



143 Whitehead Road, Corowa

EPBC Preliminary Documentation

DRAFT REPORT

Prepared for Bathla Group

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1. Project Background

1.1. Project details

1.1.1. Proposed Action

The proposed action is to construct a residential development (including associated wetland retention basins) in Corowa, New South Wales.

Bathla Group (the Proponent) proposes to subdivide Lot 1912, DP1045138 at 143 Whitehead Street, Corowa NSW (Figure 1) to create a new residential community with a mixture of housing, open space areas and two wetland retention basins. The proposed action will involve the development of 293 residential lots, two retention basins, a park and associated infrastructure (including internal roads, whitehead road upgrades and a proposed bus stop). For the purpose of this document, the development footprint shown in Figure 1 is hereafter referred to as the Proposed Action Area (PAA). The Proposed action area (PAA) (i.e. all land directly impacted by the proposed action) is approximately 27.6 hectares in area.

For the consideration of impacts from the proposed action a 'project area' was established and includes a 50-metre buffer from the proposed action area to account for indirect impacts (in accordance with the terminology used in Att. 1, 'Att1-Whitehead.Street.Corowa.BDAR.pdf', Section 1.3, Page 6-7). The project area is approximately 40.4 hectares in size.

It is noted that the proposed action will wholly occur within Lot 1912, DP1045138, and direct impacts resulting from the proposed action are limited to land within the PAA.

The proposed action will involve the construction of two wetland retention basins, with one basin located in the north-eastern section of the PAA, and the other located in the north-western section (Att. 2, 'Att2-Development.Masterplan.pdf'). The Proponent has committed to constructing the retention basins in accordance with the Sloane's Froglet Stormwater Wetland Design Guidelines (the Guidelines) (Att. 3, 'Att3-Sloanes.Froglet.Design.Guidelines.pdf') and avoiding any development during the Sloane's Froglet Winter breeding season (April to mid-October).

The project area contains 4.72 ha of breeding and dispersal habitat for Sloane's Froglet in total, and the proposed action (including the construction of the artificial basin on the north-eastern corner of the PAA) will directly impact 2.04 hectares of this habitat.

It is considered possible that indirect impacts may occur to 2.68 hectares of breeding and dispersal habitat in the Project Area, including 0.13 hectares of breeding habitat in the two farms dams in the north-east of the PAA.

1.1.2. Location and extent

Lot 1912, DP1045138 is approximately 31.5 hectares and the proposed action area (PAA) (i.e. all land directly impacted by the proposed action) is approximately 27.6 hectares in area. The PAA is located on private land approximately 1.5 kilometres northwest of Corowa town centre and is currently zoned R2 (Low Density Residential) under the Corowa Local Environmental Plan 2012 (LEP).

The PAA occurs within the Riverina IBRA bioregion and the Murray Fans IBRA subregion and is located within the Murray LLS Region and the Murray catchment. The closest major waterbody is the Murray River, located approximately 1.2 kilometres to the east of the PAA.

1.2. The Proponent

Established in NSW in 1997, Bathla (Universal Property Group Pty Ltd) is a family-owned business created to provide a property supply service. From beginnings in NSW, Bathla have expanded to regional NSW, South Australia and most recently to Victoria; the Bathla team is passionate about delivering high-quality property and construction services on a national scale.

Core to the business is a belief that every Australian should have the opportunity to live in a home they love, that is why all Bathla properties are designed with the customer and community at the very core.

1.3. State Approvals

The project is considered local development and will be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). A development application has been lodged with Federation Council.

Native vegetation clearance within the PAA is over the clearance threshold and triggers the Biodiversity Offsets Scheme (BOS), and an assessment has been completed in accordance with the NSW Biodiversity Assessment Method (BAM) (DPIE 2020a) and the *Biodiversity Conservation Act 2016* (BC Act).

1.4. Previous survey efforts

The project area has been subject to the following biodiversity assessments completed by Biosis:

- Biodiversity Development Assessment Report (BDAR), including:
 - Ecological field investigations of the project area (July 2022)
 - Targeted survey for Sloane’s Froglet *Crinia Sloanei* (August 2022)

This preliminary documentation report largely draws on the details presented in the assessment reports listed above (Biosis 2022). Many sections of this report have therefore been extracted from the above assessments.

Information sources used to prepare this documentation are referred to throughout and listed as references at the end of the document.

1.5. Referral Decision

On 14 February 2023, the proposed action was determined to be a controlled action for the purposes of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (2022-09402), subject to the following controlling provisions:

- listed threatened species and communities (sections 18 & 18A).

At the same time, it was determined that the proposed action will be assessed by preliminary documentation.

This document sets out responses to the specified information required by the Minister under section 95A of the EPBC Act for the assessment of the impacts of the proposed action (the ‘preliminary documentation’).

2. Environment and MNES

2.1. Description of current environment

The proposed action is located on former agricultural land. The land is disturbed with historical clearing and agricultural practices resulting in significant modification and removal of native vegetation. The surrounding vegetation is similar with areas to the north and west consisting of similar agricultural lots, and residential lots to the south towards Corowa town centre.

Field investigation was undertaken in accordance with the NSW BAM for the proposed action, a total of 35.57 hectares of degraded native vegetation was recorded within the project area (comprising 0.17 hectares of low condition and 34.89 hectares of non-offsetable grassland (NOG) state PCT 75: *Yellow Box - White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina Bioregion and western NSW South-western Slopes Bioregion*, plus 0.51 hectares of Canegrass Swamp Tall Grassland Wetland), with no threatened ecological communities (TECs) present.

Targeted surveys for Sloane's Froglet by Biosis in August 2022 found that two existing farm dams and the 0.51 hectares of Canegrass Swamp Tall Grassland Wetland in the north-eastern corner of the project area provide moderate to high quality breeding habitat for the Sloane's Froglet. A buffer of 100 metres from the wetland is considered dispersal habitat for this species. The Sloane's Froglet was observed to be calling within the farm dams and greater than 100 individual males were calling from wetland outside of the project area (Figure 2).

2.2. Matters of National Environmental Significance (MNES)

An assessment of the impacts of the proposed action on Matters of National Environmental Significance (MNES), under the EPBC Act was prepared as a part of the BDAR to determine whether referral of the proposed action to the Commonwealth Minister for the Environment was required.

A summary of the protected matters which may be impacted by the proposed action are provided in Table 1.

Table 1 Summary of MNES and their consideration in relation to the proposed activity

Controlling provision	Impacted
World Heritage	The PAA and surrounding environment does not contain any World Heritage properties. The proposed action will not have any direct or indirect impact on the values of any World Heritage property. No further consideration is required.
National Heritage	The PAA and surrounding environment does not contain any National Heritage places. The proposed action will not have any direct or indirect impact on the values of any National Heritage places. No further consideration is required.
Ramsar Wetland	No Ramsar Wetlands are located within the local area. No direct or indirect impacts to the ecological character of a Ramsar Site will occur. No further consideration is required.

Controlling provision	Impacted
Threatened Species and Ecological Communities	One EPBC listed fauna species (Sloane's Froglet <i>Crinia sloanei</i>) was recorded within the PAA. No other EPBC listed fauna species or flora species have been recorded or are predicted to occur within 5 kilometres of the PAA (Biosis 2022). Refer to Section 2.2.1 below for further information. On-ground assessment confirmed the PAA does not support any EPBC Listed TEC's. Refer to Section 2.2.1 below for further discussion around the potential occurrence of Seasonal Herbaceous Wetlands of the Temperate Lowland Plains.
Migratory Species	No migratory species were recorded or considered likely to occur in the PAA. No further consideration is required.
Nuclear	The proposed action is not a nuclear action. No further consideration is required.
Commonwealth Marine Area	The PAA is not located within or near a Commonwealth Marine Area. No further consideration is required.
Great Barrier Reef	The PAA is not located within or near the Great Barrier Reef Marine Park. No further consideration is required.
Water resource in relation to large coal mining development or coal seam gas	The proposed action is not related to coal seam gas development or coal mining development. No further consideration is required.
Commonwealth Land	The PAA is not located on Commonwealth land. No further consideration is required.
Commonwealth heritage places overseas	The PAA is not located in proximity to any Commonwealth heritage places overseas. No further consideration is required.

2.2.1. Threatened Species and Ecological Communities

Sloane's Froglet *Crinia sloanei* (Endangered)

Sloane's Froglet is a small ground-dwelling frog that is listed as Endangered under the EPBC Act. Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. The low number of sites, low number of recorded individuals per site, and the low proportion of records of this species in regional surveys all indicate that a moderately low number of mature individuals exist. The apparent loss from previously recorded sites and decline in recording rates indicates that this is not just a rare or uncommonly encountered species, but that there has been a reduction in population size and range. The Sloane's Froglet is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats.

Key threats to the Sloane's Froglet include fragmentation and degradation of habitat and water quality through clearing, changes in water availability, flow and flooding regimes, loss of habitat due to development, habitat degradation from overgrazing, and potential susceptibility to the Chytrid fungus.

Previous records of the Sloane's Froglet exist in the surrounding localities (10 records within 5 kilometres of the project area), with the most recent records collected in 2013 and the closest records located within 95

metres of the project area. The nearby Whitehead Street Wetlands are known to be a significant site for Sloane's Froglet in Corowa, located approximately 300 metres east of the project area.

Targeted surveys by Biosis in August 2022 undertaken in accordance with the *Survey Guidelines for Australia's Threatened Frogs* (DEWHA 2010) and the *NSW Survey Guide for Threatened Frogs: A Guide for the Survey of Threatened Frogs and their Habitats for the Biodiversity Assessment Method* (DPIE 2020a) found that the two farm dams and 0.51 hectares of Canegrass Swamp Tall Grassland Wetland in the north-eastern corner of the project area provide moderate to high quality breeding habitat for the Sloane's Froglet. A buffer of 100 metres from the wetland is considered dispersal habitat for this species. The Sloane's Froglet was observed to be calling within the farm dams and greater than 100 individual males were calling from the wetland outside of the project area (Figure 2). As such, the BDAR determined a direct impact of 2.04 hectares and indirect/prescribed impacts of 2.68 hectares of known habitat for Sloane's Froglet (Figure 3).

Based on the targeted survey results, it was determined that the species will potentially be significantly impacted by proposed action. Section 3.1 details the potential impacts of the proposed action on Sloane's Froglet.

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Critically Endangered)

The native vegetation assessment completed in July 2022 as a part of the BDAR considered the occurrence of relevant TEC's within the project area (PAA plus a 50 metre buffer from the development footprint). Background information sourced from relevant databases, spatial data and literature were also considered when determining potential TEC's present. Database searches included a five kilometre buffered search of the project area using the EPBC Protected Matters Search Tool (PMST), NSW BioNet database, NSW BAM Calculator and NSW Department of Primary Industries Spatial Data Portal. Detailed flora data was collected in accordance with the BAM during the field investigation which included:

- The identification and mapping of plant community types (PCTs) according to the structural definitions held in the BioNet Vegetation Classification database, with reference to information provided in *State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469* (DPIE 2016).
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE 2020b), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, Harden 1993, Harden 2000, Harden 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to *Surveying Threatened Plants and Their Habitats* (DPIE 2020c).
- Incidental observations using the "random meander" method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the project area.
- An assessment of the natural resilience of the vegetation in the project area.

A small area (0.51 hectares) of PCT 24 Canegrass Swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains was identified during the field assessment. This vegetation type is located in the northeast corner of the project area and forms the outer edge of the broader wetland matrix that makes up the Whitehead Swamp system on neighbouring properties and public land. This vegetation type is characterised by the proliferation of semi-aquatic or characteristic wetland vegetation including Canegrass *Eragrostis australasica*, Red Water Fern *Azolla filiculoides*, Pale Spike-sedge *Eleocharis pallens*, Brown Backed

Wallaby-grass *Rytidosperma duttonianum* and Drumsticks *Pycnosorus globosus*. The remainder of the project area comprises 0.17 hectares of low condition and 34.89 hectares of non-offsetable grassland (NOG) state of PCT 75: *Yellow Box - White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina Bioregion and western NSW South-western Slopes Bioregion*. Figure 4 shows the extent of native vegetation identified in the project area.

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (hereafter referred to as Seasonal Herbaceous Wetlands (SHW)) ecological community is a seasonally inundated freshwater wetland, occurring throughout most of Victoria, into south-east South Australia and a small region of southern NSW. The SHW ecological community is characterised by a herbaceous ground layer, often with a considerable graminoid component and with forbs present (DSEWPC 2012).

The approved conservation advice for SHW lists key diagnostic characteristics and also lists a series of features that SHW does not include (DSEWPC 2012). The advice states:

The Seasonal Herbaceous Wetlands ecological community does not include wetlands if they:

- *are dominated by other, usually taller native graminoids not noted above, [e.g; Typha spp. (cumbungi), Phragmites australis (common reed), Eragrostis australasica and E. infecunda (cane grasses), Eleocharis spp. (spike-sedges).*

The examples of PCT 24 *Canegrass Swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains* observed within the project area during the site assessment are dominated by Pale Spike-sedge *Eleocharis pallens* and Canegrass *Eragrostis australasica*. These species contribute over 75 percent of the projected foliage cover within the BAM floristic plots. It is our interpretation of the approved conservation advice that the presence of these conraindicator species at the densities observed would preclude the occurrence of SHW.

Based on the results of the field investigation, vegetation in the project area does not represent the SHW community as associated wetland vegetation does not fit the key floristic diagnostic characteristics.

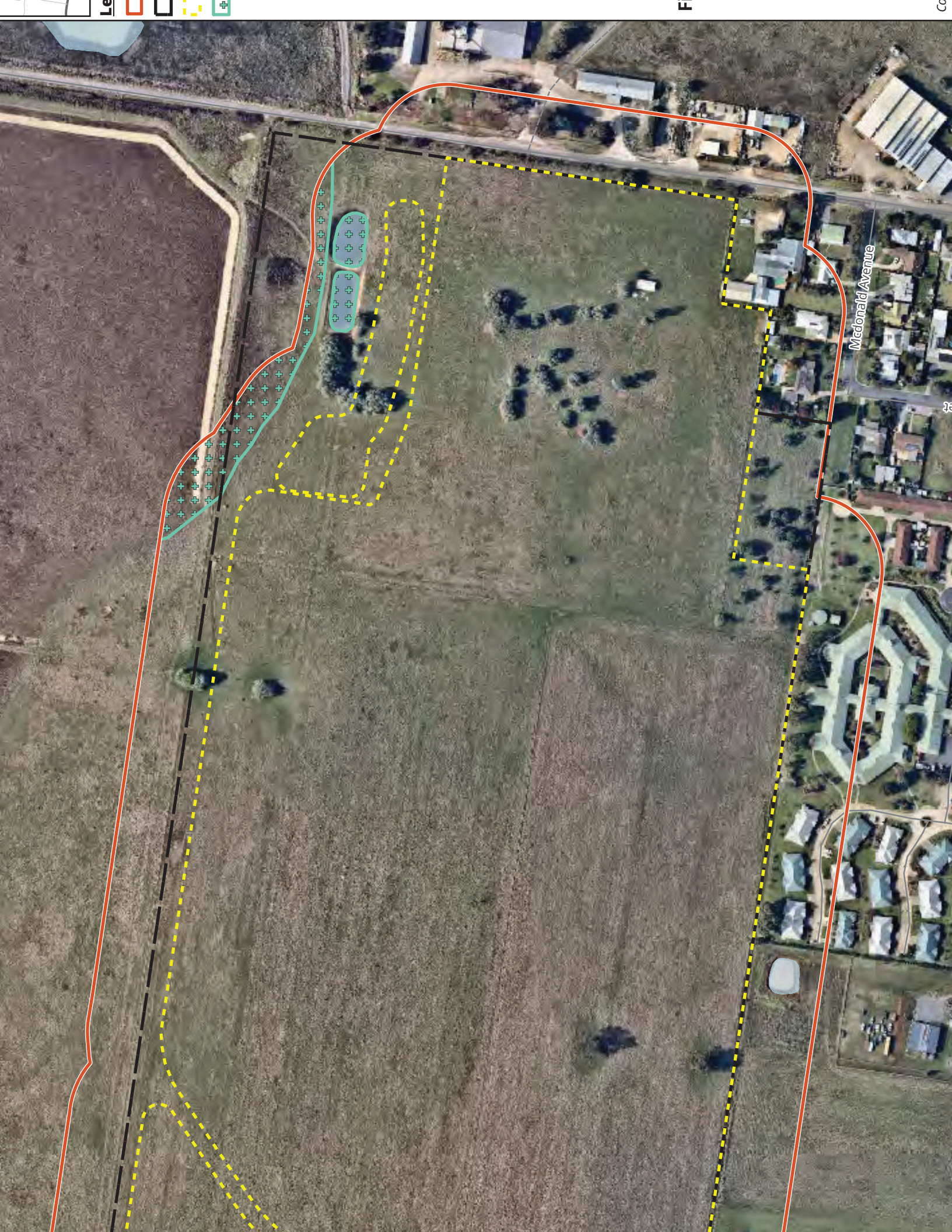
It is unlikely that further surveys would provide additional justification for the presence or absence of SHW. The present field assessment was undertaken in mid-winter during July 2022. Given that this TEC is seasonally inundated in winter through spring and shallow standing water was observed throughout PTC 24, key diagnostic characteristics were present at the time of survey.

SHW are not present within the project area and are thus not subject to any direct or indirect impacts from the proposed action. Further discussion of SHW in Section 3 has not been undertaken.



Whitehead Street

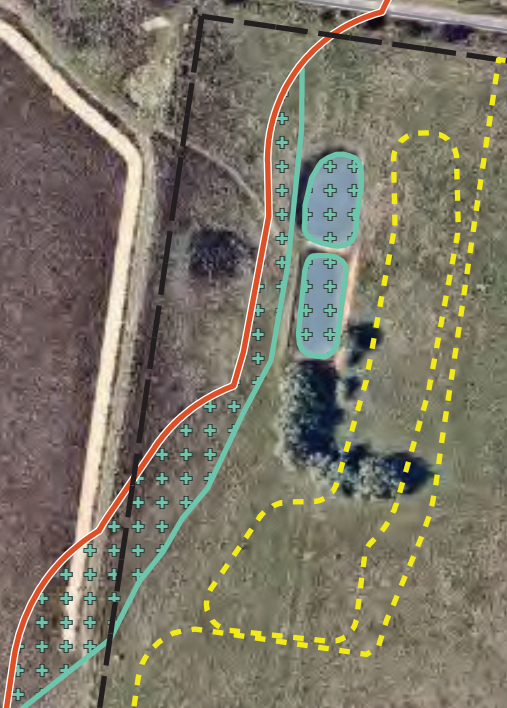
McDonald Avenue



Macdonald Avenue

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- [Yellow dashed line symbol]
- [Green cross symbol]





Murray River

Eastern Coromandel Parkway

Corowa

Gray Street

Tower Street

Corowa

3. Relevant impacts

3.1. Sloane's Froglet

3.1.1. Direct impacts

The project area contains 4.72 hectares of breeding and dispersal habitat for Sloane's Froglet in total, and the proposed action (including the construction of the artificial basin on the north-eastern corner of the impact area) will directly impact 2.04 hectares of habitat.

3.1.2. Indirect impacts

Approximately 12 hectares of contiguous wetland is located outside of the project area to the north-east. This wetland system provides suitable breeding and dispersal habitat for a significant population of Sloane's Froglet. It has been estimated that 2.68 hectares of this habitat (including the two farm dams totalling 0.13 hectares) may be indirectly impacted by the proposed action. Discussion on suitable mitigation and management measures are provided in Section 4.

An assessment of impacts to Sloane's Froglet against the *Significant Impact Criteria 1.1* (Commonwealth of Australia 2013) is presented in Table 2 below.

3.2. Cumulative impacts

The proposed action has the potential to result in negative cumulative impacts to nearby Sloane's Froglet wetland habitat with increased pollution, hard surfaces and runoff. It is possible that the proposed action may result in cumulative impacts in relation to soils and water quality, noise, traffic, visual amenity, air quality, socioeconomic and land use impacts. The proposed action would increase the incidence of these impacts in the local area. However, such impacts are unlikely to be substantial given the relatively small scale of the proposed action and existing development in the surrounding landscape and the size of the population contained within protected reserves and wetlands.

Cumulative impacts to SHW have not been considered as the ecological community is considered unlikely to be present within the PAA.

3.2.1. Artificial wetland creation

One of the two artificial wetlands which are proposed to be constructed, is to be developed in the north-easter corner of the PAA and will require the removal of habitat surrounding the existing artificial farm dams, resulting in direct impact to Sloane's Froglet. However, Bathla Group has committed to designing the new wetland in accordance with the *Sloane's Froglet Stormwater Wetland Design Guidelines* (ACC & OEH 2017) which may provide future habitat for the species and result in a positive cumulative impact.

Sloane's Froglet Stormwater Wetland Design Guidelines have been used extensively across the nearby Albury City Council Local Government Area (LGA) over the past 5 years. Most major housing developments in the aforementioned LGA that require retention basins or water storage have been required to be constructed to these standards. The artificial wetlands designed to these standards have been shown to provide suitable habitat for Sloane's Froglet with healthy breeding populations recorded in artificial wetlands within 6-12

months of creation at several development sites including Brooklyn Fields Estate, Mitchell Park Estate and Kerrford Park Estate.

If connectivity is maintained between nearby populations, Sloane's Froglet have the potential to naturally recolonise the artificial wetland over time. As the farm dams containing populations of Sloane's Froglet will not be removed or impacted by the creation of the artificial wetlands it is expected that colonisation once constructed will occur. Furthermore, the artificial wetlands have been demonstrated to provide habitat for a range of additional aquatic, migratory and semi-aquatic species. Please see Appendix A for the specifications for the *Sloane's Froglet Stormwater Wetland Design Guidelines* (ACC & OEH 2017).

Table 2 Assessment of Sloane's Froglet (listed endangered species) in relation to Significant Impact Criteria for critically endangered and endangered species

SIC assessment for Sloane's Froglet
<p>Lead to a long-term decrease in the size of a population.</p> <p>Sloane's Froglet was observed to be calling within the two farm dams and greater than 100 individuals were calling within the Wetland that is partially located within the project area. Approximately 2.04 hectares of habitat may be impacted by the proposed action. Sloane's Froglet breeds in temporary or permanent water bodies including both natural wetlands and artificial farm dams (Threatened Species Scientific Committee 2019a). This species lays its eggs attached to vegetation and therefore requires aquatic vegetation to successfully breed (Threatened Species Scientific Committee 2019a). The Canegrass swamp tall grassland wetland and the farm dams contain plant species that are highly important for this species to breed and to sustain the size of this population. Therefore, the impact to 2.04 hectares of dispersal and breeding habitat may result in decrease in the size of this population.</p>
<p>Reduce the area of occupancy of the species.</p> <p>The project area contains 4.72 hectares of breeding and dispersal habitat for Sloane's Froglet and the proposed action will directly impact 2.04 hectares of this habitat. Sloane's froglet was detected within the farm dams in the project area. The farm dams provide connectivity and dispersal opportunities for this species' population in the wetland outside of the project area.</p>
<p>Fragment an existing population into two or more populations.</p> <p>It is unlikely that construction activities will fragment an existing population as the proposed disturbance occurs on the edge of the existing habitat and will not form a barrier that will genetically fragment the existing population into two or more populations. Furthermore the construction will be carried out in summer and the two existing farm dams will be retained, ensuring refuge habitat is retained during construction,</p>
<p>Adversely affect habitat critical to the survival of a species.</p> <p>In order to sustain a viable population, the Sloane's Froglet requires breeding and dispersal habitat. The proposed action will directly impact 0.13 hectares of breeding habitat and 1.91 hectares of dispersal habitat. Sloane's froglet is known to breed in farm dams that contain aquatic vegetation (Threatened Species Scientific Committee 2019a) therefore the farm dams are likely critical breeding habitat for this population. The dispersal habitat includes 100 metres from the boundary of the farm dams and the wetland and is critical for the movement of this species between breeding habitat. The construction of additional wetlands and the retention of the farm dams is unlikely to affect habitat critical to the survival of the species.</p>
<p>Disrupt the breeding cycle of a population.</p>

SIC assessment for Sloane's Froglet

Sloane's Froglet breeds in temporary or permanent water bodies including both natural wetlands and artificial farm dams (Threatened Species Scientific Committee 2019a). This species lays its eggs attached to vegetation and therefore requires aquatic vegetation to successfully breed (Threatened Species Scientific Committee 2019a). The Canegrass swamp tall grassland Wetland and the farm dams contain plant species that are highly important for this species to breed and to sustain the size of this population. The removal of these water bodies and aquatic vegetation is therefore likely to disrupt the breeding cycle of this species and it is strongly advised that any disturbance to this vegetation or habitat type is avoided.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The habitat to be removed contains moderate quality breeding and dispersal habitat and Sloane's Froglet was detected within the area to be directly impacted. Indirect impacts to the rest of the wetland that is present outside of the project area is possible. Removal of important habitat and a reduction in the quality of the remaining habitat will occur as a result of the proposed action and may cause declines within this species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.

The project area has been utilised as agricultural land and is therefore already susceptible to invasive species. Therefore, the proposed action is unlikely to exacerbate the current level of invasive species threat operating within the project area.

Introduce disease that may cause the species to decline.

Frog Chytrid Disease *Batrachochytrium dendrobatidis* is rapidly emerging as one of the greatest threats to frog species. Therefore, minimisation of the spread of this disease is important to the protection of the Sloane's Froglet. The proposed action may introduce this disease to the wetland and this population through the movement of machinery and people. If the disease is introduced, it could cause declines within this population and the species overall. Section 4 outlines appropriate measures to be undertaken to reduce the likelihood of spreading the infection by following the Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis (DEE 2016).

Interfere with the recovery of the species.

There is no recovery plan for the Sloane's Froglet, however the conservation advice (Threatened Species Scientific Committee 2019a) outlines sufficient conservation actions for the recovery of this species, including:

- Identify important populations and ensure important habitat is being maintained and restored.
- Implement a program ensuring suitable habitat is maintained and protected in areas supporting extant Sloane's Froglet populations and investigate options for enhancing the resilience of the species' current habitat to climate change.
- Investigate opportunities to restore and enhance areas of degraded habitat.
- Develop and implement translocation strategies for Sloane's Froglet to create additional populations whilst preventing the accidental spread of the amphibian chytrid fungus.
- Manage priority sites to reduce the impacts of habitat destruction by feral species or livestock by using fencing and controlling feral pig numbers.
- More precisely assess the distribution and ecological requirements of Sloane's Froglet.
- Provide advice and information to land holders on the use of herbicides / biocides against pests and diseases in areas with threatened frogs.
- Inform the public about the status and recovery efforts for the, e.g. by providing information to visitors to the area and publicising the species through the media.

SIC assessment for Sloane's Froglet

- Design and implement a monitoring program for Sloane's Froglet.

The removal of breeding and dispersal habitat due to the proposed action may interfere with the recovery of this species. However, the proposed wetland basin that is to be constructed in line with Sloane's Froglet Stormwater Wetland Design Guidelines (ACC & OEH 2017) may restore suitable habitat for this species.

Conclusion

Sloane's Froglet was recorded in the farm dams within the project area during field investigations. The farm dam is connected to a larger population that is partially located within the project area. The proposed retention basins which are to be constructed as part of the proposed action will be constructed in accordance with the Sloane's Froglet Stormwater Wetland Design Guidelines (ACC & OEH 2017), however the construction will also impact 0.13 hectares of breeding and 1.91 hectares of dispersal habitat.

4. Avoidance and mitigation measures

4.1. Avoidance

The development footprint was originally sited to partially occur within the mapped wetland to the northeast of the current PAA. The design has since been refined to exclude impacts to any vegetation in this area.

As such, the current layout (Figure 1) is considered to have minimised impact to Sloane's Froglet due to the avoidance of habitat in the north-eastern and north-western corners and the retention of the existing farm dams which are used as summer refuge habitat.

4.2. Mitigation

4.2.1. Relevant guidance material

Documents consulted during design, survey and the preparation of this preliminary documentation report include:

- *Sloane's froglet stormwater wetland design guidelines* (ACC & OEH 2017) which provide design considerations for the creation of Sloane's Froglet breeding habitat and stormwater treatment wetlands for urban development projects.
- *Conservation Advice – Crinia sloanei (Sloane's Froglet)* (Threatened Species Scientific Committee 2019b).
- *Conservation Advice - Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains* (Department of Sustainability, Environment, Water, Population and Communities, 2012)
- *State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469* (DPIE 2016)
- *Surveying Threatened Plants and Their Habitats* (DPE 2022)
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA 2010)
- *NSW Survey Guide for Threatened Frogs: A Guide for the Survey of Threatened Frogs and their Habitats for the Biodiversity Assessment Method* (DPIE 2020a)
- *Hygiene protocols for the control of diseases in Australian frogs* (DECC 2008)

4.2.2. Sediment management

Construction activities associated with the proposed action have the potential to result in release of sediment-laden runoff. As such, sediment management will be employed prior to and maintained during construction to minimise impacts to nearby wetlands and waterbodies. Management actions will be detailed in a project specific Construction Environmental Management Plan (CEMP), however standard measures typically include silt fences to reduce the velocity of run-off and provide some filtration, use of straw bales or coir logs to capture sediments, protection of established drainage inlets and restricting site access during wet weather. It is the responsibility of the contracted developer to implement adequate sedimentation management measures and maintain them for the duration of the project. Sediment control measures are effective to significantly reduce sedimentation resulting from works and can also act to deter/exclude frogs from the construction areas.

4.2.3. Chytrid fungus management

The water-borne fungal pathogen *Batrachochytrium dendrobatidis*, commonly referred to as chytrid fungus, is a major threat to amphibian populations in Australia and can result in severe declines or loss of frog populations. The proposed action has the potential to aid in the transmission and spread of chytrid fungus if not adequately managed.

Correct hygiene protocols are effective in reducing the risk of spreading chytrid fungus during the construction phase. On-site hygiene protocol to guide best practice chytrid management will be developed in accordance with the *Hygiene protocols for the control of diseases in Australian frogs* (DECC 2008) to be incorporated into the CEMP and site induction material. Measures include thoroughly cleaning footwear, clothing, equipment and machinery with an appropriate disinfecting solution before entering and exiting the construction area of the PAA.

Water testing of existing waterbodies and farm dams should occur prior to construction to determine the level of chytrid fungus presence within the works area. Measures can then be taken to avoid bringing chytrid into the works area and to avoid spreading chytrid from the works area.

4.2.4. Construction of artificial wetlands

The proponent is committed to the construction of two new artificial wetlands, one in the North-East corner and one in the North-West corner of the PAA (Figure 1). The Proponent has committed to constructing the retention basins in accordance with the Sloane's Froglet Stormwater Wetland Design Guidelines and it is intended to provide additional breeding and dispersal habitat in the long term for the species.

The Sloane's Froglet Stormwater Wetland Design Guidelines have been used extensively across the Albury City Council Local Government Area (LGA) and Federation Council LGA over the past 5 years. Artificial wetlands designed to these standards have been shown to provide suitable habitat for Sloane's Froglet with healthy breeding populations recorded in artificial wetlands within 6-12 months of creation at several development sites including Brooklyn Fields Estate, Mitchell Park Estate and Kerrford Park Estate. See Appendix A for the Sloane's Froglet Stormwater Wetland Design Guidelines.

4.2.5. Construction activity management

The proposed action will be staged to avoid construction and site activities during breeding season for Sloane's Froglet (April to mid-October). The Proponent will be responsible for construction timing and managing contractors to ensure these timeframes are adhered to.

Sediment and Chytrid Fungus management measures will be implemented through a CEMP and the Construction Contractor must monitor and adapt measures as works progress to ensure all measures are complied with. All site workers will be inducted to ensure compliance with the CEMP.

4.3. Summary of mitigation measures and management actions

Table 3 summarises the management and mitigation actions to minimise impacts to Sloane's Froglet, including details on roles and responsibilities and measurable performance criteria.

The proponent's construction budget will be amended as required to allow for the implementation of all mitigation and monitoring measures.

Table 3 Summary of management and mitigation actions to minimise impacts of the proposed action on Sloane’s Froglet

Management/mitigation measure	Action	Timing	Performance criteria	Outcome	Responsibility
Modified project timing	Stage development to avoid construction and site activities during breeding season for Sloane’s Froglet (April to mid-October).	Prior to and during construction	No works on site from April through to mid-October.	Avoid significant impacts to the breeding period of Sloane’s Froglet.	Proponent
Sediment management, stormwater and erosion controls	Install appropriate stormwater and erosion controls on site to avoid impacts to nearby drains, wetlands or other waterbodies.	Prior to and during construction	No further degradation to retained vegetation and habitats.	Avoid impacts to nearby waterbodies.	Proponent / contractor
Hygiene protocol - chytrid fungus management	Implement strict hygiene protocols to minimise the transmission and spread of chytrid fungus, in accordance with the <i>Hygiene protocols for the control of diseases in Australian frogs</i> (DECC 2008).	During construction	Protocols followed by all personnel for duration of the project.	Reduction in risk of introduction of amphibian chytrid fungus.	Proponent / all site visitors
Exclusion fencing	Fencing will be erected to mark the exclusion zones of all habitat to be retained.	Prior to and during construction	Adequate and intact fencing maintained for duration of development.	Exclusion of humans from entering frog or other fauna habitat.	Proponent / contractor
Pre-clearance surveys and habitat removal timing	Pre-clearance surveys are to be undertaken prior to vegetation removal by an ecologist to confirm absence of fauna. Habitat removal will be restricted to periods of low activity and avoid breeding season (April to mid-October).	Prior to construction/within three days of vegetation removal	Documentation of completed survey with associated results and recommendations.	Mortality/ injury of fauna avoided.	Proponent / project ecologist
Site inductions	Site inductions will contain relevant information on Sloane’s Froglet, exclusion areas and hygiene protocols.	Prior to and during construction	Site inductions undertaken and documented for all personnel entering the site.	Exclusion of personnel from frog habitat, avoided mortality of frogs, reduce risks of introduction of	Proponent / contractor / all site visitors

Management/mitigation measure	Action	Timing	Performance criteria	Outcome	Responsibility
Artificial wetland creation	New wetlands to be designed in accordance with the <i>Sloane's Froglet Stormwater Wetland Design Guidelines</i> (ACC & OEH 2017).	Prior to, during and post construction	Wetland construction to the standard of the guidelines. Operation and maintenance considerations are met.	amphibian chytrid fungus. Creation of suitable Sloane's Froglet breeding habitat.	Proponent

5. Offsets and residual impacts

5.1. Residual impacts

The mitigation and avoidance measures to be implemented will result in the avoidance of indirect impacts to Sloane's Froglet habitat.

Direct impacts will occur to 2.04 hectares of habitat. The below offsets will be secured to account for this loss of habitat.

5.2. Offsets

Species credit offsets are required for the impacts of the proposed action on the habitat of Sloane's Froglet. The offset requirement was calculated as below (Biosis 2022):

- Vegetation zone: PCT 75_Low
- Species: Sloane's froglet
- Habitat condition (vegetation integrity score) loss: -15.9
- Area (ha): 2.04
- Biodiversity risk weighting: 1.5
- Credit requirement: 5

Species polygons for the above species credit species impacted by the proposed action are illustrated in Figure 5.

The offsets for Sloane's Froglet outlined through the BOS under the BC Act achieve like for like requirements under the bilateral agreement.

It is the intention of the proponent to pay into the BC offset fund upon receipt of development approval from Federation Council.

6. Economic and social impacts

6.1. Social impacts of the proposed action

The proposed action will have a generally positive social impact resulting from the development of a quality subdivision development and associated dwelling construction on new lots. The release of additional land will provide continued opportunity for the residential growth of Corowa and the Federation LGA generally. Increased populations will continue to provide for better quality housing in a highly accessible area, close to the Corowa CBD, and places of employment.

The development achieves the design principles of the Urban Design for Regional NSW – A guide for creating healthy built environments in regional NSW and the Draft Greener Places Design Guidelines, which will result in a high-quality urban design. Similarly, the development provides for a variation in lot sizes that responds to market demand and changing demographic trends towards an aging population and smaller household sizes. The proposal seeks approval to subdivide residential zoned land consistent with the requirements of both the LEP and DCP.

This area is considered appropriate for residential development, due to its proximity and accessibility to services contained within the main town centre including, retail and employment opportunities, as well as social infrastructure and services. The primary social impacts of a residential subdivision typically relate to population growth, and the impacts of that growth on the existing character of an area, the local amenity, and community needs for social infrastructure and services. The impacts of additional population have been considered within a broader forecast population decline predicted for Corowa between 2021 and 2036 (-660 residents from current).

Even accounting for the additional population associated with this subdivision, population decline rather than growth is forecast for the locality over the medium term. This indicates that current pressures on social infrastructure and services will ease. Overall, the proposed development is unlikely to result in needs for increased community infrastructure and services over the estimated 5-10 year development timeframe.. The subdivision will provide a diversity in available residential lot sizes, which can encourage affordability. Increased housing affordability can bring positive social impacts in relation to population growth, diversity, and equity, which are key values set out in Federation Council's Community Strategic Plan. This is particularly relevant to the key household types in the locality including couples, families with and without children and single person households, for whom housing affordability is typically a key consideration.

Whilst it is acknowledged that the development does seek to provide a smaller lot housing product within Corowa, consideration has been given to the built form and development outcomes that can be expected and achieved on these lots following development. This has included the preparation of four (4) conceptual house designs for a typical 550m² allotment. These plans have been based on a typical 250m² residential dwelling comprising a single storey dwelling containing four bedrooms, 2 lounge rooms and a 2-car garage design.

6.2. Economic impacts of the proposed action

The development itself represents a substantial investment by the applicant in the residential development of Federation generally. This represents the recent and expected positive conditions of the housing market for Corowa on suitably zoned residential land. Flow on effects to a variety of local contractors, services, trades, and the like would be expected given the long-term period for the release and development of the subject land.

7. Environmental History of the Proponent

Bathla has been developing and building homes across Eastern Australia for 25 years and in that time has not had any unsatisfactory proceedings under any Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources.

All developments undertaken by Bathla are done in line with best practice engineering and environmental work methods and in compliance with local and state government policies and practices.

Bathla has a strong history of compliance to all specific development conditions applied to projects.

8. Ecologically Sustainable Design

Australia's National Strategy for Ecologically Sustainable Development (1992) defines ecologically sustainable development as: 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

Section 3 of the EPBC Act outlines the objects of Act and includes "to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources".

Section 3A of the EPBC Act goes on to outline the following ESD principles:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations (the 'integration principle').
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the 'precautionary principle').
- The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle').
- The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making (the 'biodiversity principle').
- Improved valuation, pricing and incentive mechanisms should be promoted (the 'valuation principle').

Extensive planning and background research has gone into the development of 143 Whitehead Road to ensure that decision-making processes have integrated both long-term and short-term economic, environmental, social and equitable considerations (the 'integration principle'). Bathla has worked alongside ecological and planning specialists to minimise its ecological footprint and when unable to do so, will ensure that habitat for the MNES impacted by the proposed development will be offset. Furthermore, extensive survey has been conducted across the proposed activity area to provide a high level of confidence in the environmental values that are present.

The development will provide approximately 300 dwellings on the northern edge of the established Corowa Township. The development achieves the design principles of the Urban Design for Regional NSW – A guide for creating healthy built environments in regional NSW and the Draft Greener Places Design Guidelines, which will result in a high-quality urban design. Furthermore, the development of this area will provide employment opportunities through the construction phase. Bathla has worked alongside Biosis to ensure the maximum retention of environmental values, including MNES, on site. The creation of retention basins in line with the Sloane's Froglet Stormwater Wetland Design Guidelines in the north-east and north-west corners of the site will provide the opportunity for habitat of a range of additional aquatic, migratory and semi-aquatic species, creating an environmental connection with future residents and the local landscape.

In order to fulfil the EPBC Offset requirements, Bathla will acquire offsets for Sloane's Froglet through the Biodiversity Offsets Scheme under the BC Act to achieve like for like requirements under the bilateral agreement.

REFERENCES

ACC & OEH 2017. Sloane's Froglet Stormwater Wetland Design Guidelines.

Biosis 2022. *143 Whitehead Street, Corowa NSW Biodiversity Development Assessment Report*, Report prepared for Habitat Planning. Authors: Nicholson, J, Kelly, E, Biosis Pty Ltd, Wollongong, NSW. Project no. 37607.

Commonwealth of Australia 2013. Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999.

Cropper S 1993. *Management of Endangered Plants*, CSIRO Publications Victoria, Melbourne, Victoria.

DECC 2008. Hygiene protocol for the control of disease in frogs, DECC (NSW), Sydney South. Information Circular Number 6.

DEE 2016. *Threat Abatement Plan for Infection of Amphibians with Chytrid Fungus Resulting in Chytridiomycosis*, Department of Environment and Energy, <http://www.environment.gov.au/system/files/resources/d7506904-8528-411e-a3f4-19d4379935f9/files/tap-chytrid-fungus-2016.pdf>.

DEWHA 2010. *Survey Guidelines for Australia's Threatened Frogs: Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Department of the Environment Water Heritage and the Arts.

DPE 2022. *NSW BioNet Threatened Biodiversity Profile Data Collection*, <https://data.nsw.gov.au/data/dataset/9125a0e2-a575-40d4-83b0-45d985420d0e>.

DPIE 2016. State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469.

DPIE 2020a. *NSW Survey Guide for Threatened Frogs: A Guide for the Survey of Threatened Frogs and their Habitats for the Biodiversity Assessment Method*, Department of Planning, Industry and Environment.

DPIE 2020b. *Biodiversity Assessment Method (BAM)*, Department of Planning, Industry & Environment, <https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-2020>.

DPIE 2020c. *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method*, State of NSW and Department of Planning, Industry and Environment, NSW, accessed 11 June 2020, <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf>.

DSEWPC 2012. Approved Conservation Advice for the Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains., <https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=97>.

Harden GJ 1992. *Flora of New South Wales*, NSW University Press, Kensington, NSW.

Harden GJ 1993. *Flora of New South Wales*, NSW University Press, Kensington, NSW.

Harden GJ 2000. *Flora of New South Wales*, Revised Edition, NSW University Press, Kensington, NSW.

Harden GJ 2002. *Flora of New South Wales*, Revised Edition, NSW University Press, Kensington.

Threatened Species Scientific Committee 2019a. *Crinia sloanei* (Sloane's Froglet) Conservation Advice, Department of Environment, Canberra.

Threatened Species Scientific Committee 2019b. *Conservation Advice Crinia sloanei (Sloane's Froglet)*.

APPENDICES

Appendix A. Sloane’s Froglet Stormwater Wetland Design Guidelines

The background consists of several overlapping geometric shapes in shades of orange, red, and grey. A large orange shape covers the top right, a dark grey shape covers the bottom left, and a red shape is in the middle. The text is overlaid on the dark grey area.

SLOANE'S FROGLET STORMWATER WETLAND DESIGN GUIDELINES

11 OCTOBER 2017

PREPARED FOR ALBURY CITY COUNCIL AND THE NSW OFFICE OF
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1. VISION AND PURPOSE

The Sloane's Froglet Stormwater Wetland Design Guidelines (the "Guidelines") detail key design considerations and hold points associated with the creation of Sloane's froglet breeding habitat and stormwater treatment wetlands in urban development projects in the Local Area Management Plan (LAMP) zone, defined in Figure 1.

These Guidelines are supplemented by existing planning, design, maintenance and construction documents (referenced throughout the document). These Guidelines provide a common understanding of and consistency in requirements for development approvals for proponents. These Guidelines are dynamic – they will be refined over time to incorporate new knowledge and considerations, as required.

Vision: a viable Sloane's froglet (*Crinia sloanei*) population is secured in the Albury area in the long-term.

Primary aims of the guideline is to ensure for all future development within the LAMP (where stormwater management is required) achieve:

1. Habitat outcomes - Sloane's froglet breeding habitat requirements are incorporated into all new stormwater wetlands irrespective of the presence of existing habitat.
2. Stormwater quality outcomes - Stormwater design delivers water quality outcomes in accordance with current state regulations.

2. CONTEXT

2.1 BACKGROUND

Sloane's froglet is a small threatened (Vulnerable in NSW) frog restricted to a few localities in southern NSW. Recent surveys (2012 to 2016) demonstrated an estimated decline in the species' range of over 90%. Ongoing habitat loss and degradation, including loss of connectivity between wetlands, landscape fragmentation, and recent severe drought, are causing an ongoing decline. One of the largest known population of Sloane's froglet in NSW occurs in Albury, in an area undergoing rapid urban expansion. Securing a viable population of Sloane's froglet in Albury is critical to securing the species in NSW.

Important Sloane's froglet habitat occurs on land zoned for development and on land zoned for environmental management in the Albury area. On its own, land zoned for environmental management is insufficient to ensure the species' future. Populations at many of these sites are relatively small, and breeding habitat may not be present in all years.

The persistence of Sloane's froglet in Albury will depend on the presence of sufficient connected habitat across the local area to support a viable population. Consequently, maintaining or creating connected breeding habitat on developable lands is necessary. This is achievable through the incorporation of breeding habitat into open space and its integration in the stormwater management system.

These Guidelines have been developed with staff from Albury City Council's (ACC) Town Planning, Engineering and Design, Environmental Planning, and Asset Management teams and the NSW Office of Environment and Heritage (OEH) Planning, and Ecosystems and Threatened Species teams. These Guidelines outline the key planning, design, habitat management and construction criteria that proponents must consider for any proposed development in the LAMP area (Figure 1). All development in this area that requires stormwater management must consider Sloane's froglet breeding habitat requirements, including the management of existing habitat on site and/or the creation of new breeding habitat (irrespective of whether existing habitat is present or not).



Figure 1: Sloane's froglet Local Area Management Plan area.

All development in this area must consider the need for creating or maintaining Sloane's froglet breeding habitat. Effectively, where a development requires a stormwater management system, Sloane's froglet breeding habitat must be created or maintained in line with these Guidelines. Stormwater management is a requirement for most new developments. These Guidelines detail how stormwater management should occur to benefit Sloane's froglet.

2.2 CRITICAL HABITAT REQUIREMENTS FOR SLOANE'S FROGLET

Sloane's froglet breeding habitat requirements are to be incorporated into combined stormwater quality treatment wetlands and flood retarding basins by ensuring that wetland construction adheres to the following key habitat design principles:

- ▶ **Habitat water depth** Calling male Sloane's froglets are typically found in areas of shallow water ranging from depths of 10 to 310 mm.

- ▶ **Habitat hydrology - length and season of inundation** Waterbodies need to contain water from mid- to late-autumn, and for at least 3 months after the winter breeding period finishes (i.e., at least until the end of October).

- ▶ **Habitat accessibility** Movement of Sloane's froglet into and out of wetlands can be helped by ensuring that batter slopes to water level are typically 1 to 4%, with a maximum acceptable slope of 18%.

- ▶ **Habitat size** Large robust colonies of Sloane's froglet are typically found in wetlands greater than 3000 m² in area.

- ▶ **Habitat vegetation** Ideal Sloane's froglet breeding habitat includes emergent wetland species that have a stem diameter of less than 5 mm (e.g., common spike rush, *Eleocharis acuta*). Plant species with a larger stem diameter (e.g., *Typha* and *Phragmites* species) should not be planted.

Each of these habitat characteristics have been considered in the steps defined in these Guidelines. Figure 2 outlines a schematic Sloane's froglet wetland, including breeding habitat. Standard designs are included in Appendix A.

2.3 HOW TO USE THE GUIDELINES AND KEY REFERENCE MATERIAL

The Development Approval Process is outlined in Figure 3. Common terms are defined in the glossary (Appendix J).

Hold points are associated with each step. Proponents must ensure that they have received written approval from the relevant party or parties to demonstrate in-principle approval before proceeding to the next step. Approval will not be granted until each output has been provided. Upon submission of information at key hold points, both OEH and ACC will respond with initial feedback within 21 working days.

These Guidelines are not intended to provide a detailed process for the development of a stormwater wetland design. Other guidelines on detailed design processes are available, including the Melbourne Water Constructed Wetland Guidelines, which are referenced throughout this document.

The Sloane's Froglet Stormwater Wetland Design Guidelines provide a local context and specific design criteria for the incorporation of Sloane's froglet breeding habitat requirements into stormwater wetlands.

The Melbourne Water Constructed Wetland Guidelines have been selected as the key guiding document because:

- ▶ It is the most comprehensive design guideline for constructed wetlands available in Australia
- ▶ It is a proven and tested document that has evolved over the last decade
- ▶ Its content is general and can be applied to most areas in south-east Australia

Additional supporting information that should be considered when applying the Guidelines includes the following documents:

- ▶ Thurgoona Wirlinga Precinct Structure Plan
- ▶ Sloane's Froglet Interim Habitat Guide and Management Recommendations
- ▶ Threatened Species Profile – Sloane's Froglet
- ▶ Engineering Guidelines for Subdivisions and Development Standards for Stormwater Drainage Design
- ▶ Albury Local Environmental Plan (2010)
- ▶ Development Control Plan (DCP)
- ▶ Thurgoona Wirlinga Drainage Strategy (in development)
- ▶ Floodplain Risk Management Study and Plan
- ▶ Rural Lands Strategy for Table Top and Splitters Creek
- ▶ Albury Industrial Hub Master Plan
- ▶ East Albury Industrial Precinct – Masterplan

This document updates and supersedes guidelines previously distributed by ACC and OEH titled “*Sloane's Froglet Stormwater Management Guidelines – Working Draft V1*”.

ACC engineering standards that should be considered include:

- ▶ Guidelines for stormwater drainage and design
- ▶ Guidelines for design of roads
- ▶ Guidelines for landscaping (under review in 2017)
- ▶ Standard specifications for subdivisions
- ▶ Engineering standard drawings

These documents are readily available online, but can also be requested from ACC or OEH.

Where inconsistencies are identified between any of the documents mentioned above, ACC and OEH should be consulted.

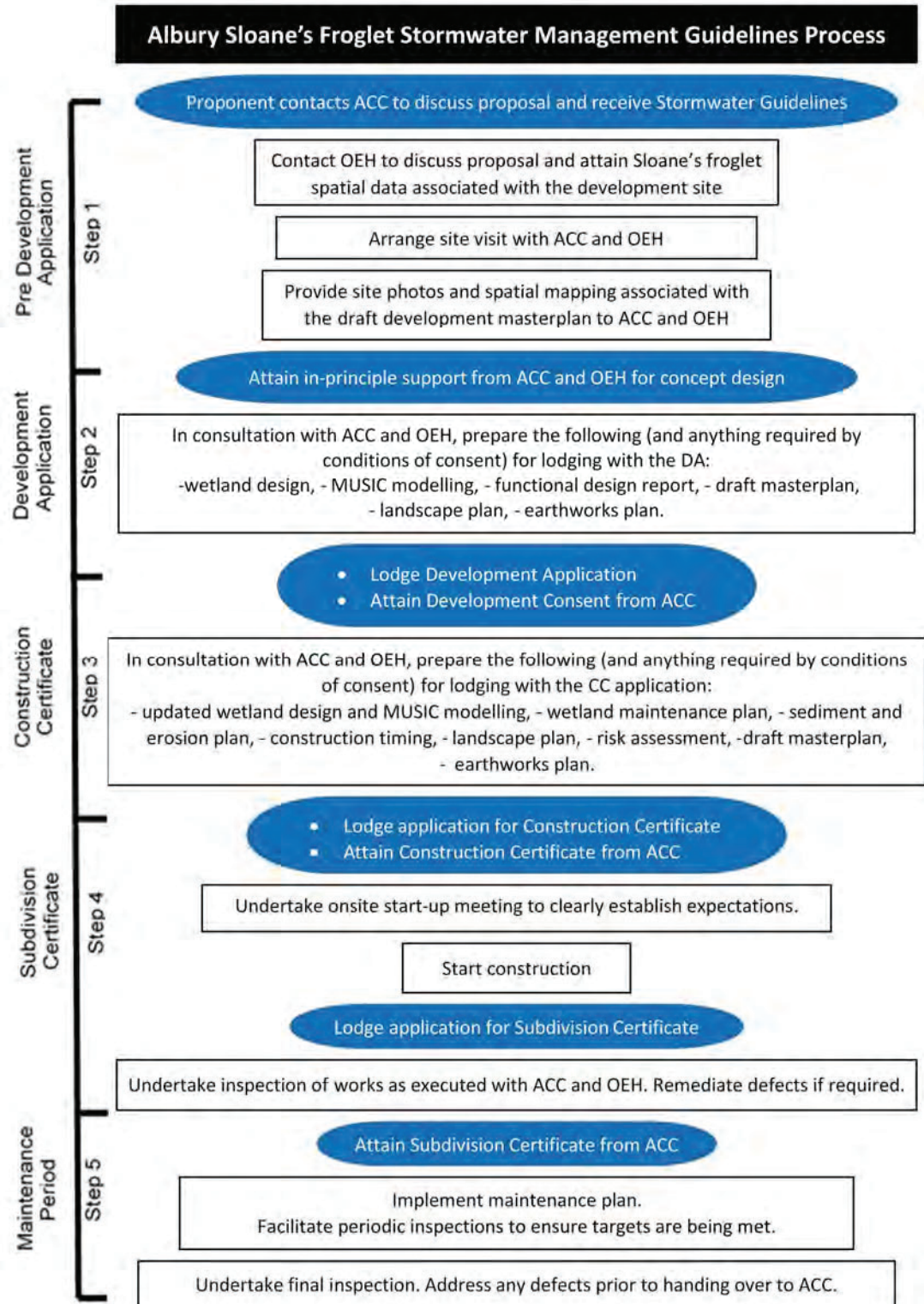


Figure 3: Overview of development approval process for developments in the Sloane's froglet Local Area Management Plan area. Detailed process provided in Appendix B

3. PROCESS

Section 3 details the requirements and critical hold points associated with each step in the development approval process.

STEP 1 PRE DEVELOPMENT APPLICATION

STEP 1.1 EARLY PLANNING

The intent of this step is for all parties to attend the proposed development site and understand key background information.

OEH and ACC encourage early engagement by proponents to ensure clarity around expectations for the management of existing Sloane's froglet habitat, and incorporation of new breeding habitat into the stormwater management system.

Step 1 requires proponents to:

- ▶ Undertake due diligence prior to purchase of a land parcel.
- ▶ Complete an early masterplan for the development area.

Specifically, Step 1 requires the proponent to complete the following:

- ▶ Organise and attend a visit of the development site with OEH and ACC.
- ▶ Review and understand:
 - These Guidelines, including key hold points and deliverables.
 - The content of other key reference documents (see section 2.2).
 - Map existing Sloane's froglet habitat on the site (a spatial layer of existing Sloane's froglet habitat can be obtained from OEH).
 - That a stormwater wetland area for Sloane's froglet will need to be proportional to the contributing catchment at a ratio of 3000 m² of breeding habitat per 10 ha of developed catchment.
- ▶ Provide a draft masterplan of the development to ACC and OEH

Site Visit

As early as practicable during Step 1, the proponent and their appointed consulting advisors should meet ACC and OEH representatives on site, in a joint meeting. These representatives include staff from:

- ▶ OEH – Planning and Ecosystems and Threatened Species
- ▶ ACC – Planning and Environment (Town Planner & Environmental Planner and Engineering - Development Engineer or representative)

The intent of this initial site visit is to begin the transfer of information between the proponent and key authorities, including:

- ▶ Proposed scale, land uses and spatial layout for the proposed development.
- ▶ Key site characteristics that will affect the creation and/or management of Sloane's froglet breeding habitat, including significant land on site relating to environmental or stormwater management (e.g., major drainage lines, shallow depressions, existing dams and waterways, surrounding catchment, catchment on-site, movement corridors and catchment post-development).
- ▶ Understanding the current and future site catchments as well as external catchments.
- ▶ Considerations for construction staging and sediment management over the duration of the catchment build out and potential impacts on constructed stormwater wetlands.
- ▶ Understanding existing and future habitat requirements for Sloane's froglet.
- ▶ Confirming the proponent's understanding of the requirements detailed in key information defined below.

Key information

The following is a list of key information that the proponent should be aware of before preparing a draft masterplan:

- ▶ Albury City Council
 - Information outlined in Section 2.3.
 - ACC can support the early design development step with high-level contour information (LIDAR). This information can be made available to proponents on request through ACC's Asset Team. It should be noted that LIDAR information is only valid up to "Step 3 - Concept Development Step". Following this step, the proponent is required to provide a detailed feature and level survey of the site completed by a licensed surveyor.
- ▶ Office of Environment and Heritage
 - Sloane's Froglet Interim Habitat Guide and Management Recommendations Booklet.
 - Spatial layer of existing breeding habitat (contact OEH to obtain access to this information).
- ▶ Other
 - At Step 1, the proponent should also consider educational/interpretive signage, open space requirements, landscape elements (boardwalks and structures).

Hold Point

The key outputs from Step 1.1 are:

- 1) A site visit with OEH and ACC key staff.
- 2) Photos and spatial mapping of key site characteristics provided to OEH and ACC.

STEP 1.2 SITE ASSESSMENT AND DRAFT MASTERPLAN

The intent of this step is for all parties to develop a comprehensive understanding of site-specific considerations and provide a draft masterplan.

Draft Masterplan

At the completion of this step a draft masterplan must be submitted by the proponent to ACC and OEH for review (see Appendix C for an example).

This masterplan should consider:

- ▶ Typical land uses and major access roads.
- ▶ Key land areas defined in preliminary investigations and the site visit.
- ▶ The proposed sub-division layout, including:
 - Stormwater assets
 - Indicative location and size of Sloane's froglet wetlands (i.e, constructed stormwater retarding basins).
 - Retained habitat
 - Movement corridors
- ▶ Catchments external to the site that drain into the site.
- ▶ Sub-catchments internal to the site.
- ▶ All waterways or waterbodies (natural and artificial) located on the site, or within 200 m of the site.
- ▶ Key development overlays, including the Environmental Conservation and Management Zones, defined in the LEP 2010 as E2 and E3 respectively.
- ▶ Existing utility easements.
- ▶ Existing Sloane's froglet habitat areas defined during the site visit or as provided by OEH.

The sizing ratio requirement for breeding habitat on site is 3000 m² for every 10 hectares of developed catchment. Created wetlands for developed catchments less than 10 hectares can be scaled accordingly. See Step 3 – wetland concept design for additional guidance.

Hold Point

The key output from step 1.2 is:

- 1) A draft masterplan supplied to ACC and OEH.

STEP 2 DEVELOPMENT APPLICATION

STEP 2.1 WETLAND DESIGN AND STORMWATER MANAGEMENT

This step aims to inform the completion of the development application, which includes; a stormwater management strategy and initial wetland concept design(s) that cater for the site's characteristics, Sloane's froglet breeding habitat requirements, and stormwater management.

Stormwater Management Strategy

Consideration of stormwater management is a standard requirement for any development irrespective of the presence of Sloane's froglet. The stormwater management strategy should consider key environmental requirements (including Sloane's froglet breeding habitat needs), the site masterplan, and the following:

- ▶ Hydrological analysis and flood mitigation:
 - Overview of 1% Annual Exceedance Probability (AEP) catchment hydrology (pre- and post- development), internal and external to the site.
 - Major drainage infrastructure required on-site to cater for the best-practice management of post-development flows.
 - Major drainage infrastructure sizing and spatial details for retarding basins, major drainage pipelines, road cross sections and constructed waterways, which should be supported by hydraulic computations and conceptual design information.
- ▶ Minor flows, environmental outcomes and stormwater quality treatment:
 - Overview of 20% AEP catchment hydrology (pre- and post-development), internal and external to the site.
 - Information on stormwater quality treatment infrastructure required to cater for the best-practice management of post-development flows, including how these flows will be integrated into the major drainage infrastructure for the site.
 - Sizing and spatial details for wetlands and minor drainage infrastructure, supported by hydrologic and hydraulic computations and conceptual design information (See Wetland Concept Design step for further details).
 - The habitat connecting the created Sloane's froglet breeding habitat to areas outside of the development, which will facilitate movement of Sloane's froglet throughout the landscape. This habitat may include non-breeding wetland areas (e.g., creeks; drainage lines; the existing stormwater network), and vegetated habitats (e.g. grasslands, woodlands).

Wetland Concept Design

The wetland designs must include the following parameters:

- ▶ The section of the wetland that constitutes breeding habitat maintains a water level of 300 mm.
- ▶ The extended detention depth in the wetland should not exceed 100 mm.
- ▶ A wetland with 2000 m² or more of breeding habitat should be divided into three separate wetland cells of similar size (i.e., a wetland of 3000 m² should have three cells of 1000 m² breeding habitat), separated by an impermeable wall with a concrete weir structure to allow movement of water from one cell to the next.

- ▶ Wetlands that will have breeding habitat from 1000 to 2000 m² in area can be divided into two cells of similar size; wetlands with breeding habitat of less than 1000 m² should only consist of one cell.
- ▶ Drawdown pipes connecting each wetland cell are provided for maintenance of water levels only and are to remain closed under normal operational conditions.

The design should also consider:

- ▶ Hydrological and stormwater quality analysis to confirm sizing, using MUSIC.
- ▶ How high sediment loads through stormwater runoff into the proposed wetland will be managed during the construction step of the development. For further detail on sediment management refer to Appendix E.
- ▶ Sizing must be validated against the topographical information available for the site.
- ▶ A treatment area that demonstrates the incorporation of the following criteria:
 - Maintenance of appropriate hydrological conditions for Sloane's froglet breeding habitat requirements, (see details on MUSIC modelling below).
 - A minimum size of 3,000 m² for the wetland per 10 ha or part thereof.
 - Best-practice standards for pollutant removal.

It should be noted that temporary sedimentation basins built during construction cannot be included as part of the ultimate wetland area.

- ▶ A layout that considers the required treatment area, flood retardation volume, high-flow bypass, provisions for maintenance and amenity values (see the Melbourne Water Constructed Wetlands Design Manual – Part A2 Deemed to Comply Design Criteria to guide key design aspects at Step 3).
- ▶ The treatment area, which must be supported by MUSIC modelling (see details on MUSIC modelling below).
- ▶ The total wetland footprint must consider the combined sedimentation and wetland treatment area defined from MUSIC, increased in size by a factor of 2 as a rule-of-thumb. This factor accommodates for the additional area required around the wetland for maintenance tracks and sediment dry-out areas, which will be included in future design steps. This factor must also be validated by the proponent.

MUSIC Modelling

The wetland concept design must apply the following MUSIC modelling parameters:

- ▶ Rainfall:
 - The average rainfall year to be used for MUSIC modelling is 1962 from Hume Reservoir. This MUSIC template is available from ACC and includes evapotranspiration data.
- ▶ Source node inputs (this is the catchment node), including:
 - Fraction imperviousness – See Appendix F for guidance on fraction impervious values. Press “Next” for Rainfall-runoff parameter inputs.

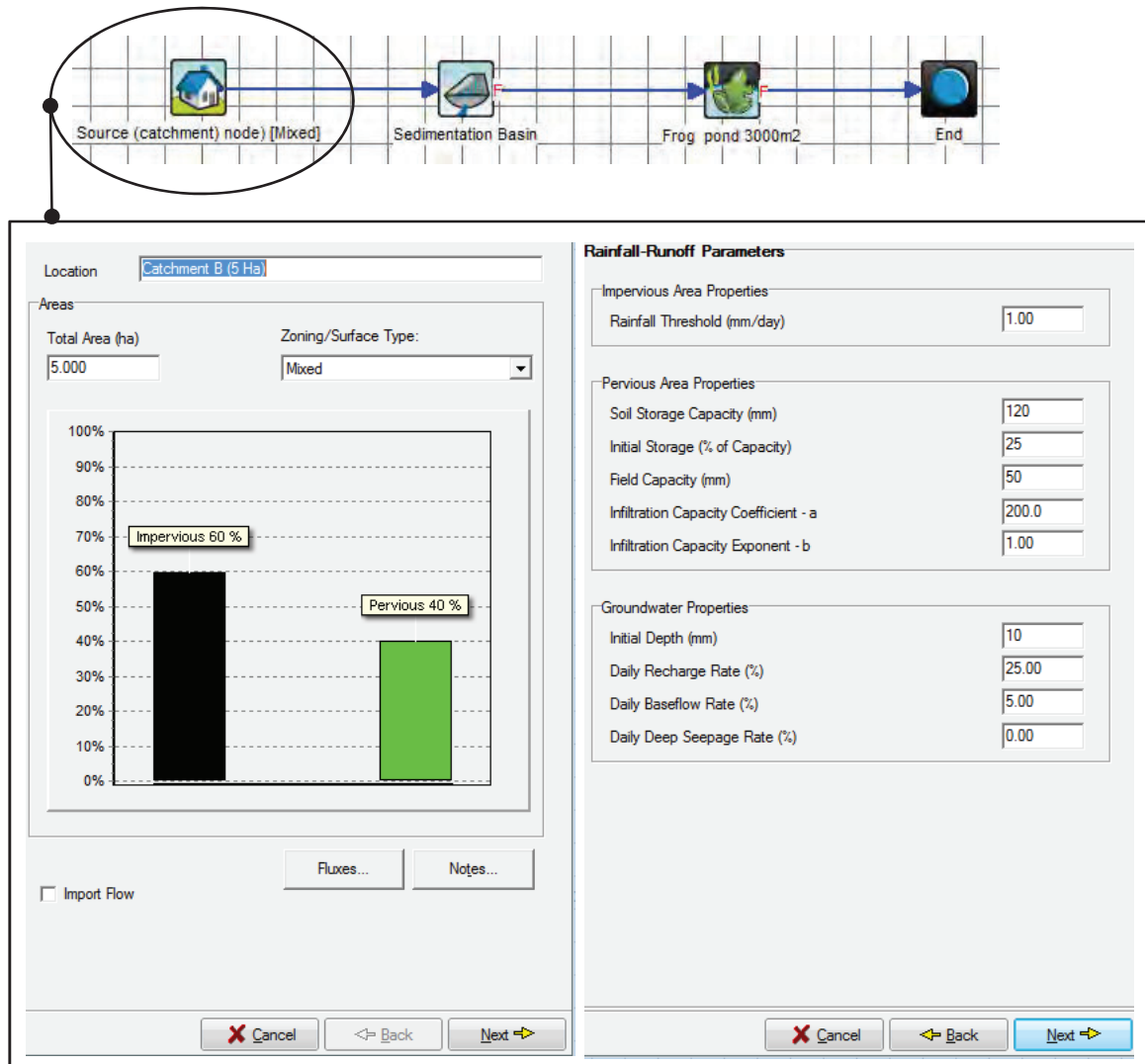


Figure 4: MUSIC screenshot showing input of key data into Source Node

- ▶ Rainfall and runoff parameters should be kept as default except for the below criteria, which should be entered as follows:
 - Soil storage capacity – 120 mm
 - Field capacity – 50 mm
 - These are reasonable parameter values to use where no other information is available. Where different values are used, justification must be supplied.
- ▶ Sedimentation basin parameters:
 - Sedimentation basin area and volume sizing is to be conducted in accordance with Melbourne Water’s Constructed Wetland Guidelines.
 - The extended detention depth is to be determined on a case-by-case basis, but should not exceed 100 mm.
 - The sediment basins must be lined (exfiltration rate set to zero).
 - A 12-hour equivalent Notional Detention Time should be targeted (vary the Equivalent Pipe Diameter to achieve this outcome).

Location	Sedimentation Basin
Inlet Properties	
Low Flow By-pass (cubic metres per sec)	0.00000
High Flow By-pass (cubic metres per sec)	100.0000
Storage Properties	
Surface Area (square metres)	180.0
Extended Detention Depth (metres)	0.10
Permanent Pool Volume (cubic metres)	180.0
Initial Volume (cubic metres)	180.00
Exfiltration Rate (mm/hr)	0.00
Evaporative Loss as % of PET	75.00
Estimate Parameters	
Outlet Properties	
Equivalent Pipe Diameter (mm)	24
Overflow Weir Width (metres)	2.0
Notional Detention Time (hrs)	11.8
<input type="checkbox"/> Use Custom Outflow and Storage Relationship	
Define Custom Outflow and Storage Not Defined	
<input type="button" value="Re-use..."/> <input type="button" value="Fluxes..."/> <input type="button" value="Notes..."/> <input type="button" value="More"/>	
<input type="button" value="X Cancel"/> <input type="button" value="← Back"/> <input type="button" value="✓ Finish"/>	

Figure 5: MUSIC screenshot - input of key data into Sedimentation Basin Node

► Wetland parameters:

- The pond volume and surface area should correspond to 300 mm permanent pool depth (e.g. 3000 m² equates to 900 m³ permanent pool volume). During the detailed design step a more accurate permanent pool volume should be applied based on 3D terrain modelling.
- Inlet pond set to zero (sedimentation basin is a separate node).
- 100 mm extended detention depth is typical.
- Notional Detention Time should equate to of 24 to 72 hours (aiming to minimise flow rate). Vary the Equivalent Pipe Diameter to achieve this.
- An overflow weir to minimise wave depth should be applied.
- The exfiltration rate should be varied based on site specific soils. If the ponds are to be lined this should be set to zero, however, the ponds should allow some seepage typical of a clayey material. Refer to MUSIC in-built guidance.

Location

Inlet Properties

Low Flow By-pass (cubic metres per sec)	<input type="text" value="0.00000"/>
High Flow By-pass (cubic metres per sec)	<input type="text" value="100.0000"/>
Inlet Pond Volume (cubic metres)	<input type="text" value="135.0"/>

Storage Properties

Surface Area (square metres)	<input type="text" value="3000.0"/>
Extended Detention Depth (metres)	<input type="text" value="0.10"/>
Permanent Pool Volume (cubic metres)	<input type="text" value="900.0"/>
Initial Volume (cubic metres)	<input type="text" value="900.00"/>
Vegetation Cover (% of surface area)	<input type="text" value="50.0"/>
Exfiltration Rate (mm/hr)	<input type="text" value="0.36"/>
Evaporative Loss as % of PET	<input type="text" value="125.00"/>

Outlet Properties

Equivalent Pipe Diameter (mm)	<input type="text" value="69"/>
Overflow Weir Width (metres)	<input type="text" value="30.0"/>
Notional Detention Time (hrs)	<input type="text" value="23.8"/>

Use Custom Outflow and Storage Relationship

Not Defined

Figure 6: MUSIC screenshot - input of key data into Wetland Node

Outputs from the MUSIC Model must demonstrate:

- ▶ A wetland size that ensures compliance with best practice standards with a total removal of the following pollutants for the site:
 - Total Suspended Solids – 80%
 - Total Phosphorus – 45%
 - Total Nitrogen – 45%
 - Gross Pollutants – 90%

- ▶ Compliance of the wetland hydrology to the breeding habitat requirements of the Sloane's froglet where:
 - Water levels in at least one wetland cell must remain above 300 mm in depth from 15 May to 31 October.
 - Modelling results show the wetland water level trace over this period. This result can be generated by creating a flux file from the wetland node as shown below:

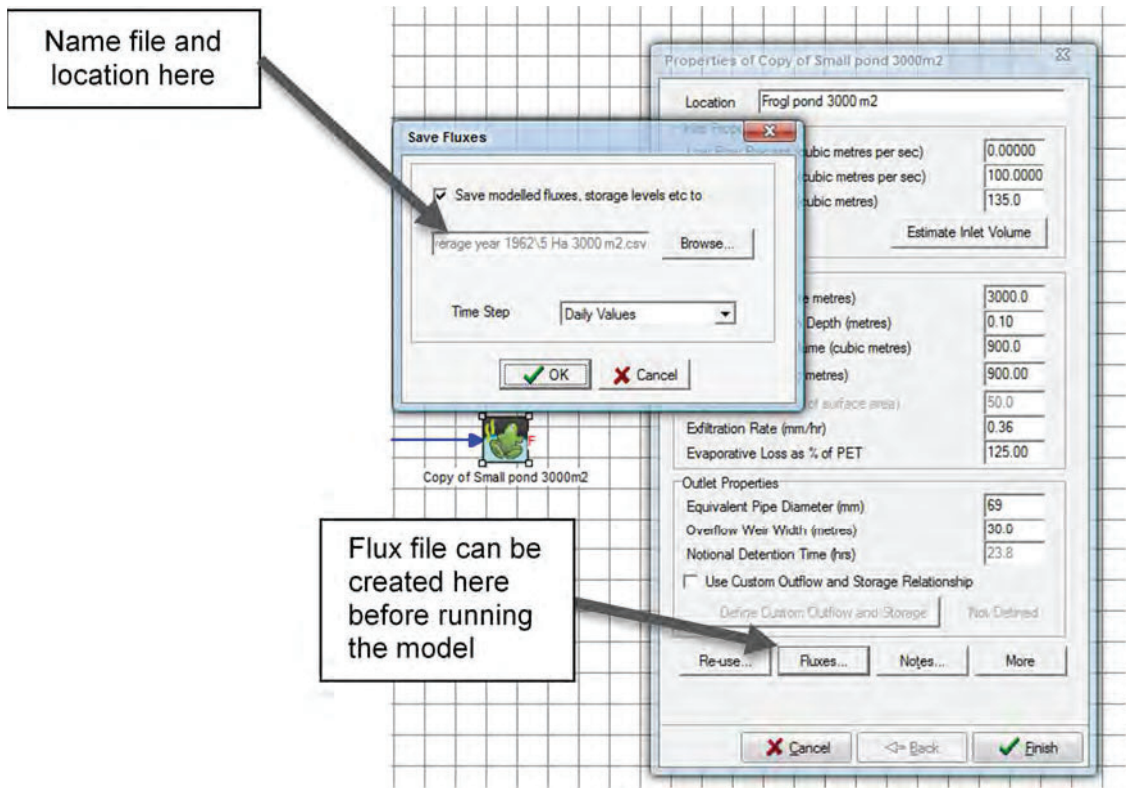


Figure 7: MUSIC screenshot - creating a flux file

- The flux file is created in Excel in the location specified. The relevant column is called 'Waterlevel (m)'. From here, a graph can be created of the storage level through time.
- Figure 8 outlines the MUSIC output and a compliant water level analysis:

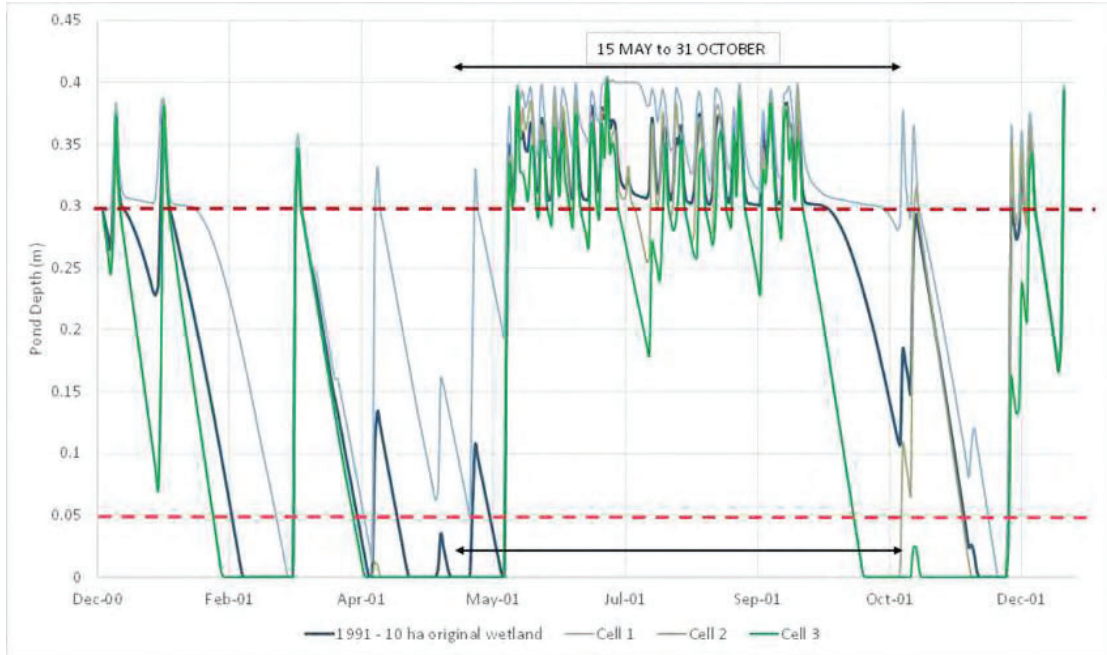


Figure 8: Example MUSIC modelling output demonstrating the water level analyses

Hold Point

The key outputs from step 2.1 are:

- A) A draft wetland design (see Appendix A), including drawing, dimensions, scale and typical sections
- B) The MUSIC model
- C) MUSIC modelling outputs – water level and stormwater quality treatment outcomes

STEP 2.2 FUNCTIONAL DESIGN, DRAFT MASTERPLAN AND EARTHWORKS

This step completes the information required for the development application, which is a progression of the concept design developed previously, based on feedback provided by ACC and OEH.

Where changes to the design have been created because of alternations to the project they must be documented. Step 4 requires the following to be considered:

- ▶ Masterplan or other design variables:
 - Changes must be rationalised with ACC and OEH.
 - The updated design must align with the design parameters defined in Step 3.
- ▶ Melbourne Water Constructed Wetlands Part A2
- ▶ On a case-by-case basis, stormwater harvesting and reuse may be considered for potential inclusion in the wetland. The inclusion of a stormwater harvesting and reuse system is subject to:
 - Available water for local reuse that doesn't affect the Sloane's froglet breeding habitat negatively.
 - The Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Step 2) Stormwater harvesting and reuse (July 2009) must be used to guide the design.
 - Other related permits from key NSW government stakeholders including Department of Primary Industries - Water.
 - Restricted to the non-breeding period for Sloane's froglet (November to April).
- ▶ Flood retarding basin hydrologic and hydraulic modelling must be completed in Runoff Routing Model (RORB) and Hydrologic Engineering Centres River Analysis System (HECRAS) (or an agreed alternative program). All inputs and outputs from this modelling must be approved by ACC.
- ▶ The following additional information must be submitted to ACC and OEH:
 - Updated MUSIC modelling for the functional design showing calculations for wetland hydrology and stormwater quality treatment performance.
 - A wetland design following the design principles and bathymetry defined in the standard drawing in Appendix A.
 - Preliminary planting plan for all aquatic and terrestrial planting, defining species and densities.
 - Completion of the risk assessment checklist in Appendix D.
 - A construction management plan detailing timing/project staging, including:
 - How Sloane's froglet breeding habitat will be managed over the duration of the project. This management plan must clearly demonstrate that the wetlands are established and functional prior to disturbance to existing defined habitat (see Appendix E for additional guidance on key habitat management requirements).
 - Evidence of how runoff from the site will be treated from the commencement of construction. ACC and OEH will not permit commencement of construction until this control is established on site.

- Where the Step 1 outfall is located far from potential outfalls or potential Sloane's froglet breeding habitats, alternative sedimentation treatment needs to be approved by ACC and OEH.
- ▶ The detail provided on the construction management plan during the approvals steps must be discussed with ACC and OEH and finalised prior to the construction certification step.

Hold Point

The key outputs from step 2.2 are:

- A) Updated wetland design (see Appendix A) including plan, dimensions, scale and typical sections
- B) Functional design report detailing revised modelling rationale for environmental, stormwater quality and flood management functionality of the system.
- C) The updated MUSIC model
- D) Any revised MUSIC model outputs, including water level and stormwater quality treatment information.
- E) Landscape plan
- F) Draft earthworks and construction plan (demonstrating earthworks, project staging and timeline)
- G) Sloane's froglet habitat overlay

STEP 3 CONSTRUCTION CERTIFICATE

STEP 3.1 DETAILED DESIGN – DETAILED DESIGN DRAWINGS

This step aims to result in the production of a comprehensive design package that includes plans that show how the wetland will be constructed.

Two critical hold points are associated with the detailed design step:

- ▶ Provision of a preliminary detailed design package to ACC and OEH.
- ▶ Provision of an Issue for Construction design package to ACC and OEH.

The following step should be considered as a supplement to the Melbourne Water Constructed Wetlands Guidelines. The final detailed design plans must be completed to a level of detail outlined in the standard drawings provided in Appendix A and must include the following key design elements:

- ▶ Sediment pond, considering:
 - Sediment dewatering and storage locations.
 - Sedimentation basin access track and ramp.
 - Temporary sedimentation basins for construction step sediment loading (if required).
- ▶ Gross pollutant trap location and product type.
- ▶ Inlet and bypass details.
- ▶ Earthworks and contour levels relating to:
 - Wetland outline and bathymetry, with clearly defined normal water level and total extended detention depth.
 - Retarding basin, clearly defining the 1% AEP flood level.
 - High flow bypass channel.
- ▶ Maintenance/pedestrian paths
- ▶ Draw down pipes
- ▶ Outlet structures for the wetland and retarding basin, including wetland baffle pits and flood spillway.
- ▶ Proposed Landscape Plan defining all aquatic and terrestrial plantings (see Appendix G).

The detailed design should also consider:

- ▶ A risk assessment for the final design (undertaken in consultation with ACC and OEH using the template in Appendix D) to ensure that all community, council and environmental risks are managed during the design, construction and maintenance processes.
- ▶ Key ACC technical guidelines and standards, and particularly the Engineering Guidelines for Subdivisions and Development Standards Part 3 – Stormwater Drainage Design (July 2009).

- ▶ Preliminary investigations, completed during the functional design step, to inform the wetland design, including:
 - A detailed geotechnical assessment to define the nature of the *in-situ* material, clay liner, topsoiling and embankment requirements.
 - A detailed feature and level survey completed by a licensed surveyor.

At this step, it is also important to consider how the local community can use the wetland for educational, amenity and environmental opportunities. These opportunities may include:

- ▶ Educational signage that increases awareness of the wetland and its broader environmental and social benefits.
- ▶ Landscape architectural elements that enhance the wetland.
- ▶ Boardwalks and structures over the wetland to attract the local community to the wetland (made from appropriate materials that will not contaminate the wetland).

Gross Pollutant Trap

ACC requires the installation of a gross pollutant trap (GPT) upstream of all wetlands. GPT must consider the following:

- ▶ Provision for easy maintenance access via education trucks. GPT with lifting baskets cannot be used.
- ▶ Location of GPT must ensure provision for safe maintenance with off-road, all-weather access for education trucks.
- ▶ GPT nominated in design need to consider:
 - Nominated manufacturer
 - Proof of installation of the GPT product in ACC jurisdiction or within a major city or town, with client references validating its performance.
 - Proven treatment capability, ideally with test results or *in-situ* operational results.
 - If an alternative product is nominated by a contractor during the tender step of a project, the alternative nominated unit must complete the nominated approval process above.

Sedimentation basin

Sedimentation basins are a critical aspect of stormwater quality treatment as they minimise sediment loading in the vegetated area of wetland. Excessive loading of sediment entering the wetland zone ultimately affects the health of aquatic plants, and therefore, the quality of Sloane's froglet breeding habitat.

The design and management of sediments entering the wetland through the sedimentation basin must consider the following ACC specific design requirements:

- ▶ Maintenance access into the sedimentation basin must demonstrate how an excavator and haulage truck can manage the removal of sediment from the sedimentation pond. Typical details of the access track are provided in the Melbourne Water Constructed Wetlands Guidelines.
- ▶ All sedimentation basins require a concrete base that extends from the base of the pond to 0.5 m above. Consideration must be given to the interface of the concrete base with surrounding rock work and vegetation.

- ▶ Given the increase in sediment loading during the construction step of the subdivision, the detailed design step must also consider:
 - The management of loading in the catchment, including construction practices that increase the likelihood of excessive sediment load entering the sedimentation pond and the Sloane's froglet breeding habitat.
 - The sizing of the temporary sedimentation basin (or a detailed sediment control plan for the catchment) that manages increased sediment loading.
 - Ease of maintenance access and ability to estimate the extent of loading in the sedimentation basin.

Note: considerations for sedimentation management during the construction step are detailed in Step 6.

Inlet/outlet, rockwork and bypass details

All inlet, outlet, rockwork and bypass details must be designed in accordance with the Melbourne Water Constructed Wetlands Guidelines.

Pits, Valves, headwalls, markers and signs

Pits and headwalls used to ensure wetland and retarding basin functionality must comply with Council Engineering Development Standards – Part 3 – Stormwater Drainage Design. The following are key design considerations when nominating/designing pits and headwalls for the detailed design step:

- ▶ Council standard junction pit detail must be applied for the wetland draw down pipes and outlet.
- ▶ Councils concrete headwall – STD-D-70 or rock headwall detail must be applied for all pipes.
- ▶ All nominated valves and gates must comply with Water Services Association Australia (WSAA) or ISO standards or ensure compliance with the following:
 - Nominated manufacturer
 - Proof of installation of the valve or gate product in ACC jurisdiction or in a major city or town, with client references validating its performance.
- ▶ Where customised pits (that are not within ACC's standard drawings) are required the detailed design package must include supporting structural calculations and drawings.
- ▶ All pits and headwalls located within the vegetated areas or below water level, must be identified by a bollard located no more than 0.2 m from its defined location. The bollards nominated must be no more than 1.5 m high and specified on the landscape plan.

Earthworks – wetland and retarding basin

The earthworks defined in the detailed design step of the wetland and flood retarding basin must ensure the following:

- ▶ The final wetland area (not including the sedimentation pond) is no less than that defined in the functional design step (i.e., ensuring it meets habitat and stormwater quality requirements, whilst incorporating key maintenance requirements including access tracks and sediment dry out areas).
- ▶ Flood storage requirements are met and substantiated with hydrological modelling (RORB or equivalent).

- ▶ Retarding basin embankments must consider downstream risks in the event of failure.
- ▶ The detailed design step is the final step to consider construction timing for the wetland and managing existing Sloane's froglet habitat areas. The detailed design step must consider appropriate engagement with ACC and OEH to clearly demonstrate timing of construction and how these sequencing will take place.

Maintenance and pedestrian tracks

Maintenance of and access to the wetland must be confirmed at the detailed design step. The design should consider the following:

- ▶ Maintenance access (pedestrian or vehicle) with reference to:
 - All pits (inlet, outlet and draw down pits)
 - Sedimentation basin
 - Clearly defined boundaries outlined by OEH
- ▶ Limiting access of non ACC or OEH vehicles onto access paths using planting and bollards.
- ▶ Locks limiting access should ensure dual access by OEH and ACC.
- ▶ Pedestrian access through the wetland area to adjoining destinations.
- ▶ ACC Standards for maintenance and pedestrian/shared paths.

Planting

The final detailed plant list must be submitted with the detailed design drawings. A sample of suggested species are provided in Appendix G. Key considerations include:

- ▶ Plants nominated must be tube stock; hydroseeding can be used if approved by ACC.
- ▶ If jute matting is proposed to be used then it should be non-toxic and biodegradable.
- ▶ Lawn used in proximity to the wetland should avoid Kikuyu (*Cenchrus clandestinus*) and lawn cultivars of Couch (*Cynodon dactylon*).
- ▶ Deciduous trees should not be planted within 20 m of the top water level of a wetland to avoid excessive leaf litter dropping into wetlands during winter (when Sloane's froglet is breeding).
- ▶ For the eastern, western, and northern sides of wetlands, shrubs and trees must not be planted closer than 3 to 5 metres from the top of the bank; grasses and some sedges (e.g., *Lomandra* spp.) can be planted closer to the wetland.
- ▶ For the eastern, western, and northern sides of wetlands, only those shrub and tree species that do not exceed 3 m at mature height can be planted.
- ▶ For the southern side of the wetland, tree and shrub species of any height can be planted, but still should not be planted closer than 3 to 5 metres from the top of the bank.
- ▶ Where practicable, all planted trees and shrubs should be species that are listed in the South West Slopes Revegetation Guide (a copy of suitable species can be requested from Council).

Signage

Appropriate signage is critical to highlight environmental and safety aspects of the wetland and flood retarding basin. Signage serves two functions:

- ▶ A mechanism to manage risk
- ▶ Information and interpretation

Signage is important for communicating risks associated with the area. ACC has adopted the signs as remote supervision principles as outlined in the Albury City Signs as Remote Supervision Policy. The steps involved in developing appropriate signage are outlined in Figure 9. This flow chart should be used together with ACC's Signage as Remote Supervision Signage Assessment toolkit.

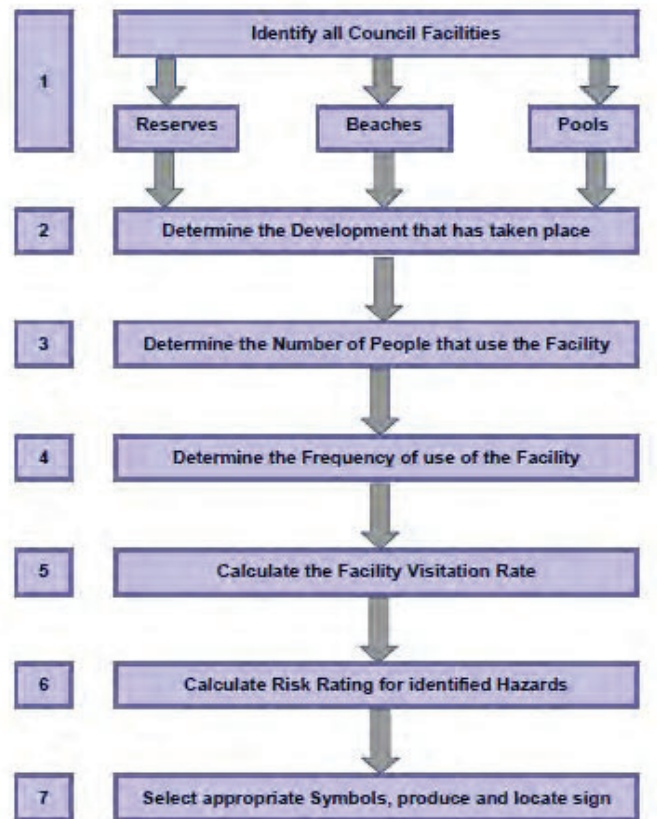


Figure 9 Signage development flowchart

The proponent is encouraged to contact ACC to assist with the risk signage process and to ensure an appropriate sign is erected prior to construction completion. A sample of the form used to document the assessment process is attached in Appendix H. Figure 10 provides some examples of signs for consideration.

Information and interpretive signage should be developed at key habitat locations (to be discussed with OEHL and ACC). The purpose is to provide the community with background to Sloane's froglet and outline how the area is constructed/maintained and why. The proponent is encouraged to work with ACC and OEHL in the development of information or interpretive signage.



Figure 10 Example Sign

Hold Point

The key outputs from section 3.1 are:

- A) Detailed design plans (see Appendix A) including plan, dimensions, scale, detailed sections, detailed landscape plans (showing aquatic and terrestrial planting)
- B) Final earthworks and construction plan
- C) A design report to support all detailed modelling and design rationale
- D) Detailed design risk assessment

STEP 3.2 DETAILED DESIGN – CONSTRUCTION SPECIFICATION AND MAINTENANCE MANUAL

The aim of this step is to produce construction specification that will support the detailed design plans. The construction specification must include key information to set expectations for contractors during subdivision construction and maintenance (defects) period.

Key inclusions in the specification are:

- ▶ Specific construction requirements that are outside the detail provided in the design plans
- ▶ Key hold points defined by ACC or OEH relating to construction and environmental approvals
- ▶ Key construction considerations relating to Sloane's froglet breeding habitat requirements including:
 - A final Environmental Management Plan
 - A final Erosion and Sediment Management plan
 - A final Earthworks and Construction Plan

Key inclusions for the maintenance manual are:

- ▶ A plan locating and labelling all assets in the wetland and flood retarding basin, including nominated markers.
- ▶ Key assets that require operation or maintenance.
- ▶ Regularity of maintenance and renewal for all assets in the wetland and flood retarding basin with respect to Sloane's froglet's requirements.
- ▶ Completed checklists by the contractor from the defects liability period (refer to Appendix I).

Other considerations for the maintenance manual include:

- ▶ If occupied Sloane's froglet breeding habitat will be destroyed as part of the development process, it is important to ensure the created habitat is established prior to the start of the breeding season (start of May) following the commencement of construction. If construction commences during the breeding season (start of May to end of October – not the preferred option), then constructed Sloane's froglet habitat should be established by the start of the following breeding season.
- ▶ While a temporary sedimentation basin may be required during construction, a proportion of the permanent sedimentation basin could be established as Sloane's froglet breeding habitat at the commencement of the construction.
- ▶ If habitat establishment fails at any point from construction to hand over, the proponent will be required to re-establish the Sloane's froglet breeding habitat. This process may include de-silting and re-planting the entire area of constructed habitat.

Refer to Appendix E for an overview of the recommended format of the Habitat and Sedimentation Manual. These documents will form part of the detailed design package submitted to ACC and OEH.

Hold Point

The key outputs from step 3.2 are:

- A) A Sloane's froglet habitat management plan (See Appendix E)
- B) Environmental management plan
- C) Final Erosion and Sediment Management plan
- D) Final Earthworks and Construction Plan
- E) Construction specification
- F) Maintenance Manual

Note: All key information relating to the Sloane's froglet should be consistent across all the documents mentioned above

STEP 3.3 REPORTING AND MODELLING

This step aims to result in the production of final detailed design report. This report must be included in the detailed design package submitted to ACC and OEH. This report will summarise all steps of design.

This report must include:

- ▶ Key background information, including geotechnical reports and the detailed feature and level survey
- ▶ All hydrologic modelling inputs and outputs relating to the retarding basin design
- ▶ All hydrologic modelling inputs and outputs relating to the wetland environmental functionality
- ▶ Water quality modelling for the wetland design
- ▶ Design calculations demonstrating the sizing of the sedimentation basin and provisions for sediment loading during the estate construction and home building
- ▶ Hydraulic modelling and computations relating to the inlet and outlet pits from the wetland and retarding basin

The report must demonstrate how the above design features and considerations fulfil Sloane's froglet breeding habitat requirements by making specific reference to the criteria listed in Section 2.1. This document will form part of the detailed design package submitted to ACC and OEH.

Hold Point

The key output from step 3.3 is:

- A) A detailed design report incorporating outputs.

STEP 4 SUBDIVISION CERTIFICATE

STEP 4.1 CONSTRUCTION

This step aims to ensure the construction considers implementation of the design and management plans to protect the Sloane's froglet habitat area.

Key construction step considerations include the following:

- ▶ Key hold points that require review and signoff from ACC and OEH (where nominated), including the following:
 - Project commencement meeting, which must include ACC and OEH representatives. This meeting will ensure all site staff:
 - Are inducted into key site practices relating to the protection and management of Sloane's froglet habitat.
 - Are clear on expectations relating to key construction hold points and attendance of OEH and ACC at each.
 - Documentation of the levels being used for pipes and pits.
 - Documentation of the type of rockwork being used.
 - Results from key materials tests, including concrete, embankment compaction and clay liner tests.
 - A final works as executed validation of earthworks in the form of construction drawings.
 - Works as executed reviewed by OEH and ACC, and signed off by ACC.
 - At the end of the defects liability period, an inspection with ACC and OEH.
- ▶ Clear site signage and no-go zones in Sloane's froglet existing or established habitat.
- ▶ Legal and educational information relating to Sloane's froglet must be included in the Sloane's froglet habitat management plan. All site inductions must consider the commitments made in this management plan. Key educational information must also be clearly displayed at site sheds and the proponent is responsible for ensuring that all contractors on site are aware of the requirement to incorporate and manage Sloane's froglet habitat on-site.

Hold Point

The key outputs from step 4.1 are:

- A) An inspection of works as executed by OEH and ACC and formal approval by ACC

STEP 5 MAINTENANCE PERIOD

STEP 5.1 OPERATION AND MAINTENANCE

This aim of this step is for the contractor to ensure that the following operational and maintenance conditions are met.

These operational and maintenance conditions include:

- ▶ Maintenance of plants (Appendix G)
- ▶ Civil assets must be fully functional and free from sediment.
- ▶ Rockwork and concreting must be free of structural faults.
- ▶ Sedimentation basins and gross pollutant traps must be cleaned and free of sediment and gross pollutants.
- ▶ Log books outlining all maintenance operations over the duration of the defects period must be handed to ACC at final inspection (see Appendix I).
- ▶ Plant survival (based on number of plantings) is at least 60% in each wetland cell as assessed by OEH.
- ▶ The depth of the first wetland cell must not drop below 200 mm (based on an average of 12 measurements) as assessed by OEH in the summer preceding handover.
- ▶ All valves in draw down pits must remain closed unless directed by OEH.

The following are ACC's mandatory defects periods:

- ▶ Civil assets – 12 months
- ▶ Landscape assets – 36 months

At the completion of the defects period, ACC and OEH will complete a final inspection with the contractor to review all aspects of the wetland and confirm that the above operation and maintenance considerations have been met.

Hold Point

The key outputs from step 5.1 are:

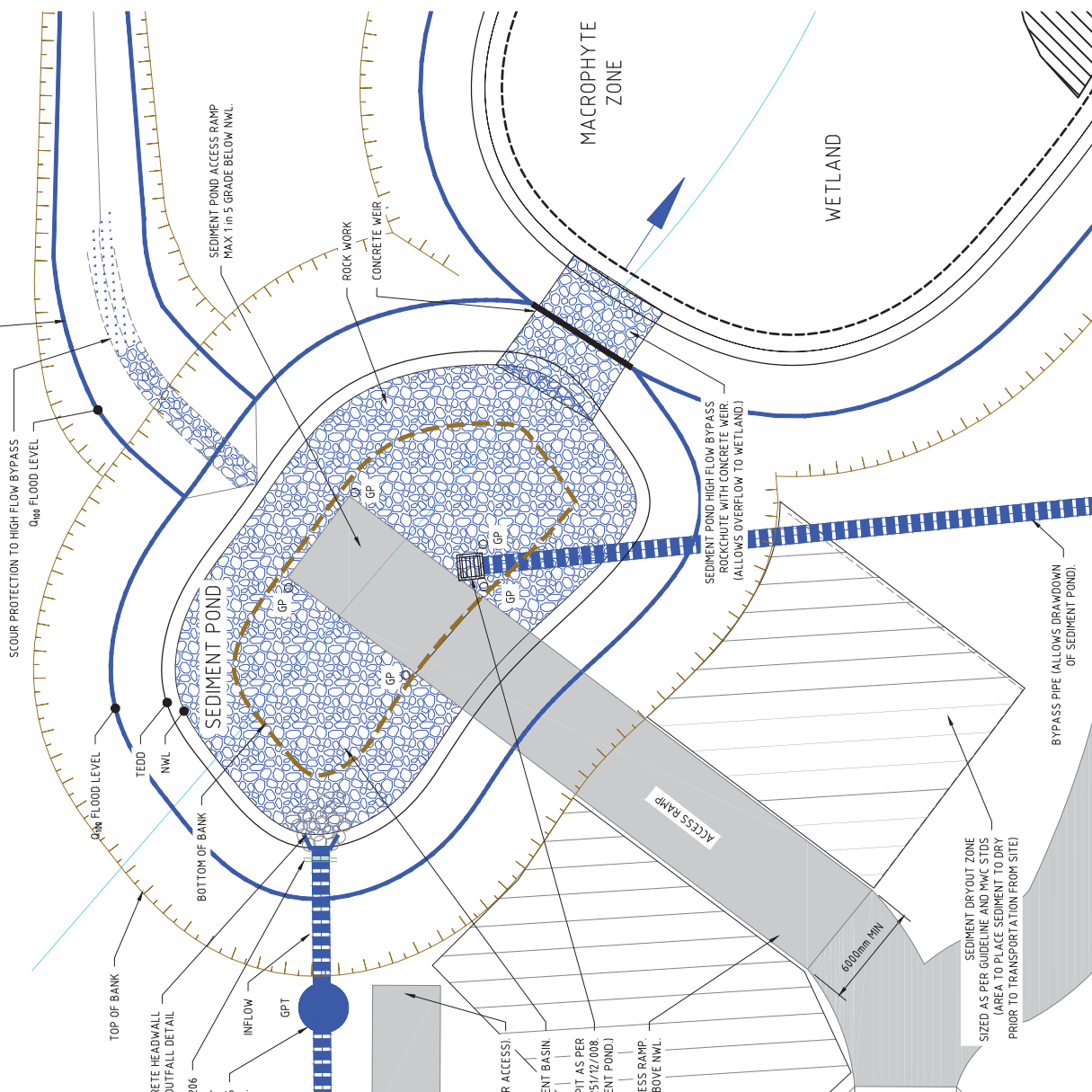
- A – An inspection of the works by ACC at the completion of the maintenance period.
- B – An inspection of the wetland breeding habitat (cells) by OEH.

APPENDIX A – STANDARD DRAWINGS

- 200mm THICK CONCRETE PAVEMENT WITH SUITABLE REINFORCEMENT.
 - 100mm MINIMUM THICK FCR BASE.
 - PAVEMENT TO BE PLACED UPON GEOFABRIC AND SUITABLY PREPARED SUBGRADE.
 - RAMP TO HAVE CORRUGATED OR ROUGH SURFACE FOR FRICTION/TRACTION PURPOSES.
 - GP DENOTES: GUIDE POST WITH EXTENSION 500mm PAST NWL.
2. OWNERSHIP OF THE LAND INCLUDING THE WETLAND AREA IS GENERALLY COUNCIL'S.
 3. ANY COUNCIL ROAD RESERVE WITH A SUBDIVISION RUNNING ADJACENT TO THE WETLAND SHOULD BE FITTED WITH BOLLARDS (NON REMOVABLE) TO PREVENT UNAUTHORIZED ACCESS.
 4. THIS MINIMISING DUMPING OF RUBBISH ETC WITHIN THE RESERVE OR UNWANTED MATERIALS INTO THE WETLAND.
 5. DESIGN MANUAL PROCEDURES AND SIZING REQUIREMENTS TAKE PRECEDENCE OVER DIMENSIONS AND DETAILS ON DRAWINGS.
 6. ALL PITS TO BE LOCATED WITHIN 0.5m OF AN ACCESS PATH.

LEGEND

- Q₁₀₀ FLOOD LEVEL (1% AEP RETARDATION WATER LEVEL AND/OR HIGH FLOOD LEVEL)
- NORMAL WATER LEVEL (NWL)
- TOP OF EXTENDED DETENTION DEPTH (TEDD)
- BATTER LINE
- SEDIMENT DRYOUT AREA
- ROCK WORK - ROCK WORK AS PER MWC DWG 7251/12/004. CONCRETE ALTERNATIVE ACCEPTABLE AS PER MWC DWG 7251/12/004.
- HEADWALL (ROCK OR CONCRETE)
- PIT



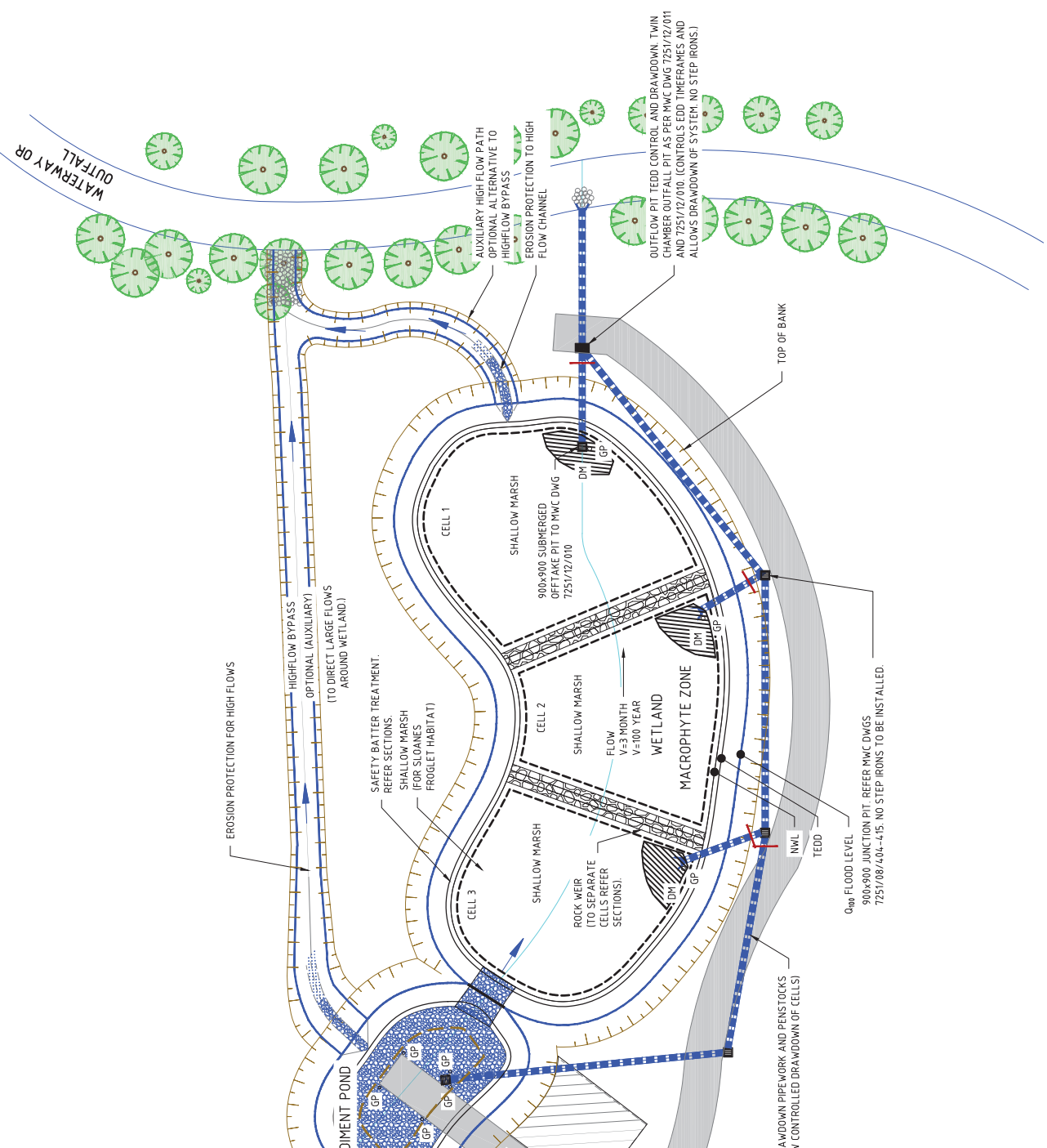
TYPICAL SEDIMENT POND LAYOUT

SCALE: 1:200

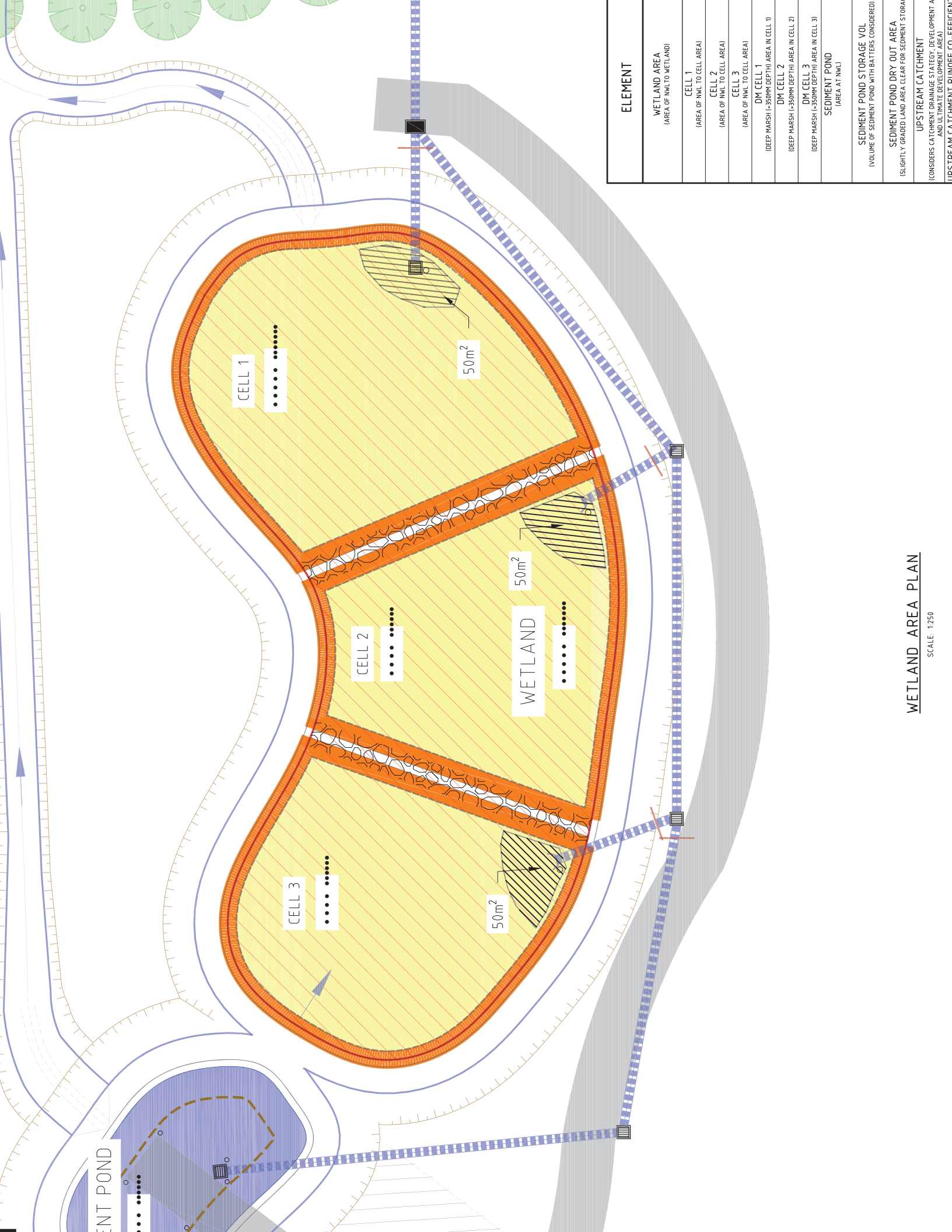
- TRIPLE CELL WETLAND SHOWN
- DESIGN MANUAL PROCEDURES AND SIZING REQUIREMENT
- DIMENSIONS AND DETAILS ON DRAWINGS TAKE PRECEDENCE
- PERCENTAGE DISTRIBUTION FOR SHALLOW/DEEP MARSH WETLANDS
- DEEP MARSH TO BE LIMITED TO 5% OF THE TOTAL AREA
- ALL PITS TO BE LOCATED WITHIN 0.5m OF AN ACCESS PATH

LEGEND	DESCRIPTION
	Q ₁₀₀ FLOOD LEVEL (1% AEP RETARDATION WALL)
	NORMAL WATER LEVEL (NWL)
	TOP OF EXTENDED DETENTION DEPTH (TEDD)
	BATTER LINE
	SEDIMENT DRYOUT AREA
	ROCK WORK
	DEEP MARSH (500mm MIN DEPTH, 1000mm MAX DEPTH)
	SHALLOW MARSH ZONE (200-350mm DEPTH)
	DRAINAGE PIPEWORK
	PIT
	ACCESS PATH
	GUIDE POST
	PENSTOCK TO BE INSTALLED TO PIT ON PIPE AND STANDARDS. OR ALTERNATIVELY ADOP VALVE TO ALBURY CITY COUNCIL APPROVAL
	ROCK WEIR
	HEADWALL (ROCK OR CONCRETE)
	PIT

NOTES:
 THIS STANDARD DRAWING IS A GUIDE ONLY BASED ON AN AVERAGE WETLAND DESIGN SHOULD BE COMPLETED USING THE REQUIREMENTS OF THE DESIGN MANUAL.
 WHERE THE WETLAND IS GREATER THAN 3000m² IN SURFACE AREA:
 • NO MORE THAN 3 WETLAND CELLS SHOULD BE APPLIED
 • CELLS SHOULD BE EQUAL IN SIZE; NO LESS THAN 1000m² PER CELL
 WHERE THE WETLAND IS LESS THAN 3000m² IN SURFACE AREA:
 • LESS THAN 1 OR 2 CELLS CAN BE APPLIED IN THE DESIGN
 • CELLS SHOULD BE EQUAL IN SIZE
 OUTFLOW PENSTOCK ADJUSTMENT DURING MAINTENANCE PERIODS SHOULD BE COMPLETED BY THE CONSULTANT AND CONTRACTOR IN CONSULTATION WITH THE OFFICE OF ENVIRONMENT AND HERITAGE STAFF. ADJUSTMENT TO TIMEFRAMES.



TYPICAL WETLAND LAYOUT PLAN
 SCALE: 1:500 (3000m² WETLAND AREA SHOWN)



ELEMENT
WETLAND AREA (AREA OF NWL TO WETLAND)
CELL 1 (AREA OF NWL TO CELL AREA)
CELL 2 (AREA OF NWL TO CELL AREA)
CELL 3 (AREA OF NWL TO CELL AREA)
DM CELL 1 (DEEP MARSH (>350MM DEPTH) AREA IN CELL 1)
DM CELL 2 (DEEP MARSH (>350MM DEPTH) AREA IN CELL 2)
DM CELL 3 (DEEP MARSH (>350MM DEPTH) AREA IN CELL 3)
SEDIMENT POND (AREA AT NWL)
SEDIMENT POND STORAGE VOL (VOLUME OF SEDIMENT POND WITH BATTERS CONSIDERED)
SEDIMENT POND DRY OUT AREA (SLIGHTLY GRADED LAND AREA CLEAR FOR SEDIMENT STORAGE)
UPSTREAM CATCHMENT (CONSIDERS CATCHMENT DRAINAGE STRATEGY, DEVELOPMENT AT AND ULTIMATE DEVELOPMENT AREA)
UPSTREAM CATCHMENT DRAINAGE COEFFICIENT

WETLAND AREA PLAN
SCALE: 1:250

APPENDIX B– DETAILED PROCESS FOR ALBURY SLOANE’S FROGLET STORMWATER MANAGEMENT GUIDELINES

LEGEND

- Direction of activity
- Alternative path if action fails
- ↔ Action may need discussion and several iterations

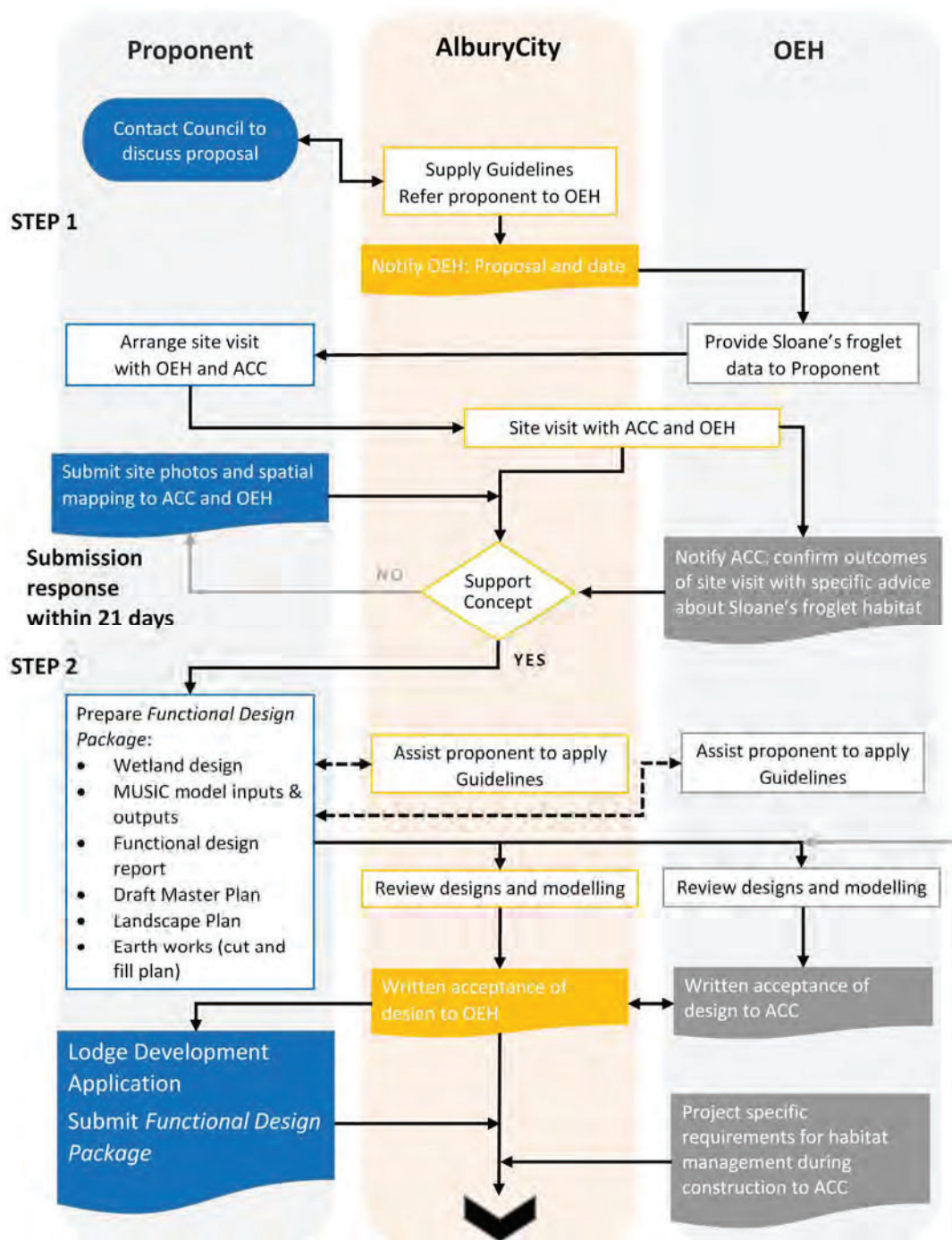
Proponent Action	Proponent to submit
ACC Action	ACC to submit
OEH Action	OEH to submit

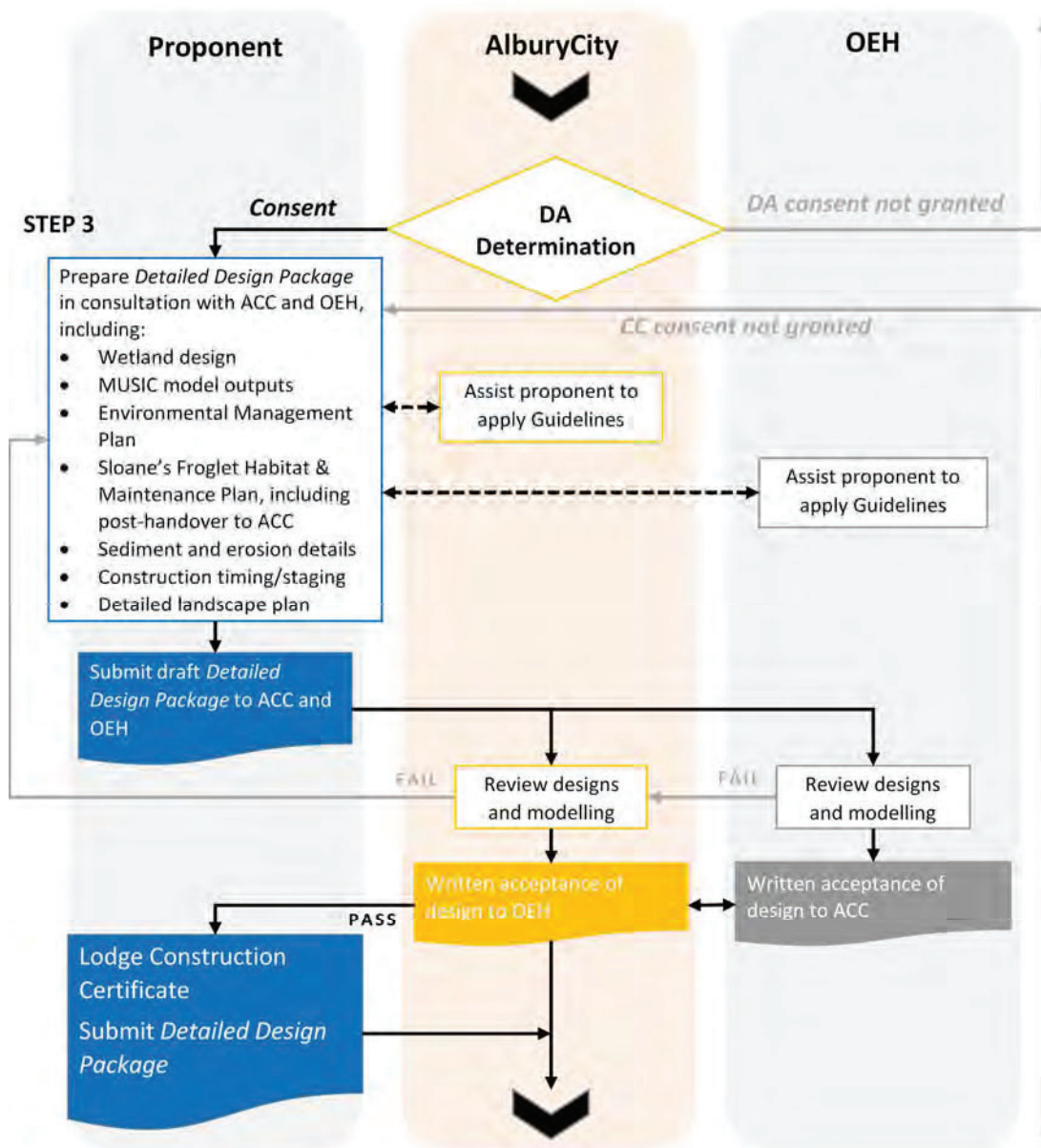


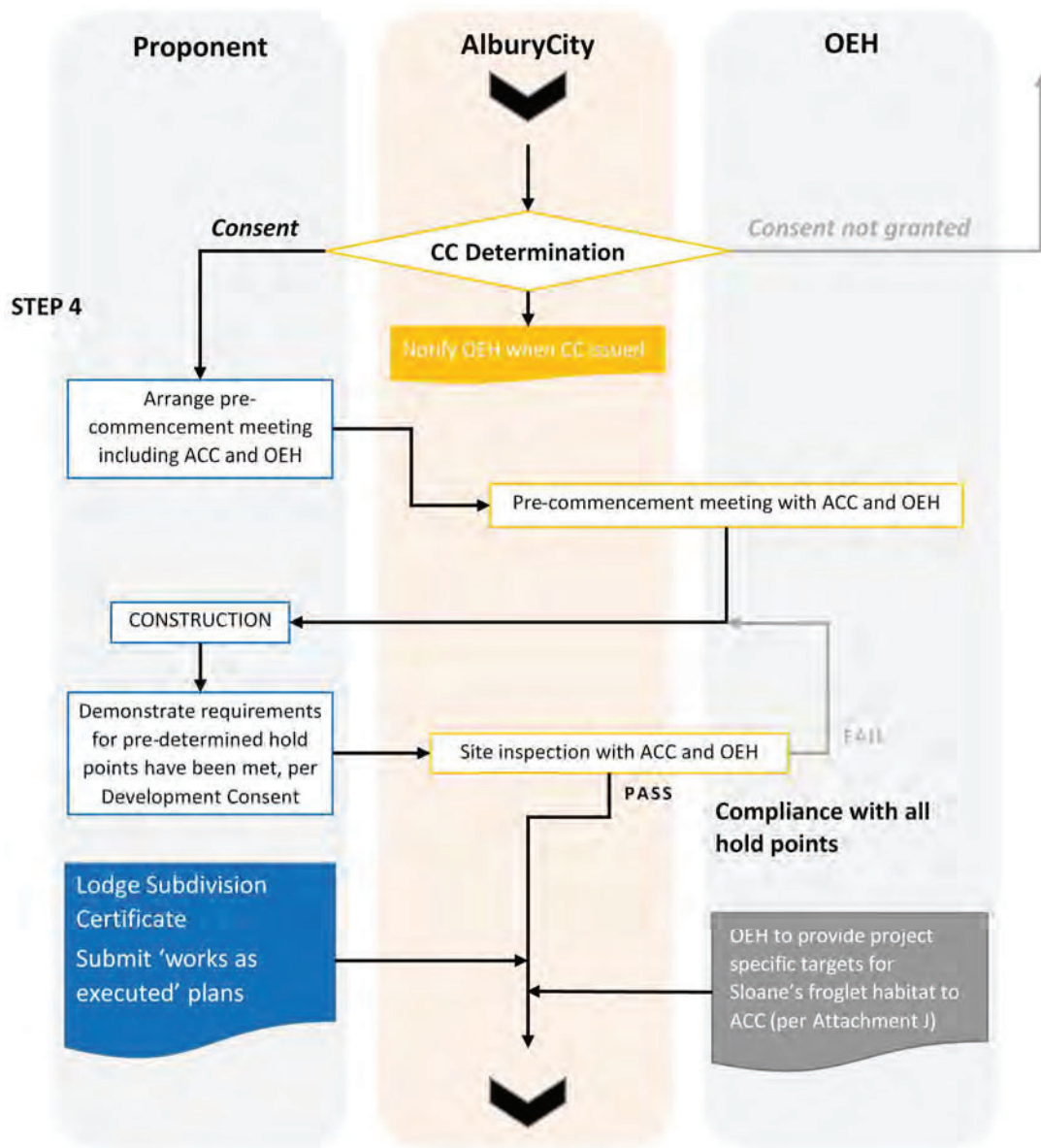
CONTACTS

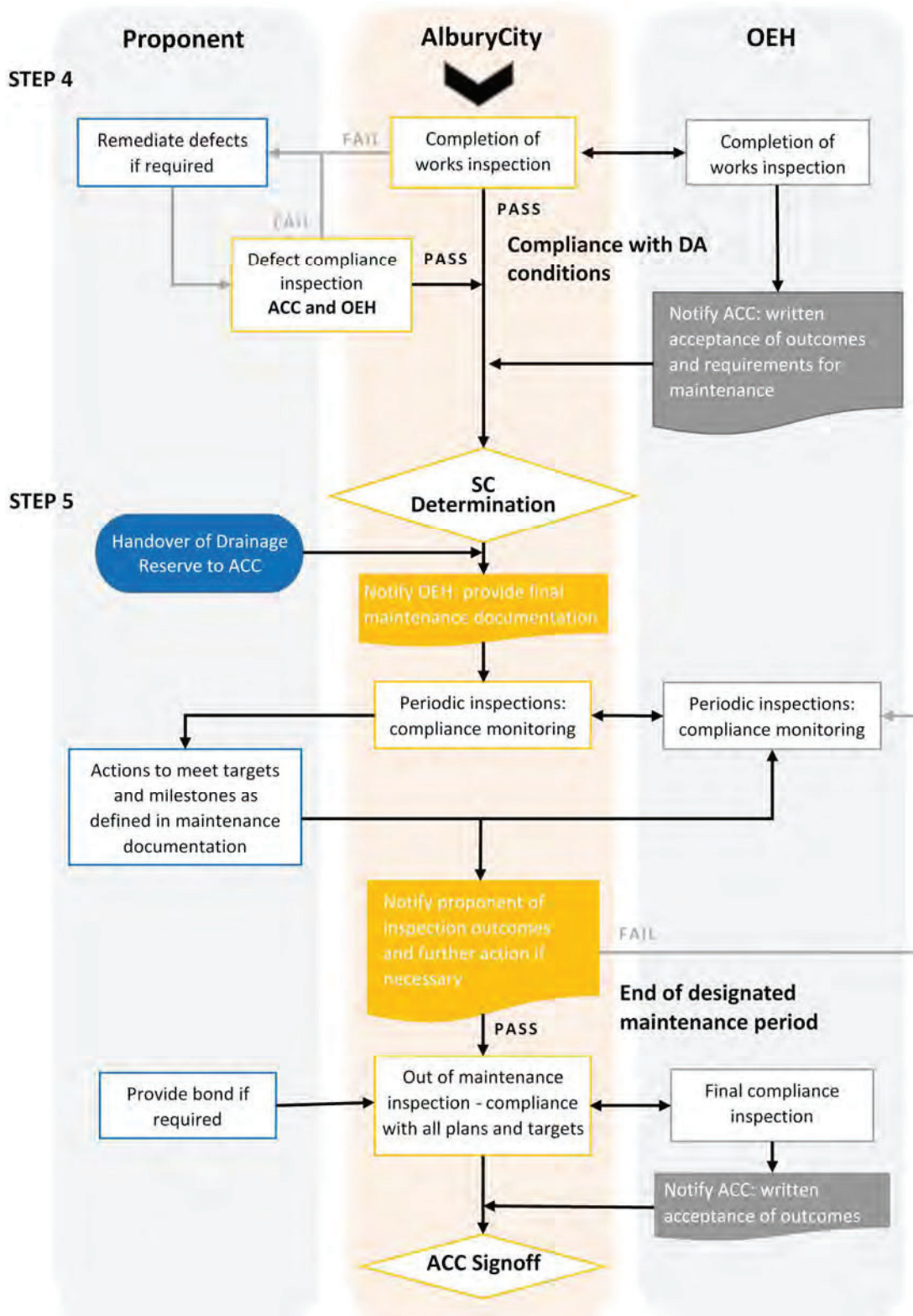
ACC Albury City Council: info@alburycity.nsw.gov.au Ph (02) 6023 8111

OEH NSW Office of Environment and Heritage (South West Planning Mailbox):
rog.southwest@environment.nsw.gov.au Ph (02) 6022 0606









APPENDIX C – EXAMPLE MASTERPLAN



APPENDIX D – RISK ASSESSMENT CHECKLIST

HS-TL301 SAFETY IN DESIGN - HAZARD IDENTIFICATION & ASSESSMENT TOOL



PURPOSE:

THIS ASSESSMENT IS TO IDENTIFY THE KEY HAZARDS ASSOCIATED WITH THE PRELIMINARY/CONCEPT DESIGN, UTILISING THE HAZARD IDENTIFICATION PROMPTS IN ORDER TO PROVIDE FOCUS ON OPTIMISATION OF THE DESIGN TO MANAGE/MITIGATE IDENTIFIED HAZARDS.

SCOPE:

THIS "SAFETY IN DESIGN" RISK ASSESSMENT IS ONLY FOR HAZARDS IDENTIFIED RAMP DEVELOPMENT PHASE, WHICH ARE SPECIFIC HAZARDS TO WORKERS AND/OR THIRD PARTIES WHICH CAN BE PARTIALLY OR FULLY MITIGATED VIA ENGINEERING DESIGN. I.E. THIS ASSUMES THAT LD&C PROJECT MANAGEMENT PLANS (INCLUDING SAFETY MANAGEMENT PLAN, ENVIRONMENTAL MANAGEMENT PLAN, QUALITY MANAGEMENT PLAN) AND ASSOCIATED SAFE WORKING METHODS, ISEAs, ITPs AND THE LIKE ARE PREPARED AND IMPLEMENTED FOR EACH PROJECT.

HAZARD IDENTIFICATION GUIDEWORDS / PROMPTS:		APPLIES? (Y/N/N/A)
1	GROUND CONDITIONS (Topography, Previous & Present Use; Contaminated Ground; Ground Stability, Seismic Activity and Groundwater)	
2	HAZARDOUS ENVIRONMENT (Biological Hazard; Chemicals (liquid, gas, powder); Radioactivity; Dust Emissions; Discharges / Effluents)	
3	EXISTING WORKING ENVIRONMENT (Abnormal Hours; Climate/Weather; Vibration; Noise; Fire & Flammables; Restricted Working Area; Lighting; Working with Lead or Asbestos)	
4	EXISTING SERVICES (Underground and Overhead Services)	
5	PROXIMITY TO OTHER STRUCTURE(S) (Risks from Existing Structures e.g. Stability)	
6	WORKING NEAR BODY OF WATER (Risk of Flooding; Work over Water; Work near Reservoir / Aquifer, River etc.; Risk of Pollution; Waterborne Diseases)	
7	PROXIMITY TO OTHER ACTIVITIES (Existing Operations; Other Contracts; Adjacent Moving Plant/Machinery)	
8	SEQUENCE OF CONSTRUCTION (Consider Programme with regard to Health & Safety)	
9	ACCESS (Access and Egress from Site or Adjacent Properties; Weight, Height or Turning Restrictions; Traffic Management Requirements, plant access requirements)	
10	INTERFACES (Neighbours – Terrorist Activity, Riots, Political Unrest, Military Action etc.; Schools; Public Highway Traffic; Rail Traffic; Shared Scaffolds or Accesses; Liaison with Operational Staff; Client Emergency Procedures)	
11	CONFINED SPACE WORKING (Buildings; Excavations; Manholes; Tanks; Chambers; Pipes)	
12	OPERATION AND MAINTENANCE CONSIDERATIONS (Cleaning; Waste Disposal; Fragile Roofs; Confined Spaces; Ventilation; Signs or Notices; access/egress)	
13	WORKING AT HEIGHT (Falling Objects; Mechanical or Manual Lifting; Lifting Cranes; Work on Sloping Roofs / Slopes)	
14	DEMOLITION / REFURBISHMENT / REPAIR (Consider Health & Safety on Existing and Future Work)	
15	WELFARE (Provide Water, Power and Wastewater Connections where practicable)	
16	OCCUPATIONAL HEALTH (Noise; Vibration; Manual Handling; Hazardous Substances; Dust, Fire Explosion, Toxic Gases, Heat)	
17	ENVIRONMENTAL ISSUES (Surrounding Land Use, Planning Restrictions, Noise Pollution, Discharge to Air, Discharge to Soil, Visual Impact)	
18	END USER SAFETY STANDARDS (Design for access and mobility, Commonwealth Discrimination Act, parking facilities, playground safety standards, pool & water safety, pavements, earth retaining structures, lighting, slip resistance, inclines, road guidelines, platforms, ladders and stairways)	
19	HAZOP (A hazard and operability study (HAZOP) is a structured and systematic examination of a complex planned or existing process or operation to identify and evaluate problems that may represent risks to personnel or equipment)	
20	OTHER SIGNIFICANT HAZARDS NOT IDENTIFIED ABOVE (e.g. Hot Works, Diving Operations, Non-Destructive Testing)	

Project Name:		Project Number:				
Component or Aspect:		Assessment No:				
Ref No	Nature of hazard	Component of Project (e.g. tank, pipeline, PS)	Possible effect of hazard	Phase where hazard may arise	Precautions or remedial action to be taken (mitigation if any)	Details of Residual Risks
Assessment by:						Approved by:

APPENDIX E – SLOANE’S FROGLET HABITAT MANAGEMENT TEMPLATE

Note: this template is intended to provide guidance to the proponent on the type of information need to demonstrate how Sloane’s froglet habitat will be managed and maintained. The use of simplified tables/diagrams/flowcharts etc. is encouraged. Proponents will be required to provide separate Environmental Management, Erosion and Sedimentation Management, and Construction Timing and Staging plans. Proponents should contact AlburyCity Council for specific details to be included in these plans.

Purpose

A statement on the plan’s primary purpose and intent. E.g., ‘This Plan aims to ensure that stormwater wetlands for DEVELOPMENT NAME conform to Sloane’s froglet (Crinia sloanei) habitat and stormwater management requirements as detailed in the Thurgoona Stormwater Wetland Guidelines, to contribute the long-term viability of the Thurgoona Wirlinga Sloane’s froglet population’.

Sloane’s Froglet Habitat Creation and Management

▶ General Methods

A statement on the general methods that will be used to create and/or maintain Sloane’s froglet habitat on the development site.

▶ Habitat Creation Timeline

Specific details on the planned timing of habitat creation and maintenance for Sloane’s froglet. This section should include details of when planting will occur and the contingency for failed plantings.

▶ Revegetation Details

Information on the plant species and densities to be planted in and around Sloane’s froglet stormwater wetlands. Diagrams demonstrating the location and depth (for aquatic plants) of plantings are encouraged. Species should be separated into the following categories: emergent plants (deep), emergent plants (shallow), fringing plants, and barrier plants. Contingency plans for re-planting where necessary.

▶ Water Management Regime and Methods

Details the methods and/or infrastructure that will be used to regulate water levels.

Sedimentation Management and Maintenance Methods

▶ General Methods

A statement on the general methods that will be used to manage sediment from pre- through to post-construction (i.e., includes the defects period). This section should also include information on infrastructure or plant used to remove/manage sediment (e.g., gross pollutant traps; eduction trucks).

▶ Sedimentation Maintenance Timeline

Specific details on the timing of sediment management from pre- through to post-construction. This section should also include details on how and when the proponent will monitor sediment inflow to the wetlands, and trigger points for revising the maintenance regime. A table or similar is recommended to clearly show the proposed timeline.

- ▶ Sediment Management and Control Methods

Details on the proposed sediment management and control methods. Should include information on any infrastructure (e.g., silt exclusion fencing).

Monitoring undertaken by OEH for presence of Sloane's froglet, sediment levels in habitat cells, and aquatic plant survival

The following sections associated with monitoring undertaken by OEH should be incorporated into the Sloane's froglet habitat management plan:

- ▶ Monitoring Sloane's froglet occupancy

OEH will be responsible for monitoring the colonisation of the wetlands by Sloane's froglet. This monitoring will commence immediately (first winter) following wetland construction.

- ▶ Sedimentation monitoring in the Sloane's froglet habitat cells

To assess whether the sedimentation management has effectively protected the habitat cells from excessive sediment deposits, OEH will monitor changes in the depth of the habitat cells over the duration of construction (prior to handing wetland basins over to ACC).

Measurements for each cell will be taken using a laser level from 12 evenly spaced points in summer when the cells are dry, with the water level being determined at the outlet.

Measurements will only be taken from sections of the cells initially set at 300 mm depth. If the average depth of the cell is less than 200 mm, the developer will be required to dig out and replant the habitat cells to the initially prescribed 300 mm prior to handover.

- ▶ Aquatic vegetation monitoring within the Sloane's froglet habitat cells

*OEH will assess the survivorship of aquatic plants in the habitat cells. This assessment will only be undertaken for emergent aquatic plants in the 300 mm depth zones (i.e., *Eleocharis acuta*). For each habitat cell, survivorship will be assessed in 12 evenly spaced quadrats (each quadrat will be 4- × 4-m) throughout the habitat cells. If average survivorship is less than 60%, the proponent will be required to undertake additional planting to achieve an overall coverage/survivorship of 60% in that cell.*

APPENDIX F – MUSIC SUPPORTING INFORMATION

Table 1: Guide for fraction impervious based on land type

Zone	Brief Description	Normal Range	Typical Value
Residential	Large Residential Allotment size 601-1000m ²	0.50-0.80	0.60
	Standard Density Allotment size 300-600m ²	0.70-0.80	0.75
	High Density Allotment size <300m ²	0.80-0.95	0.85
Mixed Use	Mix of residential, commercial, industrial and hospitals	0.60-0.90	0.75
Industrial	Typical industrial areas with large warehouses and large paved areas	0.70-0.90	0.90
	Garden Supplies/Nurseries	0.30-0.60	0.50
	Quarries	0.10-0.30	0.20
Commercial	Offices, manufacturing and broader commercial areas	0.70-0.95	0.90
Rural	Rural Areas	0.05-0.20	0.10
	Rural Living	0.10-0.30	0.20
Public Land	Education	0.60-0.80	0.70
	Powerlines, pipe tracks and drainage reserves	0.00-0.10	0.05
	Hospitals	0.80-0.90	0.85
	Railways	0.60-0.80	0.70
	Cemeteries	0.50-0.70	0.60
	Libraries, sports complexes and Depots	0.50-0.90	0.70
	Major Roads and Freeways	0.60-0.90	0.70
	Secondary and Local Roads	0.50-0.80	0.60

APPENDIX G - PLANT LIST

Potential plant species for each wetland zone are listed below. Where practical, all planted trees and shrubs should be species that are listed in the South West Slopes Revegetation Guide. Additional species may be proposed by the proponent, but should be discussed with ACC and OEH prior to planting.

Emergent vegetation zone:

- ▶ *Eleocharis acuta* (common spike rush); six to eight tubes per m² (this species is strongly recommended for planting)
- ▶ *Potamogeton ochreatus* (blunt pondweed); two per m²
- ▶ *Myriophyllum papillosum* (common water-milfoil); four to six tubes per m²

In the emergent vegetation zone, *Eleocharis acuta* should be planted in the area that will be 300 mm deep. *Potamogeton ochreatus* and *Myriophyllum papillosum* should be planted in the 450-mm deep zone.

Approximately 60% of the wetland should be 300 mm deep. The other 40% should be approximately 450 mm deep.

Fringing vegetation zone:

- ▶ *Poa labillardieri* (snow grass); four tubes per m²
- ▶ *Carex appressa* (tall sedge); four tubes per m²
- ▶ *Juncus usitatus* (common rush); one to two for every 1m²
- ▶ *Cynodon dactylon* (common couch); three tubes per m²
- ▶ *Paspalum distichum* (water couch); two to three per m²

Barrier shrubs zone:

Medium Shrubs – greater than 1m high (but not shading the breeding habitat)

- ▶ Fan Grevillea – *Grevillea ramosissima* subsp. *ramosissima*
- ▶ Urn Heath – *Melichrus urceolatus*

Small Shrubs – less than 1m high

- ▶ Heathy Bush-pea – *Pultenaea procumbens*
- ▶ Crimson Grevillea – *Grevillea polybractea*

Deciduous trees should not be planted within 20 m of the top water level of a wetland to avoid excessive leaf litter dropping into wetlands during winter (when Sloane's froglet is breeding). The wetland zones are defined in Appendix A.

APPENDIX H - SIGNAGE ASSESSMENT CHECKLIST

Signage as Remote Supervision Signage Assessment



1. OPEN SPACE IDENTIFICATION DETAILS				
Location Name:				
Park ID Number:		Property Number:		
2. INSPECTING COUNCIL OFFICER				
Name:		Date:		
Position:				
Signature:				
3. FACILITY VISITATION RATE (FVR)				
A. DEVELOPMENT RATING NATURAL	1 = No hazardous features 2 = Sloping ground, no natural water, walking track around reserve 3 = Reserve contains natural waterway that runs during wet weather, drops less than 1m 4 = Creeks, ponds and ledges between 1m and 3m 5 = Contains rivers, dams and cliffs greater than 3m		RATING:	
A. DEVELOPMENT RATING INFRASTRUCTURE	1 = Virginal bush, cleared land, no infrastructure 2 = Cleared land, static infrastructure, eg grass area with tables and chairs, toilet block, lookout 3 = Cleared land with mobile infrastructure eg grassed area with play equipment, cycleway, market, leash free dog areas 4 = Council owned infrastructure with no artificial lighting eg golf course, football field, recreational ground, caravan park 5 = Extensively developed infrastructure with artificial lighting eg sporting complex, artificially lit courts		RATING:	
B. POPULATION USING RESERVE	1 = Less than 5 people at a time 2 = 5 to 50 people at a time 3 = 50 to 100 people at a time 4 = 100 to 500 people at a time 5 = More than 500 people at a time		RATING:	
C. FREQUENCY OF USE	1 = Annual Use 2 = Monthly use 3 = Weekly use 4 = Daily use 5 = Continuous use during day		RATING:	
FACILITY VISITATION RATE		A (Highest) x B + C = RATING:		
4. HAZARD IDENTIFICATION AND RATING				
	Hazard	Risk Rating (VH/H/M/L)	Hazard	Risk Rating (VH/H/M/L)
1.			7.	
2.			8.	
3.			9.	
4.			10.	
5.			11.	
6.			12.	

Signage as Remote Supervision Signage Assessment



5. SIGNAGE REQUIREMENTS		
<input type="checkbox"/>	FVR = 2 to 3	Sign Details: No sign is required. Sign Location: No sign is required.
<input type="checkbox"/>	FVR = 4 to 6	Sign Details: Name of facility. General warning message. All Council regulations as prohibition pictograms. Any information symbols relevant to facility. Does not require warning symbols. Sign Location: A prominent position within the reserve.
<input type="checkbox"/>	FVR = 7 to 10	Sign Details: Name of facility. General warning message. All Council regulations as prohibition pictograms. Any information symbols relevant to facility. All Very High or High risk hazards as warning symbols or if none, the top hazard. Sign Location: All entrances to the facility.
<input type="checkbox"/>	FVR = 11 to 15	Sign Details: Name of facility. General warning message. All Council regulations as prohibition pictograms. Any information symbols relevant to facility. All Very High or High risk hazards as warning symbols or if none, the top two hazards. Sign Location: All entrances to the facility.
<input type="checkbox"/>	FVR = 16 to 20	Sign Details: Name of facility. General warning message. All Council regulations as prohibition pictograms. Any information symbols relevant to facility. All Very High or High risk hazards as warning symbols or if none, the top three hazards. Sign Location: All entrances to the facility. Consider placing in high use areas.
<input type="checkbox"/>	FVR = 21 to 26	Sign Details: Name of facility. General warning message. All Council regulations as prohibition pictograms. Any information symbols relevant to facility. All Very High or High risk hazards as warning symbols or if none, the top four hazards. Sign Location: All entrances to the facility. Consider placing in high use areas.
<input type="checkbox"/>	FVR = 27 to 30	Refer to Document: Signage as Remote Supervision - High Facility Visitation Rate Form DOC16/184500.

6. SIGNAGE SPECIFICATIONS			
Location Name:			
General Warning Message:	Warning: Use of this area may be hazardous. Please take reasonable care for your safety.		
Council Prohibitions:	1.	2.	3.
	4.	5.	6.
Information Symbols:	1. <input type="checkbox"/> Keep children under active supervision at all times <input type="checkbox"/> (Additional) in or around water.	2.	3.
Hazard Warning Symbols:	1.	2.	3.
	4.	5.	6.

APPENDIX I – PREI-NSPECTION CHECKLIST

A range of guidelines, checklists and case studies are available on the Melbourne Water Website. The checklists below are updates to the Melbourne Water (2005) *WSUD Engineering Procedures: Stormwater Manual* and are available for download in MS Word format from the Melbourne Water website:

www.melbournewater.com.au/planning-and-building/stormwater-management/case-studies-and-checklists

Constructed wetland handover checklist

This list has been developed by Melbourne Water for use as a guide by Councils in assessing constructed wetland projects at handover.

Location	
Inspected by	
Asset ID	
Date and time	
Asset designed by	
Asset constructed by	
Defects and liability period	

Item Inspected	Satisfactory (Y/N/NA)	Comments
Treatment		
1. System appears to be working as designed visually?		
2. No obvious signs of under-performance?		
Maintenance		
3. Operation and Maintenance plans provided for each asset?		
4. Inspection and maintenance undertaken as per maintenance plan?		
5. Inspection and maintenance checklist completed and provided including up to date inspection with no outstanding issues?		
6. Asset inspected for defects?		
Asset Information		
7. Design Assessment Checklist provided?		
8. As constructed plans provided?		
9. Copies of all required permits (both construction and operational) submitted?		
10. Proprietary information provided (if applicable)?		
11. Digital files (including drawings, survey, models) provided?		
12. Asset listed on asset register or database?		

Constructed wetland maintenance checklist

This list has been developed by Melbourne Water for use as a guide by Councils in maintaining constructed wetlands.

Location	
Inspected by	
Asset ID	
Date and time	

Item Inspected	Satisfactory (Y/N/NA)	Details of Action Required
Litter accumulation within Gross Pollutant Trap (cleanout required)?		
Sediment accumulation at inflow points?		
Sediment accumulation within inlet zone (record depth, remove if > 2/3 full)?		
Litter or debris within inlet structure?		
Litter within inlet or aquatic plant (macrophyte) zone?		
Overflow structure integrity satisfactory?		
Outlet structure free of debris?		
Maintenance drain operational?		
Settling or erosion of bunds or batters present?		
Terrestrial vegetation condition satisfactory? (density, weeds, disease, pest infection, stunted growth or dead plants)		
Aquatic vegetation condition satisfactory? (density, weeds, disease, pest infection, stunted growth or dead plants)		
Replanting required?		
Evidence of damage or vandalism?		
Evidence of dumping (building waste, oils etc.)		
Evidence of algal scums?		
Evidence of odours?		

Sediment pond handover checklist

This list has been developed by Melbourne Water for use as a guide by Councils in assessing sediment pond construction handover projects.

Location	
Inspected by	
Asset ID	
Date and time	
Asset designed by:	
Asset constructed by	
Defects and liability period	

Item Inspected	Satisfactory (Y/N/NA)	Comments
Treatment		
1. System appears to be working as designed visually?		
2. No obvious signs of under-performance?		
Maintenance		
3. Operation and Maintenance plans provided for each asset?		
4. Inspection and maintenance undertaken as per maintenance plan?		
5. Inspection and maintenance checklist completed and provided including up to date inspection with no outstanding issues?		
6. Asset inspected for defects?		
Asset Information		
7. Design Assessment Checklist provided?		
8. As constructed plans provided?		
9. Copies of all required permits (both construction and operational) submitted?		
10. Proprietary information provided (if applicable)?		
11. Digital files (including drawings, survey, models) provided?		
12. Asset listed on asset register or database?		

Sediment pond maintenance checklist

This list has been developed by Melbourne Water for use as a guide by Councils in maintaining sediment ponds.

Location	
Inspected by	
Asset ID	
Date and time	

Item Inspected	Satisfactory (Y/N/NA)	Details of Action Required
Civil Components		
Safety fences, batters and other public safety features intact?		
Inlet erosion, damage or standing water?		
Sediment blocking inlet pipe?		
Outlet freely draining?		
Blocking of outlet pipe?		
Sediment level is more than 0.5 m below normal water level?		
Overflow structure integrity satisfactory?		
No isolated pools with presence of mosquito larvae?		
Maintenance drain operational?		
Landscape Components		
Terrestrial vegetation condition satisfactory and of adequate density?		
Less than 10% of the basin surface area and batters covered in weeds?		
Evidence of damage or vandalism?		
Evidence of algal scums?		
Evidence of odours?		

APPENDIX J - GLOSSARY

Breeding habitat

The environment where a species lives and can complete its life cycle.

Breeding habitat for Sloane's froglet (*Crinia sloanei*) has the following characteristics: permanent or ephemeral waterbodies; wet from mid-late autumn and for at least three months after the winter breeding period (at least until the end of October); dry during summer; emergent vegetation with a stem diameter of less than 5 mm; banks with a gentle slope from 1 – 4%; still water (apart from immediately after rainfall events) with a water depth ranging from 10 to 310 mm. Large robust colonies are typically found in wetlands greater than 3000 m² in area.

Catchment

A topographically defined area, drained by a stream such that all outflow is directed to a single point (WSUD Engineering Procedures Manual 2005).

Connectivity / Habitat corridor

A wildlife corridor, habitat corridor, or green corridor is an area of habitat connecting wildlife populations and people. In these corridors, passive transport means are encouraged to minimise potential impacts on the local environment

Construction Certificate (CC) for subdivision works

A CC is required as part of the development process if a subdivision requires civil construction works (e.g. roads, footpaths, drainage works). The CC is issued by Council and verifies that the detailed design of the works complies with the development consent. Work cannot commence until a CC has been issued.

Development Application (DA)

The *Environmental Planning Assessment Act 1979* requires consent to be granted for various forms of development. In many circumstances that consent is via the submission and assessment of a DA. Planning for the DA includes the preparation of supporting documentation known as a Statement of Environmental Effects (SEE) and lodgement with the Consent Authority (Albury City Council).

Drainage Strategy

A strategy (not yet in existence) that Albury City may seek to develop to further inform stormwater management in the Thurgoona-Wirlinga area.

Defects period

A defects liability period is a set period after a construction project has been completed during which a contractor has the right to return to the site to remedy defects.

Detention time

The time it takes for a 'parcel' of water to flow from the inlet of a wetland system to the outlet. Detention time is never a constant (see also Notional detention time) (WSUD Engineering Procedures Manual, 2005).

Ecological Community

Ecological communities are unique and naturally occurring groups of plants and animals. Their presence can be determined by factors such as soil type, position in the landscape, climate and water availability

Extended detention

Volume above wetland normal water level and the overflow weir height in a treatment element (e.g. wetland, sedimentation basin).

Fraction Impervious

A proportion that defines the percentage of area that does not permit permeability into natural soils.

Gilgai

Gilgai refer to surface micro-relief formed by the shrinking and swelling of clays during alternate drying and wetting cycles. The surface eventually becomes covered by a repeated pattern of small mounds and depressions that give the soil surface a 'pock-marked' appearance. Gilgai depressions are sometimes also called crabholes or melonholes.

Gilgai wetlands

Ephemeral wetlands that occur in gilgai soil formations. Wetlands in the Albury region called 'gilgai wetlands' may correspond to '*Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains*', listed as a critically endangered ecological community (CEEC) on the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (see Threatened Species).

The Seasonal Herbaceous Wetlands CEEC is characterised by a particular hydrology, geographical position and vegetation structure. These are isolated, freshwater wetlands that are usually inundated on a seasonal basis through rainfall, then dry out, so surface water is not permanently present. They occur on the lowland plains of temperate south-eastern Australia and have a vegetation structure that is open, i.e. woody cover is absent to sparse, and the ground layer is dominated by herbs (grasses, sedges and forbs) adapted to seasonally wet or waterlogged conditions. When standing water is present, wetland plants are clearly evident, however during drought or seasonal dry periods plants may not be visible above ground. In some cases (including around Albury), the terrain is characterised by gilgais with wetlands forming in the gilgai depressions. More information:

www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=97&status=Critically+Endangered

Gross Pollutant Trap (GPT)

A structure used to trap large pieces of debris (> 5 mm) transported through the stormwater system (WSUD Engineering Procedures Manual, 2005).

HECRAS

HEC-RAS is a computer program that models the hydraulics of water flow through natural rivers and other channels. The Hydrologic Engineering Center (HEC) in Davis, California developed the River Analysis System (RAS) to aid hydraulic engineers in channel flow analysis and floodplain determination

Life cycle

Relating to constructed wetland – the various steps of a constructed wetlands design development, construction, operation and maintenance.

Local population

A community (group) of animals, plants, or humans (in this case a population of Sloane's froglet) among whose members interbreeding occurs, which occurs near the point of interest. I.e., the Sloanes population in the Sloane's Local Area Management Plan area is a "local population". A population may consist of several smaller "meta-populations" that contribute to the size and viability of the overall populations.

Maintenance Period

The period usually commences upon practical completion of the works and runs for a specified time frame. Maintenance starts on date of issue of the Subdivision Certificate.

Melbourne Water's Constructed Wetlands Design Manual

Melbourne Water's Constructed Wetlands Design Manual is one of the most comprehensive design manuals currently available within industry. The content of this guideline is applicable to all cities and towns in South East Australia. Updated material is available from the Melbourne Water website www.melbournewater.com.au/planning-and-building/developer-guides-and-resources/standards-and-specifications/constructed-0.

MUSIC

A program designed to help urban stormwater professionals visualise possible strategies to tackle urban stormwater hydrology and pollution impacts. As an aid to decision-making, MUSIC – Model for Urban Stormwater Improvement Conceptualisation – predicts the performance of stormwater quality management systems.

OEH - NSW Office of Environment and Heritage

State government department with legislative responsibilities for the *National Parks and Wildlife Act 1974*, *Biodiversity Conservation Act 2016* and parts of the *Environmental Planning and Assessment Act 1979*. For biodiversity and Aboriginal cultural heritage planning matters in south-western NSW, OEH can be contacted at rog.southwest@environment.nsw.gov.au.

Pre-Development Application (or pre-lodgement)

Early planning, site visit and meetings with OEH and ACC in the period before lodging the DA. Allows OEH and ACC staff to see the proposal on the ground and provide site-specific advice about implementing the Guidelines.

RORB

RORB is a general runoff and streamflow routing program used to calculate flood hydrographs from rainfall and other channel inputs. It subtracts losses from rainfall to produce rainfall-excess and routes this through catchment storage to produce the hydrograph.

Sloane's Froglet Interim Habitat Guide and Management Recommendations

A document prepared by Dr Alexandra Knight, with support from the NSW Office of Environment and Heritage (OEH). Details existing knowledge of Sloane's Froglet habitat requirements. Information in the guide is drawn almost entirely on work done as part of Alex's Ph.D. research. http://www.alburyconservationco.org.au/wp-content/uploads/2015/02/Sloanes-Froglet_Office-of-Enviroment-Herritage-A5-Booklet-A4_reduced-size.pdf

Sedimentation Basin

Sediment basins are used to retain coarse sediments from runoff and are typically the first element in a treatment train. They are important in protecting downstream elements from becoming overloaded or smothered with sediments. They operate by reducing flow velocities and encouraging sediments to settle out of the water column.

They are frequently used for trapping sediment in runoff from construction sites and as pre-treatments for elements such as wetlands (e.g. an inlet pond). They can be designed to drain during periods without rainfall and then fill during runoff events or to have a permanent pool. Sediment basins can have various configurations including hard edges and base (e.g. concrete) or a more natural form with edge vegetation creating an attractive urban landscape element. They are, however, typically turbid and maintenance usually requires significant disturbance of the system (WSUD Engineering Procedures Manual, 2005)

Sloane's Froglet Local Area Management Plan (LAMP)

A strategic plan (in preparation) that details what work should happen where in the Thurgoona-Wirlinga area to support the long-term viability of the local Sloane's Froglet population. Primarily map-based, the document will focus on a range of potential management actions, including where new wetlands could be created, where existing wetland or land management could be improved, and where critical connections need to be created or maintained to support movement of Sloane's Froglet across the landscape. The LAMP is currently being prepared by OEH and will be finalised in consultation with Albury City and other major stakeholders. The LAMP will take the form of an overarching Thurgoona-Wirlinga strategic map, and also individual, "zoomed-in" maps for specific interested stakeholders (e.g., Albury Environmental Lands; Charles Sturt University; Albury Equestrian Centre).

Sloane's Froglet Habitat Management Plan

A document prepared during the detailed design stage for each development where the Sloane's Froglet Stormwater Management Guidelines are applied. This plan aims to ensure that stormwater wetlands conform to the Sloane's froglet (*Crinia sloanei*) breeding habitat and stormwater management requirements as detailed in the Guidelines. It specifies how Sloane's froglet breeding habitat will be managed and maintained to contribute to the long-term viability of the Thurgoona Wirlinga Sloane's froglet population.

Small-stem diameter vegetation

Emergent wetland plants with a stem diameter of less than 5 mm, such as common spike rush (*Eleocharis acuta*). These types of plants are a common feature of good quality Sloane's froglet wetlands.

South West Slopes Revegetation Guide

Guide to identifying trees, shrubs and groundcover species that should be used in revegetation works in the NSW South West Slopes bioregion (Stelling 1998). The guide identified the species best suited to particular areas based on catchment (and sub-catchment) and landscape features of the site (valley, slope, hill top). The full guide can be downloaded from www.biodiversitygateway.com.au/SWSR_Guide/home.html

Stormwater Wetland Design Guidelines

This document. Guidelines currently being prepared by Spiire, in consultation with OEH and Albury City Council. These guidelines will provide developers with clear advice on processes, obligations, and technical requirements relating to the development of stormwater wetlands that will support the long-term viability of Sloane's Froglet in the Thurgoona-Wirlinga area.

Subdivision Certificate (SC)

A SC certifies that all engineering and landscape works (including works as executed plans) are completed and all other conditions of the development consent are satisfied. It is issued after completion of works inspections show that all works comply with DA conditions and have been completed in accordance with the construction certificate, and works as executed plans have been endorsed by Council. The SC authorises the lodgement of the plan of subdivision (or 'linen plan') with NSW Land & Property Information (LPI). It is required before LPI will register the new lot and deposited plan (DP) number and subsequently issue the new title. It is only after the issue of the new lot and DP number (title) that the new allotment or property legally exists and the land can be transferred to another party. Issue of the SC is sometimes referred to as linen plan release.

Temporary Sedimentation Basin

A temporary sediment basin is a temporary pond built on a construction site to capture eroded or disturbed soil that is washed off during rain storms, and protect the water quality of a nearby stream, river, lake, or bay. The sediment-laden soil settles in the pond before the runoff is discharged. A temporary sediment basin is considered applicable for the Sloane's Froglet Wetland system to ensure it protects the ultimate breeding habitat area of the froglet from large sediment loading.

Threatened Species

Plants and animals whose survival is threatened because of changes in the landscape and native habitat as a result of human activity. Species, populations and ecological communities are considered threatened (at risk of extinction) if there has been a reduction in population size, they have restricted geographical distribution or there are few mature individuals.

NSW legislation applying to threatened entities and threatened species programs is the *Biodiversity Conservation Act 2016*. It is administered by OEH and supersedes the *Threatened Species Conservation Act 1995* (TSC Act). More information about threatened species in NSW is on the OEH website www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is Commonwealth legislation to manage nationally and internationally threatened flora, fauna, ecological communities and heritage places — defined in the EPBC Act as matters of national environmental significance. More information is on the EPBC Act website www.environment.gov.au/epbc.

Threatened species records

Point locations where threatened species have been recorded are stored in BioNet (also known as the Atlas of NSW Wildlife). BioNet records include species sightings and the results of systematic flora and fauna survey and is accessed via the OEH website www.environment.nsw.gov.au/wildlifeatlas/about.htm.

Thurgoona Wirlinga Precinct Structure Plan

The Thurgoona Wirlinga Precinct Structure Plan is a strategic planning document whose role is to deliver a framework for the future development of the Thurgoona Wirlinga area. It seeks to create an urban development structure/pattern that will facilitate the orderly development of land in the short, medium and long term and deliver practical outcomes in response to housing yields and density, employment areas land provision and location, activity centres land provision and location, community facilities land provision and location, transport and movement networks, open space and recreation facilities, natural systems, utilities and land use conflicts.

Viable population

A population of a species that has a high likelihood of still being present in 100 years.

Works as executed (WAE) Plans

Required for the Subdivision Certificate (SC). Following the completion of engineering works in a subdivision or development, "Works as Executed" plans are to be prepared by a registered surveyor professional engineer and forwarded to Council prior to the release of the final plan of subdivision.

Water regime

Frequency (how often), duration (how long) and timing or season of water inundation

Wetland

An area transitional between land and water systems, which is either permanently or periodically inundated with shallow water.

WSUD

Water-sensitive urban design (WSUD) is a land planning and engineering design approach which integrates the urban water cycle, including stormwater, groundwater and wastewater management and water supply, into urban design to minimise environmental degradation and improve aesthetic and recreational appeal.

WSUD Engineering Procedures Manual (Melbourne Water 2005)

Manual produced by Melbourne Water that features design and construction engineering practices to underpin strategic planning and concept designs for management of urban stormwater. It provides design and maintenance procedures, typical drawings, design checklists, landscape requirements, worked examples and case studies. Updates to sections of the manual are available on the Melbourne Water website:

www.melbournewater.com.au/planning-and-building/stormwater-management.

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