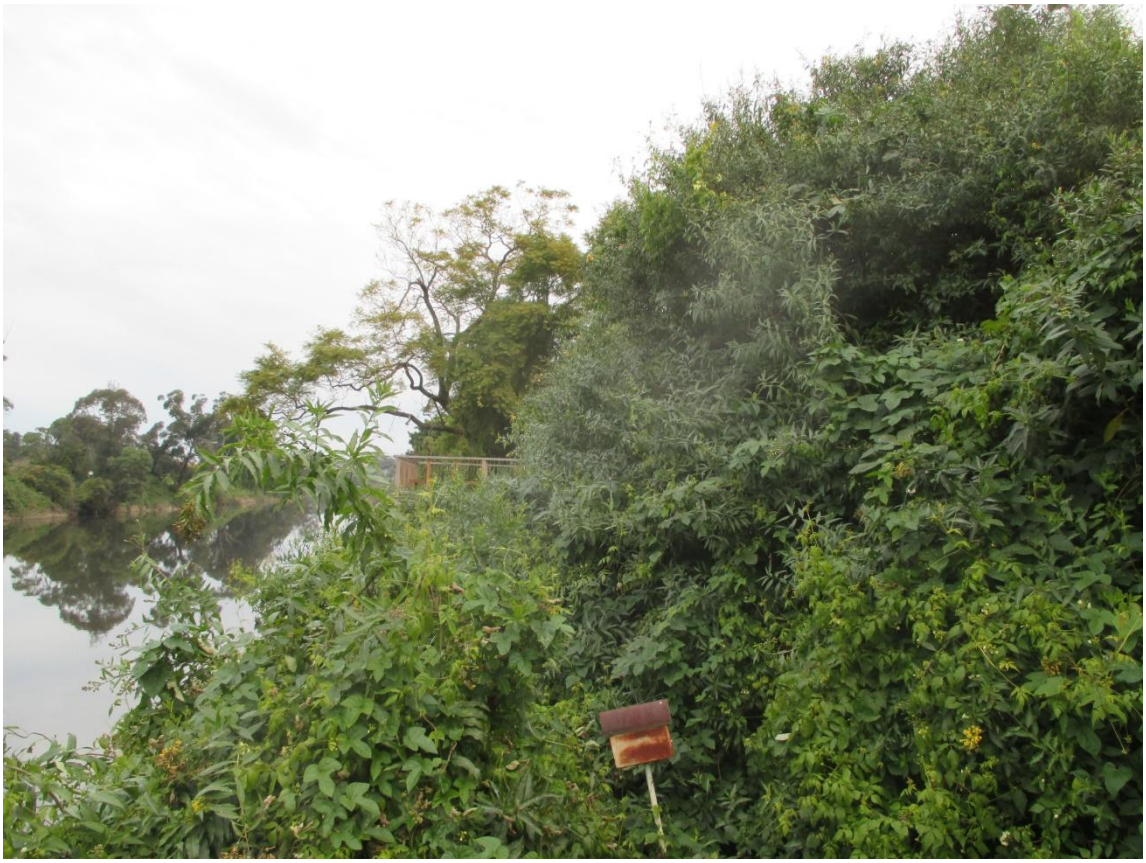

Figure 4 - The vegetation comprising the foreshore and embankment assemblage along the Georges River section of No. 20 Shepherd Street, Liverpool, includes large shrubs such as Green Cestrum and Lantana smothered with exotic vines such as Morning Glory and Balloon Vine.

Figure 5 - The vegetation comprising the foreshore and embankment assemblage along the Georges River section of No. 20 Shepherd Street, Liverpool, includes a remnant over-mature individual of Snow-in-Summer (occurring as a double-trunked tree), an indigenous small tree species representative of a former Alluvial Woodland ecological community, the individual smothered with exotic vines such as Morning Glory and Balloon Vine.

4. Proposed development

The layout of the proposed development plan for the subject site (from Aspect Studios - Woods Bagot 2015) is shown in Figure 6.

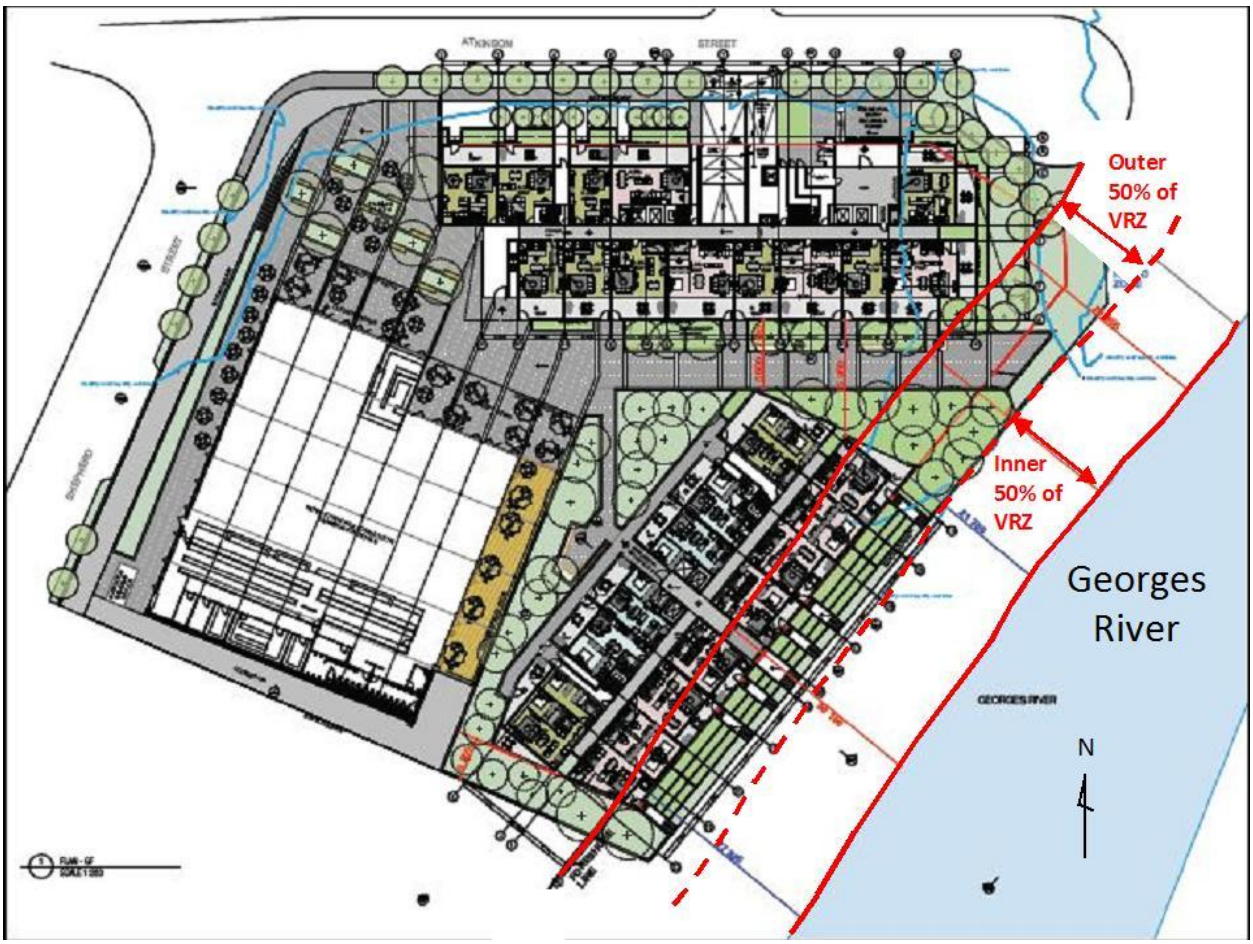

Figure 6 - The draft proposed development plan for the subject site at No. 20 Shepherd Street, Liverpool (from Woods Bagot - Aspect Studios 2015) showing the indicative 30m riparian setback (VRZ) recommended by the NSW Office of Water (red font) with the outer 50% of the VRZ indicated by the broken red line. Proposed building construction does not encroach beyond the outer 50% of the VRZ.

5. Permissible activities within the riparian zone (VRZ)

According to the guidelines given by the NSW Office of Water, certain controlled activities are allowable within particularly the outer 50% of the VRZ (from 15 - 30m from the edge of the river embankment), with consideration given to offsetting an equal area of land within the development that has been given to a prescribed use within the riparian zone (NSW Office of Water 2012).

According to the guidelines given by the NSW Office of Water, allowable development within, particularly the outer 50% of the VRZ, may include the following:

- **Cycleways and paths:** Cycleways or paths no wider than four metres total disturbance footprint can be built in the outer 50 per cent of the VRZ;
- **Detention basins:** Detention basins can be built in the outer 50 per cent of the VRZ. Refer to the Office of Water's *Controlled activities. Guidelines for outlet structures* and *Controlled activities. Guidelines for in-stream works*.
- **Stormwater outlet structures and essential services:** Stormwater outlets or essential services are allowed in the RC. Works for essential services on a fourth order or greater stream are to be undertaken by directional drilling or tied to existing crossings. Refer to the Office of Water's *Controlled activities. Guidelines for laying pipes and cables in watercourses* and *Controlled activities. Guidelines for outlet structures.*
- **Road crossings:** Indicates permitted road crossing methods. Refer to the Office of Water's *Controlled activities. Guidelines for watercourse crossings.*

However, as this section of the river is heavily weed-infested and requires extensive rehabilitation, a merit-based development such as that shown in Figure 6 may be proposed in negotiation with the NSW Office of Water.

The area encroached within the outer 50% of the VRZ may be required to be offset elsewhere within the developmental land area (NSW Office of Water 2012).

The characteristics and merits of maintaining with modification the VRZ as shown in Figure 6 are as follows:

- In a study of disturbance patterns in vegetation associated with the Georges River estuarine processes, Kirchner (in SMEC 2010) mapped similarly weed-infested riparian vegetation occurring along the river banks downstream of the subject site as 'Very High Intensity Disturbance Pattern - generally >70% affected'.
- DEC (2002) has not mapped the Conservation Significance Assessment of the current weed-infested riparian vegetation along the edges of the Georges River at Shepherd Street, Liverpool, as containing any significant vegetation indicating its extensive disturbance history and current lack of integrity as a naturally sustainable ecological community.

- The currently weed-infested VRZ vegetated section of the river bank land at Shepherd Street, Liverpool, should be rehabilitated by best -practice bush regeneration to a weed-free vegetated River-flat Forest 'alluvial woodland' zone to provide an effective integrated vegetation community in the locality.
- The extent of area encroached by building construction and other structures into the outer 15m width of the nominal 30m wide VRZ (Figure 6) should be amply offset elsewhere within the development.

Applications for controlled activities approvals should be informed by the riparian corridor matrix shown in Table 2 of the Guidelines (Office of Water 2012) and prepared using the *Application for a Controlled Activity Approval for works on waterfront land* form and the *Guideline for completing an application for a Controlled Activity Approval*.

Other controlled activity guidelines are available on the Office of Water website which also outlines relevant considerations for applicants when proposing activities and works on waterfront lands.

The current vegetation of the riparian component of the river bank is heavily weed-infested, and it is recommended that this vegetation undergo best-practice bush regeneration and rehabilitation for the health of the ecosystem and surrounding vegetated areas. It is recommended that for any development this zone is reconstructed to remove all weeds and the vegetation within the VRZ be reconstructed with species comprising riparian forest and alluvial woodland assemblages.

6. Suitable floristic assemblages for rehabilitation of the river bank vegetation

Species suitable in a reconstructed, landscaped VRZ setting for No. 20 Shepherd Street, Liverpool and surrounds, could include the following (taken from compositions indicative of River-flat Paperbark Swamp Forest and Cumberland River-flat Forest assemblages known to occur along stretches of the embankments of the Georges River (OEH 2013):

Trees	Small trees	Shrubs	Ground cover plants
Rough-barked Apple (*Angophora floribuna*)	*Acacia decurrens*	*Ozothamnus diosmifolius*	*Dianella longifolia*
Broad-leaved Apple (*Angophora subvelutina*)	*Acacia parramattensis*	*Hibbertia diffusa*	*Brunoniella australis*
Cabbage Gum (*Eucalyptus amplifolia*)	*Exocarpus cupressiformis*	*Acacia longifolia*	*Pratia purpurascens*
Blue Box (*Eucalyptus baueriana*)	*Melaleuca decora*	*Callistemon citrinus*	*Microlaena stipoides*
Forest Red Gum (*Eucalyptus tereticornis*)	*Melaleuca styphelioides*	*Kunzea ambigua*	*Dichondra repens*
Blue Gum (*Eucalyptus saligna*)	*Melaleuca linariifolia*	*Bursaria spinosa*	*Oplismenus aemulus*
Swamp Mahogany (*Eucalyptus robusta*)			*Pteridium esculentum*
Grey Box (*Eucalyptus moluccana*)			*Viola hederacea*
			Einadia hastata
			Cheilanthes sieberi
			Clematis glycinoides

Table 1 - Species suitable for planting in a reconstructed riparian forest/woodland landscaped VRZ setting for No. 20 Shepherd Street, Liverpool and surrounds

7. Compliance with Greater Metropolitan Regional Environmental Plan No. 2 - Georges River Catchment (2008)

This SREP must be addressed and complied with whenever a consent authority determines a development application, or a public authority or another person proposes to carry out development or an activity which does not require development consent but which has the potential to adversely affect the water quality, river flows, flood regime or ecosystems within the Georges River Catchment.

As such, the cumulative impact of the proposed development or activity on the Georges River or its tributaries must be considered and mitigated in such a way that there will be no overall detrimental impact of wastewater or stormwater entering the river at Shepherd Street, Liverpool.

The development should effectively utilise any relevant plans of management including any River and Water Management Plans approved by the Minister for Environment and the Minister for Land and Water Conservation and best practice guidelines approved by the Department of Urban Affairs and Planning (all of which are available from the respective

offices of those Departments), the *Georges River Catchment Regional Planning Strategy* (prepared by, and available from the offices of, the Department of Urban Affairs and Planning), and all relevant State Government policies, manuals and guidelines of which the council, consent authority, public authority or person has notice (SREP No. 2 - 2008).

The following specific issues must be addressed and complied with in regard to SREP No. 2 (2008):

Bank disturbance

Specifically, the development requires that all stormwater and water flowing from hard surfaces be retained in appropriate on-site stormwater detention basins, excess flows regulated in such a way that disturbance of the bank or foreshore along the Georges River and its tributaries is to be avoided and those areas and any adjoining open space or vegetated buffer areas must be protected from degradation (SREP No. 2).

Urban/stormwater runoff

The impacts of stormwater runoff, including sewage contaminated runoff into or near streams within the Catchment, is to be minimised and mitigation measures that address urban stormwater runoff are to be implemented in accordance with local council requirements and the 'Managing Urban Stormwater' series of documents. Development is also to be in accordance with the *NSW State Rivers and Estuaries Policy* available from offices of the Department of Urban Affairs and Planning. Stormwater management must be integrated so that quality, quantity and land use aspects are all encompassed.

Urban development areas

The environment within or in the vicinity of the Catchment is to be protected by ensuring that new or expanding urban development areas are developed in accordance with the Urban Development Program and the Metropolitan Strategy and that the requirements of the *NSW Floodplain Development Policy and Manual* (prepared by and available from the Department of Land and Water Conservation) are also satisfied. It is important to ensure that the level of nutrients entering the waterways and creeks is not increased by the development.

Vegetated buffer areas

Appropriate buffer widths (as proposed and recommended in Sections 2 & 3 of this report) must be retained as a means of improving surface runoff entering into the Georges River or its tributaries.

Land degradation

Land degradation processes, such as:

(a) erosion,
(b) sedimentation,
(c) deterioration of soil structure,
(d) significant loss of native vegetation,
(e) pollution of ground or surface water,
(f) soil salinity and acidity, and
(g) adverse effects on habitats and sensitive natural environments (aquatic and terrestrial) within the Catchment, must be avoided where possible, and minimised where avoidance is not possible (SREP No. 2).

Catchment water quality

Water quality within the Catchment is to be maintained or improved through the implementation of environmental objectives for water quality agreed between the Minister for Environment and the Minister for Land and Water Conservation and by the application of consistent decisions affecting the use and management of land (SREP No. 2).

Specific matters for consideration for the section of the Georges River at Shepherd Styreet, Liverpool (SREP NO. 2)

The following considerations must be taken into account and addressed by appropriate expert personnel in the case of the current development:

- The likely impact of the proposal on the water table.
- The likely impact of the proposal on natural flows in the Georges River and its tributaries.
- The likely impact of the proposal on other downstream water users in the Catchment.
- Whether the proposal will contribute to enhancing both the recreational and environmental amenity within the Catchment.
- If the proposal is part of rehabilitation works, whether the proposal is in keeping with an approved rehabilitation plan.
- Whether the proposal is likely to result in a propagation zone for noxious aquatic weeds.
- The likelihood of the development resulting in the formation of algal blooms and the documentation of measures proposed to control that.

8. Compliance with Fisheries Management Act 1994 (FM Act)

Fisheries NSW is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, Fisheries NSW ensures that developments comply with the requirements of the Fisheries Management Act 1994 (FM Act) (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated Policy and Guidelines for Fish Habitat Conservation and Management (2013). As such, the following conditions would be satisfied:

- It is considered that he 30m riparian VRZ setback (Vegetated Riparian Zone) as recommended by The Office Of Water guidelines (2012) (Figure 6) and the Environmentally Sensitive Lands map as indicted in Liverpool LEP (2008) (Figure 5) would be commensurate with foreshore buffer guidelines as recommended by Fisheries NSW for the merit-based proposed development along this weed-infested shoreline of the Georges River that occurs above the tidal downstream weir.

- River bank regrading works are not proposed for the development and the river banks will be left intact (Northrop 2015, Woods Bagot 2015).

- The location of the proposed bioswales occur outside the riparian zone and all surface flows grade to this point for treatment prior to discharge to the Georges River. Roof water is directed to a vault containing Stormwater360 treatment cartridges prior to discharge into the Georges River (Northrop 2015).

- It is considered that the riparian buffer zone proposed provides generous provision of native vegetation and habitat on the Georges River. Provision for connectivity in both upstream and downstream directions is made. Deep rooted areas are provided for native tree species such as recommended for landscaping as indicated in Table 1.

9. References and literature reviewed:

ACS Environmental P/L (in process 2015) Survey and Biodiversity Assessment at various addresses at Shepherd Street, Liverpool, including at Nos. 20, 20, 31, 33 and at Mill Park

Aspect Studios (2015) Proposed Development Plan

Kirchner, E. (in SMEC) 2010 - Georges River Estuarine Process Study

Liverpool City Council DCP (2008)

Liverpool City Council LEP (2008)

NSW Office of Water (2012) Guidelines for Riparian Corridors on Waterfront Land

Northrop (2015) Water and Consulting Engineers

OEH (2013) 'The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area'.

SREP No. 2 (2008) Greater Metropolitan Region REP No. 2 - Georges River Catchment (Gazetted: 5.2.99)

Wood Bagot (2015) Proposed Development Plan