Our Ref: N:\37672 Northbank\Worddocs\Report\NSW DoPI Additional Information Request November 2012

30 November 2012

Mr Chris Ritchie
Manager – Industry
Major Projects Assessment
NSW Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Ritchie,

NORTHBANK ENTERPRISE HUB (MP 10_0185)

Thank you for your letter dated 5 November 2012 providing a copy of the public and agency submissions received during the application notification period. We also refer to the late submission received from Port Waratah Coal Services Ltd (PWCS) dated 6 November 2012, together with the Equatica Assessment received from DoPI on 21 November 2012.

This submission provides a response to all matters raised within the authority and public submissions received from the following:

1. NSW Department of Planning & Infrastructure;
2. Port Stephens Council;
3. NSW Office of Environment & Heritage;
4. Equatica (for NSW DoPI);
5. NSW Environment Protection Authority;
6. NSW Office of Water;
7. Hunter Water;
8. Heritage Council of NSW;
9. National Trust;
10. Port Waratah Coal Services Ltd;
11. NSW Rural Fire Service;
12. Tomago Aluminium Company Pty Ltd;
13. Hunter Bird Observers Club; and
14. Local Residents.

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

1. NSW Department of Planning & Infrastructure

Flooding

Dot Point 1 – Mitigation of regional flooding is now addressed in further detail in Attachment 'A'.

Dot Point 2 – Clarification of the floodway definition for the site is described in Attachment 'A'.

Traffic

In terms of Stage 1 construction traffic, it is important to note that full construction will not likely commence immediately following determination of the application. The timing of land being made available for tenancy by the proponent will be driven by market demand and as such it is unknown at this point in time whether the approved subdivision as part of the Westrac facility application on the adjoining land (MP 07_0086) or Stage 1 (or any of the other stages) of this current application will be undertaken in the first instance. It is essential that flexibility is available to accommodate the land use needs of future tenants.

It is confirmed that Stage 1 will generate 105, 140 truck and dog movements (inclusive of entry and exit) to import the required fill into the site. Whilst this figure is inconsistent with the figure used in the TIA (which estimated 50 truck and dog loads per day (ie. 100 movements per day)), the findings of the TIA remain the same which is that modelling of the Westrac Drive intersection is required prior to commencement of works to determine whether or not it has capacity to safely provide access for fill import vehicles or whether an alternative arrangement is necessary.

The TIA adopts the following in relation to construction traffic:

- The Westrac Drive intersection is complete, therefore for any given stage of the proposed development (Stage 1 (S1) – Stage 4 (S4) the optimum site access to the construction area could be:

    1. Utilise an existing signalised intersection that provides acceptable access in terms of intersection capacity, impact on existing land use and / or suitability to mix existing land use and construction traffic; or
    2. Provide a dedicated construction area access intersection of Tomago Road.

- An example of the recommended process to determine the preferred access for Stage 1 construction traffic is applied below:

    1. It is planned to commence construction of Stage 1.
    2. Westrac Drive intersection is not at full traffic load as land use within Westrac and the adjoining approved subdivision lands have not become fully occupied and operational.
    3. Modelling of the Westrac Drive intersection under the traffic demands at that time plus estimated construction traffic confirms capacity.
    4. The mix of existing land use traffic and construction traffic is not deemed unsafe.
    5. Stage 1 construction traffic is approved to use the Westrac Drive Intersection.

Or

1. Modelling of the Westrac Drive intersection under the traffic demands at that time plus anticipated construction traffic indicates unacceptable capacity and / or the mix of land use and construction traffic is not agreed to.
2. Stage 1 construction traffic generates the requirement for the proposed Central Intersection or an interim deviation thereof.

The above process can be applied to the construction traffic of any stage of the proposal. In terms of Stage 1, as the key to the approved choice is dependent on operating conditions at the Westrac Drive intersection at a certain point in time (which is subject to actual occupation of the subdivision including the balance of the already approved lands adjacent to the Westrac facility which is not known at this time), modelling of the Westrac Intersection for Stage 1 construction traffic would be of little value at this point in time.

It is considered that the logical and practical way to address Stage 1 construction traffic remains as is already proposed, which is prior to commencement of construction modelling of the Westrac Drive intersection be undertaken based on demand at that time plus Stage 1 construction traffic and determine whether or not there is capacity. If so, then Stage 1 construction traffic could utilise the Westrac Drive intersection, if not, then the requirement for the central intersection or an alternative arrangement would be required. The proponent has committed to this approach in the draft Statement of Commitments.

2. Port Stephens Council

Representatives of Northbank Enterprise Hub Pty Ltd and ADW Johnson have had two (2) meetings with Port Stephens Council to discuss the contents of their submission to the NSW DoPI dated 30 October 2012. The staff at Port Stephens Council involved in the meetings included Mr Mike McIntosh (Group Manager, Development Services); Mr. Matt Brown (Manager Development Assessment & Compliance); and Mr. Bruce Petersen (Community Planning & Environmental Services Manager). Council has confirmed its in principal support of the proposed development.

The outcome of the two (2) meetings has resulted in a number of matters being resolved and Port Stephens Council confirming that an amended submission (including amended suggested conditions) would be made to the NSW DoPI. We note that an amended submission has now been provided (dated 29 November 2012). Notwithstanding this, we provide the following response to the matters raised by Council in its submissions dated 30 October 2012 and 28 November 2012 below.

PSC submission to DoPI dated 30 October 2012

Appendix D – Flora & Fauna Report

It would appear that Council has been provided with a superseded version of the proposed subdivision layout which provides for a 500m setback to the RAMSAR wetland. SEPP 14 does not apply to this site (pursuant to clause 4(3) of SEPP 14 – Coastal Wetlands) however appropriate setbacks have been provided to SEPP 14 on adjoining lands.

In relation to the small area of saltmarsh on the site it is impractical to maintain this and ensure its long term survival as part of the development footprint. We note there is an environmental offset package to be provided for the site.

Council's suggestion of an 88E restriction on a small portion of the site for the purpose of conservation and rehabilitation are inconsistent with the zoning objectives of the site and does not reflect existing ground conditions. We understand that Council, following our discussions, are proposing that they no longer require such an 88E instrument.

Appendix F - Flooding

Regional Flooding

1. There is a misconception by Council on this point. The 1% AEP regional flooding Hunter River result of 0.18m on adjoining property has been applied by Council to a perceived local flooding issue on the adjoining lot to MP07_0086 project. We are continuing to monitor and investigate however it is not relevant to Lot 1001 application. Figure 3-3 of the regional flood report indicates a reduction in peak flood level over the properties 139, 159 and 175 Tomago Road. These lots are a separate catchment to Lot 1001, approximately 1km from Lot 1001 at the nearest point. From Section 6.22 of the EAR, trunk drainage delivers Lot 1001 runoff to the Hunter River which is in the opposite direction from the aforementioned properties and the two matters cannot be conceivably related. The adjoining property referred to in the regional flooding for the increase during the 1% AEP event is to the west of Lot 1001, approximately 5km from the property identified by Council. It has been determined that despite an increase there is a significant velocity reduction which in turn reduces the hazard. Additional detail of the regional flooding analysis is provided in Attachment 'A'.

2. Refer to response above, these are separate catchments and not related. We raise our own concerns with the claims made in this statement as unjustified and irrelevant to Lot 1001.

3. We confirm that Figures 3-3 to 3-10 of the regional flood report represents the fill footprint for the full MP07_0086 project which includes WesTrac as Stage 1 and the filling of Lot 1001.

4. Under Section 3.1 of the regional flood report, there is description of the minimum floor level of any future buildings to be 1%AEP flood level plus 0.5m freeboard. In the 3rd paragraph there is a description of the fill elevations and this can be further clarified on Sheet 200 of the Infrastructure Servicing Report, Appendix H.

5. Flood mitigation has now been provided as additional detail contained in Attachment 'A'.

Flooding and Drainage Assessment

6. Attachment 'B' has been prepared to provide additional detail on the storage of stormwater in the drains and overflow wetland rehabilitation area.

7. Additional detail is provided in Attachment 'B' however we do clarify that the external drainage system referred to by Council is the Hunter River and not a local regional drain onto neighbours property as perceived in this matter raised.

8. There is a misconception by Council on this point. Low lying properties at the elevations of 0.5mAHD suggested by Council are to the north east of MP07_0086 project. These existing low lying lands are a separate catchment to Lot 1001, approximately 1km from Lot 1001 at the nearest point. Trunk drainage delivers Lot 1001 runoff to the Hunter River in the opposite

direction from the aforementioned properties and so these cannot be conceivably related. Refer to Attachment 'B' for details.

9. Dot Points 1 and 2 – There is a misconception by Council on this point as to which direction discharges from Lot 1001 are proposed. As above, the low lying properties described are in the opposite direction from the trunk drainage direction proposed for Lot 1001. Storage calculations of runoff from impervious areas have been calculated to be contained within the trunk drainage system and additional details are provided in Attachment 'B'.

10. There is a misconception by Council on this point. No nuisance flooding on private properties as a result of filling or drainage on Lot 1001.

11. After discussions with Council, maintenance access has now been detailed, refer to Attachment 'B' for details.

Appendix G Stormwater

1. 'The excessive number of small drainage structures' is not defined as to what is being referred to in this item. Pits and piped drainage is minimised by open channel drainage. The number of culvert crossings have been minimised. This point has not been raised again by Council or in their proposed consent conditions with subsequent discussions post exhibition period.

2. Gross Pollutant Trap – We clarify that a standard proprietary GPT product will be used, adequately addressing safety, risk and detail issues.

3. Flow velocities are very low due to the flat grades. BMT WBM confirm peak velocities to be expected at 0.5m/s which is non scouring. It is also expected that macrophyte growth will dominate the water quality devices within the open channels and protect them from scour.

Lot and Subdivision Scale System

Paragraph 1 - The number of GPT's proposed is the equivalent frequency or less than many developments. GPT's are typically requested by Councils for public roads and drainage reserves for development areas at 2 hectares and these are taken over by Council. At this site, that would be equivalent to 80 GPT's. Less than half that number are proposed for the development of Lot 1001, however BMT WBM consider there to be sufficient number of GPT's proposed. Similarly, biofiltration is currently one of the most commonly accepted best practice stormwater quality improvement devices employed with development. Again these are accepted by Councils on a very small scale with subdivisions of less than 10 lots being common. The pollutant reduction targets being met with these systems are industry standard. So the length proposed is all relative since the same targets as typical development are being met.

Paragraph 2 - This hasn't been raised by Council as a continuing issue in meetings since public exhibition or suggested by Council as a condition of consent.

Paragraph 3 – This hasn't been raised by Council as a continuing issue in meetings since public exhibition or suggested by Council as a condition of consent.

Minor/Major System Requirements

This correction is accepted and 10 year ARI minor drainage system for piped street drainage is proposed.

GPT Detail (Section 5.3)

The aboveground GPT is deleted and replaced with a standard proprietary product.

Paved Area Assumptions (Section 6.3)

Concrete footpaving is limited due to 'No Parking' limitations on roads within the site, however it is accepted that some increase should be made to the assumption. There are also however more significant reductions in impervious area not modelled such as subcatchment 4A. Irrespectively, monitoring is proposed to validate and verify stormwater design calculations as opposed to traditional development with no monitoring requirements which is more reliant on design calculations.

Water Quality Offline to Major System (Section 6.4)

The proposal for water quality and trunk drainage has been referred to Office of Water through the adequacy and exhibition periods. Office of Water has raised no objection to the design system proposed.

Overflow Wetland Rehabilitation Area – Section 6.22 of the EAR describes the wetland to be currently pasture grass of little environmental value and clarifies that the area is not used for water quality as part of the treatment train, however it does provide backwater storage prior to discharge through the floodgates. NEH will retain maintenance responsibility and ownership.

General Note – It is accepted that swales, biotrenches and GPT's will be located in drainage reserves.

Practical Maintenance

Maintenance access has now been detailed, refer to Attachment 'B' for details.

Water Quantity (7.2.1)

The purpose of the perimeter bund is described in Section 6.22 of the EAR, curbing trunk drainage toward the Hunter River. Additional typical sections have been prepared and are contained in Attachment 'B'.

Open Channels

Maintenance access has now been detailed, refer to Attachment 'B' for details.

Appendix M - Landscaping

Entrance & Street Trees

In relation to treatment of entrance and street trees Council' concerns are noted and trees will be located within private property.

Northbank Riverside Park and Gunner Heritage Park

Gunner Heritage Park, which provides for retention of items of heritage significance, is a significant opportunity for the public to understand contribution that this site made to local defences during WWII. NEH will retain ownership of this park.

NEH will also retain ownership of Northbank Riverside Park.

Drainage Corridors

It is agreed with Council that the rocks be removed from the landscape design and are now not proposed for the creek inverts. Maintenance access has now been detailed, refer to Attachment 'B' for details.

Appendix N – DCP for Future Development

The structure of the legislation relating to this site prevents local development controls applying to the land. The DCP that we have prepared will form part of the development consent and will adequately guide development for the future. Accordingly it is considered unnecessary to amend this document for integration with Council's DCP.

Appendix R – Public Consultation

A pre lodgement meeting was not undertaken with Port Stephens Council on the basis that the formal process is to lodge the application with the NSW DoPI. Notwithstanding this, an invitation was extended to Council on 27 October 2010 to discuss the proposed development and no response was received.

It is acknowledged however that the recent meetings with Council have been constructive and it appears that the majority of Council's issues have been addressed.

Appendix V – Acid Sulphate

Marine class culverts are accepted, however the treatment of 1m depth of finished level is not accepted. It is proposed to follow the Acid Sulphate Soils Management Plan requirements.

Environmental Pre-Construction Hold Point

This requirement is unnecessary noting that a Construction Environmental Management Plan (CEMP) will be required by the NSW DoPI.

Maintenance Periods for Bio-Retention Facilities, Vegetated Trunk Drainage and Landscaping

The 5 year establishment period is not accepted. Wetland vegetation has populated much more quickly than indicated and 5 years is considered to be unreasonable and not required.

Tomago Aluminium Smelter

NEH will maintain ownership of all lands, even when developed, and has no plans to establish polluting land uses and so it is not anticipated that there will be any significant contribution by NEH to existing levels of fluoride and sulphur dioxide emitted by the smelter.

In any event, any future end user development within the Northbank Enterprise Hub will be subject to air quality impact considerations.

Traffic & Pedestrian Access

Dot Point 1 – It is accepted that any proposed roundabouts will need to comply with the relevant Australian Standards.

Dot Point 2 – From the discussions with Council after this letter, it was agreed that NEH would liaise directly with the bus companies for an outcome on any required bus facilities on a stage by stage basis.

Dot Point 3 – It is agreed that during the detail design stage of the roads that traffic management for the points raised will be considered.

Dot Point 4 – This is not accepted. No Parking provisions on Westrac Drive has already been accepted by Council in that the facility is to have sufficient car parking for its operation. Similarly, it is proposed that future businesses in development stages will also have the same requirement applied throughout the development of Lot 1001. It is not considered a safe environment for pedestrians and not encouraged at this location.

Dot Point 5 – Provision for on road, commuting cyclists is accepted and accommodated within the proposed road carriageway width.

Contamination

The extent of any site contamination is relatively minor. It is considered appropriate that a condition of consent be imposed requesting a remedial action plan be provided with the Construction Certificate application.

Conditions of Consent

Following the recent meetings with Council, and resolution of a number of the matters raised, it is understood that Council will in the near future supply DoPI with an amended suggested list of conditions of consent.

Please find attached a table (see Attachment E) which outlines the position of the proponent in relation to each of the proposed amended Council suggested conditions.

We also understand that the NSW DoPI will critically review Council's suggested conditions and separately provide a formal draft set of conditions for our further review.

PSC submission to DoPI dated 28 November 2012

As indicated above, NEH has met with Port Stephens Council to discuss its suggested conditions of approval, and this has been provided to the NSW DoPI with their letter dated 28 November 2012. We note that there is a small number of suggested conditions that in our view do not necessarily reflect the outcomes of our meetings, or alternatively Council has not ultimately agreed with our position in finalising its revised submission. Given the proactive discussion between PSC and NEH, we believe these can be addressed in the near future. For completeness we address these specific items below (please note that our comments below should also be read in conjunction with our table provided at Attachment E).

- Condition 8 (item 13 in Attachment E) – It is the NEH's position that this condition is too onerous and therefore request deletion. We believe the current and proposed monitoring documented, coupled with the strong environmental track record of NEH demonstrates that this is too onerous.
- Condition 19 (item 25 in Attachment E) – We understand council is seeking flood free development with this condition. NEH prefer acceptance of a requirement that relates to buildings having a minimum floor level of 300mm freeboard above the 1% AEP flood event, noting that the regional flood level is variable across the site and hence cannot be specified at the 'one off' level of 2.8mAHD. All site drainage will be to trunk drainage channels having a top of bank level at minimum 2.5mAHD. Naturally, land falls will be to these top of banks and this is shown in the bulk earthworks grading of the site with the EAR, however future development preferences and opportunities may involve some land or drainage below Council's specified level.

  For simplicity, it is preferred that the minimum level for future building floor levels be agreed to as 300mm above the 1% AEP flood level be adopted.
- Condition 24(e) (item 30(e) in Attachment E) – NEH understood that this point was agreed between the parties as to be deleted. This part of the suggested condition is considered unreasonable and NEH request deletion.
- Condition 26 (item 32 in Attachment E) – It is NEH's position that the suggested condition is not able to be complied with as future distribution of employees across the site is unknown. The developer notes that it will be required to facilitate bus access in the future when and if the development population warrants such.
- Condition 30 (item 36 in Attachment E) – It is NEH's position that safety against aquaplaning can be achieved to the standards and is therefore not accepted by NEH. Refer to Attachment E for full response.
- Condition 33 (item 39 in Attachment E) – It is NEH's intent to own and develop the entire site. Given the large land holding NEH will insist on parking within development lots to remove the safety risk of parking on roadways that will have constant and large truck traffic flows. Therefore the 2.5m wide parking lane is not required as all parking can easily be achieved within development lots.
- Condition 35 (item 41 in Attachment E) – It is NEH's position that the suggested condition exceeds both Council and RMS standards and is therefore not accepted by NEH. Refer to Attachment E for full response.
- Condition 41 (item 47 in Attachment E) – It is in NEH's position that the high standard of pipe crossings required will mean that CCTV analysis is not required and should therefore be deleted.

- Unnumbered condition, 1st para under heading 'Stormwater Quality Improvement Devices' (item 54 in Attachment E) – Council's proposed standard is not accepted as we have complied with NSW Office of Water requirements and we note OoW agreement has been received.
- Condition 54 para 2 (item 62 in Attachment E) –It is NEH's position that this condition is unacceptable and excessive in its requirements.

In relation to Council's proposed condition 3, NEH notes Council's position requesting a monetary contribution under s94A of the EP&A Act 1979 however NEH request that the NSW DoPI assess the project in accordance with the provisions of Section 94B of the Act that allows the Minister to determine a more appropriate outcome.

3. Office of Environment & Heritage

Stormwater Assessment & Regional Flooding
1A Regional Flooding Assessment

i) Comparison to Previous Studies – DHI

Table 1 below provides the comparison between BMT WBM and DHI flood modelling and incorporates other known 1%.

Table 1 – Comparison of predicted 1% AEP event peak flood levels

Location	BMT WBM	DHI	Patterson Britton & Partners (2007)	Green Rocks to Newcastle (1994)
Hexham Bridge	3.9	3.94		
Site	2.4	3.5	2.4	
MP 07_0086 lands	2.25	3.0	2.21	2.24 (TMGO-7.00)
Fullerton Cove	1.85	1.82		

It is agreed that generally the DHI model is a good representation of the existing flood regime for the Hunter River. However as clearly represented in Table 1, there is an inconsistency in the predicted model results around the North Arm of the Hunter River in the vicinity of Tomago. Three (3) reputable model results are within 40mm of each other and by comparison, DHI at this location is approximately 0.8m higher. BMT WBM, through Figures 2-7 and 2-8 of the regional flood report, have highlighted and notated the flood images to account for the discrepancy at this location. The steep gradient identifying change in elevation and direction of velocity vectors as noted by BMT WBM indicate a constriction issue with the DHI model at this location, where in fact there is a large overbank area for flood flows. It is shown in Table 1 that both upstream and downstream of the site, Hexham Bridge and Fullerton Cove respectively, that there is little discernible difference between DHI and BMT WBM model results. A meeting was held between Mr Peter Evans of OEH and Mr Darren Lyons of BMT WBM on this point of discrepancy on 26 June 2012 and it was resolved and agreed at the meeting how the discrepancy would be noted in the BMT WBM regional

flood reporting. For these reasons, we consider the BMT WBM model more accurate through this section adjacent to Lot 1001 than the DHI model and that BMT WBM model verification has been satisfied.

ii) *Filling floodway* – Refer to Attachment A.

iii) *Impacts of Development* – Refer to Attachment A.

1B. Flooding and Drainage Assessment

Dot Point 1 - Open Channels
Convention has been followed that open channels are used as the trunk drainage as opposed to piped drainage. Open drains are the preferred option on the basis of minimising risk against blockages and for runoff capacity. Open drains are commonly used locally, although the proposed open drains are significantly upgraded to mitigate from potential blockage issues. Office of Water prefers open drains and has registered no concern on this matter in their recent submission. The open drain also provides biodiversity opportunities.

A number of major culvert crossings are represented as 'fish friendly' crossings for Lot 1001 (refer to Figure 5 of Appendix E 'Aquatic Assessment' of the EA Report). This requires flow conveyance structures to be maintained at low velocities, not increased through the structure. At flat sites, the result of compliance to this requirement is usually a crossing which has conveyance for approximately double the 1:100 year peak flow. The additional benefit is that this is significant risk mitigation protection against any potential blockages. Furthermore, there is no proposed development in the flowpath of the trunk drainage, should a blockage occur. It is described in the concept engineering and bulk earthworks that generally, there is 1% fall downslope to the top of bank of the trunk drainage. This provides significant, increased flood conveyance capacity for major or extreme storms with incremental changes in elevation, if there were in fact a blockage to eventuate downstream.

Dot Point 2 – Sensitivity Analysis
The potential for sediment deposition having effect on conveyance capacity is raised. Maintenance of the channels is required to avoid this scenario occurring. Vegetation growth is expected and proposed in the channels. Manning's 'n' channel roughness has assumed dense vegetation growth in the channels. Channel vegetation is necessary for improving water quality and provides the additional benefit of biodiversity and aesthetics. As described above, there is sufficient inbank and overbank capacity for local flood conveyance.

Dot Point 3 – Catchments
The catchments represented in Flooding and Drainage Assessment are consistent with the bulk earthworks grading of the infrastructure and concept engineering report. The overall capacities will remain the same regardless, the only change may be redistribution of the channel widths. For example, one channel may need to increase as a result of detailed design of a development on site, then the channel adjacent may decrease to compensate accordingly, subject to the hydrological analysis. The requirement for monitoring of actual flows at this site is also a regulator to ensure that detailed design continues to meet the objectives of hydrological design and catchment distribution.

Dot Point 4 – Partial Bund
The description in this dot point is correct, subcatchment 4A and adjacent reach is no longer proposed as described in Section 1 of the Stormwater Assessment report by BMT WBM. Results have been left intact for the superseded, larger development area, not requiring to be updated due to being an overestimate of the water quality and flooding and drainage implications.

Dot Point 5 – Perimeter bund 1.2mAHD
This elevation was iteratively derived by BMT WBM through flood modelling. Environmental sensitivities, regional flooding, flood drainage conveyance were all considered in establishing the height of the perimeter bund. The perimeter bund needed to be continuous toward the river past the extent of the fill (>2.5mAHD fill) and therefore the crest elevation was derived from regional flooding analysis. For these reasons, modelling indicated that 1.2mAHD was the appropriate crest level of the perimeter bund. Adjacent to the fill, the crest level of the bund is 2mAHD, adequate for runoff control from the site.

Dot Point 6 – Existing Discharge Points
The Flooding and Drainage Report was targeted at design storms and conveyance capacities of trunk drainage. It was correct in the report to mention the direction of discharge for minor, more frequent storms however this report and modelling is focussed on the trunk drainage. The point raised regarding discharge of runoff from more frequent storms is dealt with in detail in Section 6.22 Wetland Interface Strategy of the Environmental Assessment Report and therefore not required to be detailed in this report. We can only assume from this comment that this section of the EAR has not been reviewed as these matters are addressed in detail in this section of the EAR.

Dot Point 7 – Lot 1002 is owned by PWCS and they are in support of our proposal. Consultation has been held with PWCS and its environmental consultants working on the rehabilitation. The increases during the 1 in 100 year flood (figure 7-2 of the Local Flooding & Drainage Assessment (BMT WBM)) are a result of the bund. It is a higher priority for both PWCS and NEH that the bund control runoff from more regular storm events. This is because these events have the potential to change vegetation types if they are not managed. The increase in level during this peak design event when all areas are inundated is insignificant by comparison. PWCS also intend a levee bank of similar location and dimensions for their conservation rehabilitation project on Lot 1002, mirroring our proposed bund control.

2. Stormwater Assessment

i) Introduction clarification on subcatchment 4A. Noted, no response required.

ii) Section 2.2 best practice treatment description. The reworded description provided by OEH is accepted.

iii) Section 4.3.2. The design interface, monitoring and management for discharge to the wetlands is described in Section 6.22 – Wetlands Interface Strategy of the Environmental Assessment Report. Based on the comments being directly related to the BMT WBM Stormwater report, it is apparent that this section detailing this interaction has not been reviewed.

iv) Section 6.2. Check Williamtown data. Overestimate on subcatchment 4A. Actual monitoring requirement recorded at Williamtown for the rain rainfall period of 1999 – 2006 tallies to a

long term average rainfall of 1100mm. The period does also contain a very wet year – 1999 (1541mm) and a very dry year (897mm).

v) A, b & c – additional detail provided in Attachment B.

vi) Additional detail provided in Attachment B.

vii) Refer to detail provided for connections in Attachment B. The reduced definition of Channels 1a and 1b is due to reaching the diminishing fill extent of the drainage channels. Refer to Attachment B.

viii) Bio-retention swales. It is accepted that Figures 6-1 and 6-6 appear slightly different. This is due to three (3) reasons. The first reason is that subcatchment 4A is no longer developed and drain alignment not updated. The second reason is that there is an updated strategy for maintaining the Lot 1001 development drains separated from the existing drain entering Lot 1002. The third reason that differences are attributable to drawing scale and clarity of the drawing. It has been preferred to represent the extents for clarity. Refer to Attachment B plan details.

ix) a) and b). The Stormwater Management Report appears to have been read in isolation. Points raised on discharges to the wetland from more frequent storms is dealt with in detail in Section 6.22 Wetland Interface Strategy of the Environmental Assessment Report. The increased freshwater discharges quoted are discharged to the Hunter River and not to the wetlands adjacent. This is considered to be 'Deep Open Water'. From Table 6- Hydrologic Management Objectives for Natural Wetlands of Water Sensitive Urban Design Solutions for Catchments Above Wetlands – Appendix B: Catchment Hydrologic Indices and Urban Water Management Performance Objectives, May 2007 produced by HCCREMS, there are no hydrologic management objectives required for discharge to Deep Open Water.

In Section 6.22 Wetland Interface Strategy of the EAR, the existing discharge locations to the wetlands are identified. The drying hydrology is also identified as the key hydrological consideration. The proposed system to enable mimicking of the pre development hydrological conditions is a drain along the perimeter berm, conveying excess and more frequent flows to bypass the discharge points. Adjustable discharge control to the wetlands is also proposed. This provides for flexibility and adjustment if required as a result of monitoring results and/or modified wetland objectives on the adjacent lands. PWCS being the adjoining land owners of Lot 1002 containing conservation lands are satisfied with the proposed arrangements.

x) Climate Change – The design preference remains that crest of the perimeter berm be designed to suit current conditions. The development will take a number of years to proceed. Significant freeboard of the channels and storage capacity is demonstrated in Attachment 'B'. As contingency, there is adequate space available for adjustment of the perimeter berm crest height if there was a confirmed sea level rise or required as an outcome from monitoring.

xi) Cumulative Impacts - The drainage from the existing WesTrac development enters the head of the North South Drain behind a limiting set of floodgates. Lot 1001 is a separate catchment. The Lot 1001 drainage strategy, with the exception of maintaining existing discharge points, is toward the Hunter River, away from the drains conveying WesTrac

flows. From the retained freshwater wetlands area, fed by the catchment of MP07_0086 lands, there is a floodgate connection with the north south drain although this is downstream of the limiting set of floodgates of the North South Drain. With drainage in opposite directions, there is no cumulative analysis required of Lot 1001 to WesTrac drainage. Points raised on discharges to the wetland from more frequent storms is dealt with in detail in Section 6.22 Wetland Interface Strategy of the Environmental Assessment Report and therefore not required to be detailed in this report. We can only assume from this comment that this section of the EAR has not been reviewed as these matters are addressed in detail in this section of the EAR.

xii) The retained oak forest EEC is south of the perimeter berm and the existing open drainage channel. The perimeter berm adjacent is north and upslope, containing the development runoff, channelized toward the Hunter River. The overflow wetland rehabilitation area is partially bunded by nature in that it is proposed to scrape the exotic grasses and base of this area down to an elevation of 0.2mAHD.

a) As described in Section 6.22 wetland interface strategy of the EAR, the overflow wetland rehabilitation area provides storage for freshwater runoff from the development site at high tides. The area for ponding has no role to play in the treatment train for water quality prior to discharge. The area does also provide biodiversity and freshwater wetland habitat which was previously pasture grass with little or no environmental value. It is considered in the storage calculations and this is now clarified in Attachment 'B'.

b) The storage of stormwater behind the bund and within the perimeter drain is within the development footprint disturbance area. We are satisfied there are no impacts downstream of the bund based on the assessments completed as the quoted text states. The owners and environmental consultants for Lot 1002 conservation lands adjacent and downslope are also satisfied.

c) Figures 7-1 to 7-6 of the Stormwater Assessment Report are the discharges to the Hunter River and not to the adjoining wetlands. As described above, there are no hydrological management objectives required for the discharge to the river. The hydrological management objectives to the wetlands however, will be maintained.

3. Hunter Valley Flood Mitigation Scheme.

It is the strong view of the proponent that government maintenance of the levee is appropriate. We note that if the Levee is allowed to fail due lack of maintenance that this would result in both tidal inundation cause water during times of flood to travel along the existing drains to be maintained on the development site and/or adjoining property and make its way to private lands to the north and north east, including Tomago House. To this extent the levee does not just protect NEH lands. In addition it is our strong view that one entity being responsible for the integrity of the levee along the length of the river would make sense rather than individual owners being responsible. How would the levee length in front of the existing steel tower of 132kv high voltage power be protected? As I'm sure you would agree, levee protection for the steel tower could not be completed in isolation for just the river frontage of the Public Works land. Levee integrity required for protecting this infrastructure would need to extend further upstream onto the NEH frontage. If the government has a policy of returning levee maintenance back to individual owners we would like to be provided with a copy of that policy. If there is a strategy in place that does or proposes to identify individual

properties along the river that have a sole benefit from the levee, a copy of this would also be appreciated. We do not believe that the proposed development should be regarded as an opportunity for maintenance of the levee to be divested.

4. s256 of the Water Management Act

A s256 application will now be lodged with OEH in parallel with this resubmission to Department of Planning. Consideration was being given to authorities comments to make the s256 application a final submission. In relation to key points raised, significant open drainage is provided through the Lot 1001 development. If in the event that the levee of the Flood Mitigation Scheme is overtopped then significant storage is provided for the accumulated flood water to be stored below the finished ground levels of Lot 1001 and adjacent upstream property. Storages are quantified in Attachment 'B'. The floodway has been looked into further detail and additional information is provided in Attachment 'A'.

Threatened Species
Targeted Flora Surveys

Ecobiological has prepared a response to address the issues raised by OEH in relation to targeted searches for Tall Knot-Weed (Persicaria elatior) and Horned Pondweed (Zannichellia palustris) as requested by OEH (refer to Attachment C). The Ecobiological response confirms that sufficient survey effort has been undertaken.

Environmental Offsets

Offsets are discussed under various headings of the OEH letter, pages 9 – 11. NEH has agreed to provide offsets to address impacts of the proposed development on threatened species. NEH has been liaising with OEH and DOPI in this regard. We note that OEH supports an outcome based on the BioBanking Assessment Methodology.

NEH has already provided an outline of the proposed offsets and has no objection to a condition of approval requiring the provision of such. NEH understands that it will be necessary to satisfy DoPI, having regarding to OEH's requirements, in relation to offsets.

Aboriginal Cultural Heritage

We confirm that the McCardle Cultural Heritage Pty Ltd (MCH) dated July 2012 is the Aboriginal Cultural Heritage Assessment to be relied upon for this planning submission.

Consistent with the letter submitted to the DoPI on 28 March 2012 (refer to Attachment F), due to shortcomings within the preliminary report prepared by Indigenous Outcomes, and following public allegations and an investigation against the managing director or Indigenous Outcomes (on matters not related to NEH or its proposed development), Indigenous Outcomes asked that they be relieved as Aboriginal Archaeological consultant, which was accepted by NEH. NEH also notes that Indigenous Outcomes is no longer operating.

The McCardle Cultural Heritage report confirms that the sites previously identified by Indigenous Outcomes on lot 1001 were not actually Aboriginal sites / objects and do not exist. The McCardle Cultural Heritage Report did however identify two (2) sites within a Potential Archaeological Deposit (PAD) in the northern corner of the site which NEH will manage carefully in consultation with the

Worimi LALC. NEH has no objection to OEH directly verifying all results with McCardle Cultural Heritage.

We note that OEH advises that under Part 3A of the EP& A Act 1979 as it applies to the proposed NEH development that no AHIP will be required. In order therefore to ensure that adequate controls are in place NEH agrees that a condition of approval should be included requiring the preparation of an Aboriginal Heritage Management Plan. We note that this is exactly the same as the approach adopted for the adjoining NEH lands approval 07_0086. The proposed condition of approval could read as follows:

'The Proponent shall prepare and implement an Aboriginal Heritage Management Plan for the project to the satisfaction of the Director General. The Plan must:

- *Be submitted to the Director General for approval prior to the commencement of construction;*
- *Be prepared by a suitable qualified consultant and in consultation with OEH and relevant aboriginal stakeholders;*
- *Identify and describe all known heritage items on the site and areas of archaeological significance ;*
- *Include a strategy for the salvage and storage of salvaged objects during construction and for the long term management of these objects;*
- *Include a component within the site induction program for construction workers outlining measures to be employed to manage and minimise impacts to heritage;*
- *Identify procedures to be followed should previously unidentified objects be uncovered or additional impacts to sites be identified; and*
- *The procedure for continued consultation with Aboriginal stakeholders.'*

NEH is proud of its good working relationship established with the people of Worimi through the development of its adjoining land and is confident of appropriately managing with care all cultural matters as part of the development of Lot 1001.

In relation to registration of sites identified by McCardle Cultural Heritage, TOM1 and TOM2, please find enclosed a copy of the documentation sent for registration (Attachment D).

National Park Estate

The hydrological strategy proposed for development of Lot 1001 is assisting the success of the Tomago Wetland Rehabilitation Project. Considerable effort has been made on the wetland interface strategy with Lot 1002. Adaptive management is provided for with flexibility at discharge locations. It is well documented in Section 6.22 of the EA Report and the BMT WBM Stormwater Assessment that flows are being diverted west to the Hunter River. The strategy has also been determined in consultation with PWCS and their conservation objectives on Lot 1002 as the most immediate, adjoining neighbour to Lot 1001. Their request was to maintain freshwater flows at one (1) location from Lot 1001 and it has been preferred to accept 'no change' to the existing discharge as the more appropriate objective. Nonetheless, the controls proposed are flexible and adjustable that if National Parks and the owners of Lot 1002 agree that no freshwater at all is to discharge in this direction, the pit discharge can be closed. Freshwater is curtailed via the perimeter berm toward the Hunter River for the majority of runoff, assisting the Wetland Rehabilitation Project.

1. Regional Flooding Assessment

Dot Point 1 – The subject of regional flooding is for analysis of major storm events of the Hunter River. By comparison, the hydrologic modelling work of Rayner & Glamore, 2011 is the analysis of tidal simulation occurring daily and more frequent, local rainfall and runoff events. There is no link of this work. Note that the work of Rayner & Glamore, 2011 is covered in Section 6.22 - wetland interface strategy of the Environmental Assessment Report, which deals with runoff from every day, more frequent rainfall events.

2. Stormwater Assessment

Dot Point 1 – We confirm there are no new flow diversions east from NEH site. The flow discharge points are the existing points identified on ground. Excess flows are diverted to the Hunter River by the perimeter berm and drain as described in Section 6.22 wetland interface strategy of the EAR. Whilst we have provided adaptability to shut off this discharge, PWCS as the owner of Lot 1002 has been consulted and requested that we ensure that the freshwater discharge at this location described, be maintained for their conservation purposes. Monitoring is proposed prior to flow over boundary. Mitigation controls proposed are flexible and adjustable if NPWS and PWCS objectives are agreed to be modified in the future.

Dot Point 2 – Discharge connections to Hunter River, refer to Attachment B plan for details.

Dot Point 3 – Drainage has been realigned for Subcatchment 4A not being developed and we clarify that 6.6 is representative of the proposal. An additional drawing on stormwater management has been prepared to clarify this position, refer to Attachment B plan for details.

Dot Point 4 – We have now further clarified these storages, represented in Attachment 'B' containing these details.

Dot Point 5 – The area referred to is the overland wetland rehabilitation area. This area is within Lot 1001 and OEH and PWC are not mentioned, so we are unable to determine how this has been determined as a change of responsibility. NEH will retain ownership of this area.

Dot Point 6 – The point being made in the quoted text is that following the capacity of the biofiltration measures being reached, overflow of runoff is to the trunk drainage system conveyed to the Hunter River and not the wetlands. Discharge to the wetlands is not mentioned. Refer to Section 6.22 wetland interface strategy and Attachment B plan for additional details.

Dot Point 7 – As above, there is an incorrect assumption in this point as to the discharge direction, ie assumed to be to the wetland project rather than the Hunter River. This is clarified in Section 6.22 - wetland interface strategy of the Environmental Assessment Report. Refer to Attachment B plan for details.

Dot Point 8 – We have now further clarified these storages and extents, represented in Attachment 'B' containing these details.

Dot Point 9 – No flow regime change is proposed and so vegetation changes are unlikely. We have consulted PWCS being the owner of the adjoining conservation lands, Lot 1002. The wetland interface strategy has been prepared based on an experienced understanding of the Tomago Wetland Rehabilitation Project objectives and in light of the comments does not appear to have been reviewed. With predominant discharge to the Hunter River and only minor interactions

maintained as existing from Lot 1001 to Lot 1002, the TWRP is distanced and well separated from the development of Lot 1001. It would appear from these comments that there is a slight conflict between TWRP and Lot 1002 conservation objectives. We are satisfied that the proposed system of adjustable pit discharge controls can be adjusted to meet either of these conflicting objectives. It is initially proposed for settings to be 'no change' to the current flow regime at the same discharge locations as existing. The wetland interface strategy proposed for the development aligns with the objectives of TWRP for management of the freshwater and groundwater interface. The Lot 1001 project provides control and a managed direction of groundwater and surface runoff flows toward the Hunter River, *enhancing* the TWRP. MP07_0086 catchment area that is already part of the TWRP upstream catchment is shown to be diverted toward the Hunter River aligning with TWRP objectives.

Dot Point 10 – Flow monitoring is proposed at all discharge locations to Lot 1002 wetlands and the Hunter River as represented on Figure 8-1 of the Stormwater Assessment Report and replicated in the draft state of commitments.

Development Plans

The development plans show connecting access from the proposed NEH development to the ring levee road (refer to 'Northbank Enterprise Hub Masterplan' DA10 supplied within Appendix D of the EA). NEH has no objection to this being confirmed as a condition of approval.

4. Equatica Submission 16 November 2012 (for NSW DoPI)

We note on the front page of the letter that Section 6.22 of Environmental Assessment Report – Wetland Interface Strategy is not listed as a reference document. A number of points raised are described in this section of the EAR.

Appendix F Regional Flooding

We took the comments from equatica as positive. The last paragraph calls for additional modelling. We have not provided additional modelling, however we have provided a more in depth analysis of the regional flood modelling results. Whilst there is a level increase, there is a hazard decrease which of more significance to existing property. This additional detail on regional flooding is contained in Attachment 'A'.

Appendix F Local Drainage and Flooding

A meeting and site inspection was held with equatica representatives Alexa McAuley and David Knights on 26 November 2012. The catchment to the head of the North South Drain, ie upstream floodgate which limits tidal flooding for the Tomago Wetland Rehabilitation Project were described and visited on site. Additional information is provided in Attachment 'B' to assist with an understanding of the flow regimes and catchments, additional to Section 6.22 – wetland interface strategy of the EAR.

Dot Point 1 – The Lot 1001 development has very minor connection with the North South Drain. There is a small floodgate located immediately downstream at the existing NPWS floodgates at the upstream end of the North South Drain. The majority of catchment area to the NPWS floodgate is from the MP07_0086 project. A smaller portion is the retained freshwater wetland of Lot 1001 remaining undeveloped. Adjoining land owners properties to the east of the MP07_0086 project,

drain to the NPWS floodgate at the head of the North South Drain so these are a quite separate catchment from the development of the Lot 1001 project.

There are three (3) upstream adjoining properties besides MP07_0086 lands.
There is an existing drain downstream of Industrial Switchgear and Centurion Civil which lacks continuity. An existing small pipe crossing of Tomago Road is also approximately 400m to the west of this adjacent property. Proposed trunk drainage has been catered for both of these existing drains with improved drainage width on the western edge of Centurion Civil and the existing drain southward through Lot 1001 is also maintained and will be reinstated as part of these works. No submissions were received from either Industrial Switchgear or Centurion Civil.

The third remaining adjacent upstream neighbour is Tomago House. Existing drainage from the Tomago House lands is poorly defined. Whilst the house itself is on locally higher ground, the rear of the property is low. Allowance has been made for drainage from this area with improved drain width and definition. Additional drainage extends along the south eastern boundary of the property. It is expected that the drains will also benefit from improved surveillance being located adjacent to roads.

Downstream, we have consulted with PWCS and its environmental consultants Umwelt for preferred drainage to Lot 1002 to meet their conservation objectives. This consultation was to develop a suitable interface strategy and acknowledge the current drainage flowpaths onto Lot 1002 for mimicking pre development hydrology.

Dot Point 2 – Based on the above description for Dot Point 1, we consider the drain of Industrial Switchgear and Centurion Civil as the only drain to evaluate. Impacts have been shown to be negligible and likely to improve compared to existing conditions. This is covered in Attachment 'B'.

Dot Point 3 – BMT WBM analysis was only completed for the 1% AEP event. Storage capacities have now been calculated for more minor storms and represented with typical cross sections. Analysis has extended to the upstream properties described in Dot Point 2.

Dot Point 4 – Storages have been calculated for smaller, more frequent events as requested, refer to Attachment 'B'.

Dot Point 5 – Raises Council's points 6 and 8. We clarify that Lot 1001 drains via separate floodgates on the Hunter River and not the North South Drain floodgates inferred in this comment. Responses to these points are provided below.

> *6. Attachment 'B' has been prepared to provide additional detail on the storage of stormwater in the drains and overflow wetland rehabilitation area.*

> *8. There is a misconception by Council on this point. Low lying properties at the elevations of 0.5mAHD suggested by Council are to the north east of MP07_0086 project. These existing low lying lands are a separate catchment to Lot 1001, approximately 1km from Lot 1001 at the nearest point. Trunk drainage delivers Lot 1001 runoff to the Hunter River in the opposite direction from the aforementioned properties and so these cannot be conceivably related. Refer to Attachment 'B' for details.*

Dot Point 6 – Raises Council's points 7, 9 and 10. Responses to these points from Council are copied below.

7. *Additional detail is provided in Attachment 'B' however we do clarify that the external drainage system referred to by Council is the Hunter River and not a local regional drain onto neighbours property as perceived in this matter raised.*

9. Dot Points 1 and 2 – There is a misconception by Council on this point as to which direction discharges from Lot 1001 are proposed. As above, the low lying properties described are in the opposite direction from the trunk drainage direction proposed for Lot 1001. Storage calculations of runoff from impervious areas have been calculated to be contained within the trunk drainage system and additional details are provided in Attachment 'B'.

10. There is a misconception by Council on this point. No nuisance flooding on private properties as a result of filling or drainage on Lot 1001.

Recommendations on how to address above issues

Dot Point 1 – Catchment delineation to the floodgates at the head of the North South Drain are indicated in Attachment 'B'. We provide the following additional description to cover WesTrac and adjacent properties.

The existing catchments for runoff and groundwater flow from Lot 1001 and MP07_0086 are reasonably separate catchments having only a small overlap when measured to the existing NPWS floodgate. The existing drains from MP07_0086 land in full delivers water to pond behind the existing NPWS floodgates at the head of North South Drain. The floodgate marks the limit of tidal extent of the Tomago Wetland Rehabilitation Project. Existing drains from a number of rural properties to the east of MP07_0086 also drain to behind the NPWS floodgate. At low tide, the NPWS floodgates open and the accumulated freshwater of groundwater and surface runoff pass through the North South Drain, through the Smart Gates to the Hunter River.

The deeply incised man made drains and site elevations of Lot 1001 curb stormwater to the Hunter River frontage of Lot 1001. There is an existing floodgate at the end of each of the two (2) main drains. As described in Section 6.22, there are four (4) discharge points from Lot 1001 to Lot 1002. None of the Lot 1001 catchment is behind the NPWS floodgate. The retained freshwater wetland area of Lot 1001 has floodgate connection to the North South Drain via a small pipe at the same location as the NPWS floodgate, but downstream of it. The groundwater and surface runoff to the retained freshwater wetland is derived from MP07_0086 drains. Flows not reaching the small pipe outlet pass into Lot 1002 toward the 'rice paddy'. The remaining two (2) discharge points are relatively small and intermittent only, not passing regular flows to Lot 1002. Refer to catchment delineation in Attachment 'B'.

Dot Point 2 – The proposed drainage system, developed in consultation with PWCS being the owners of Lot 1002, has been prepared with the following key objectives:

- Maintain existing hydrology to Lot 1002.

- Curb stormwater from MP07_0086 lands toward the Hunter River via a perimeter berm. This reduces the freshwater load from behind the NPWS floodgate, diverting it toward the Hunter River instead, to a different, existing floodgate outlet. This is consistent with TWRP objectives to reduce freshwater (groundwater and surface runoff) in this direction toward the North South Drain. Note of points 1 and 2, the freshwater in drains behind the NPWS floodgate has virtually

no direct connection to the wetlands project. This water is reliant on a low tide for discharge and passes through the drain. However there is a benefit to NPWS for this water load to be diverted to the Hunter River. This is separate to the hydrology of discharge points to Lot 1002.

- Drying hydrology at the key locations of discharge into Lot 1002 is maintained via a perimeter drain excavated adjacent to the perimeter berm and an adjustable, flexible outlet at each of the discharge points. The perimeter drain conveys excess stormwater from impervious areas with a pathway past the discharge points to the Hunter River.

- Provide trunk drainage as open channels to overcome the flat site gradients.

- Provide an overflow wetland rehabilitation area. This area is currently grass providing minimal environmental value. Creating a wetland at this location provides biodiversity opportunities, however also provides an area for freshwater to pond at high tides adjacent to the floodgate outlet to the Hunter River.

- Provide improved drainage for the adjacent upstream properties of Tomago House, Industrial Switchgear and Centurion Civil for no impact. Refer to Section 6.22 and Attachment 'B'.

Dot Point 3 – This is demonstrated in further detail in Attachment 'B'.

Dot Point 4 – Results presented are based on conservative tidal boundary conditions, refer to additional details in Attachment 'B'.

Dot Point 5 – Worst case scenarios have been adopted in terms of storage and a range of stage/design storm event relationships are described in Attachment 'B'.

Dot Point 6 – Refer to Attachment 'B'.

Dot Point 7 – Additional calculations have been provided in Attachment 'B'.

Appendix G Stormwater Assessment – Water Quality

Dot Point 1 – Existing drains to be maintained so as to provide for positive drainage of the bioretention systems were not represented in the Stormwater Assessment Report. Additional detail has been provided on the sections, refer to Attachment 'B'.

Dot Point 2 – In preparing this additional detail and information, it was considered that Section B was potentially not going to positively drain in some instances. As a result, additional excavation of a deeper baseflow drain within Channel 3, cut below natural would be excavated for certainty on positive drainage of the bioretention systems. The ASSMP already covers drain excavation into the natural ground for the perimeter drain and drain from Tomago House.

Dot Point 3 – Calculations have been completed for the water levels in channels and represented on the cross sections, shown in Attachment 'B'.
Dot Point 4 - Flow velocities are very low due to the flat grades. BMT WBM confirm peak velocities to be expected at a maximum of 0.5m/s which is non scouring. It is also expected that macrophyte growth will dominate the water quality devices within the open channels and protect them from scour.

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Dot Point 5 – We confirm that bioretention components are not proposed below groundwater levels. Groundwater levels are controlled by the existing open drains, keeping levels low for positive drainage. Refer to Attachment 'B'.

Dot Point 6 - The aboveground GPT is deleted and replaced with a standard proprietary product.

Similar issues – Council

Dot Point 7 – As above, we clarify that a standard proprietary GPT product will be used, adequately addressing safety, risk and detail issues.

Dot Point 8 – It is understood and accepted that conventionally trunk drainage is conveying the 1% AEP event as high flows with high velocity. The very flat grades and outlet conditions at this site however have been modelled to be a maximum flow rate in the order of 0.5m/s, which is non scouring. The macrophyte growth which will quickly inhabit and densely populate the channels will also provide bed protection.

Dot Point 9 – This is now addressed in further detail in Attachment 'B'.

Recommendations on how to address above issues:

Dot Point 1 – Additional detail provided in Attachment 'B'.

Dot Point 2 – Groundwater interactions and detail provided in Attachment 'B'.

Dot Point 3 – Velocities at 0.5m/s not considered to be an issue due to the flat grades and macropyhte growth.

Appendix G Stormwater Assessment – Hydrology

Dot Point 1 – Targets are defined by continued monitoring of background levels and in consultation with PWCS. The size of the development and time periods associated with development lend to be able to continue monitoring for an extended period prior to commencement. PWCS is satisfied that the hydrology can be maintained and matched. Monitoring is within the Lot 1001 property. Flexibility and adjustability is provided for discharges over the boundary.

Dot Point 2 – Drying hydrology was acknowledged in Section 6.22 of EAR. The method for achieving drying hydrology without discharge of every event was the excavation of the perimeter drain adjacent to the perimeter berm. This is to provide storage below discharge levels across the boundary for maintaining drying hydrology. Because Section 6.22 has not been quoted in the reference list we presume this may not have been known at the time of writing this request.

Dot Point 3 – There is an inference that all discharge from the site is to the wetlands and we refer to Section 6.22 of the EAR that this has been addressed. The trickle flows described are not essential at this location. Each of the discharge points have been observed and ground truthed to establish their connection during dry, average and wet conditions. As described above, the important consideration of the discharge points is the drying hydrology, which is catered for in design by the perimeter drain. This is to allow bypass and conveyance to the Hunter River where there are no hydrological management objectives, the river being regarded as 'deep open water' under HCCREMS. Because Section 6.22 has not been quoted in the reference list we presume this may not have been known at the time of writing this request.

Dot Point 4 – The target quoted has been adopted in combination with standard pollutant reduction targets. We agree with the pick up that there is a mix up of terms in the text quoted from the report. The wording should be detain. The Hunter River flood peaks are not of concern. This is because the existing piped drainage floodgate connections to the river remain as a 900mm and 525mm diameter pipes, detaining the flow. The water quality targets are met with the bioretention systems proposed.

Dot Point 5 – The bunded floodplain area is covered in Section 6.22, however additional detail is provided in Attachment 'B'.

Recommendations on how to address above issues

Dot Point 1 – This is described in detail individually addressing the characteristics for each discharge point in Section 6.22. Because Section 6.22 has not been quoted in the reference list we presume this may not have been known at the time of writing this request.

Dot Point 2 – The objectives of no change to hydrology together with the monitoring plan and adjustability of controls for ongoing management and adaptive management of discharge are described in Section 6.22. Because Section 6.22 has not been quoted in the reference list we presume this may not have been known at the time of writing this request.

Dot Point 3 – An objective is to not have impact on the adjoining wetlands. Modelling detail is essential for conventional development because there is usually no monitoring committed to post development for verification that function matches objectives. The objectives have been determined for the existing site and the discharge points ground truthed during dry, average and wet events. A flexible discharge control that is adjustable is proposed and there is a commitment to ongoing monitoring for the development of this site. At this site ongoing management, monitoring and an adjustable system for surface water are proposed with development. The assessment tools such as modelling are then not critical compared to conventional development system which is left in most circumstances to perform without any attention or verification. We have consulted with the adjoining conservation land (Lot 1002) owner PWCS and their environmental consultants. Lot 1002 is the location of the wetland receiving waters and we have had a positive submission from them on our approach because our approach is in line with their objectives and we have made a commitment to ongoing monitoring.

Dot Point 4 - The proposed strategy and mitigation measures with adjustable controls for ongoing management and adaptive management of discharge are described in Section 6.22. Because Section 6.22 has not been quoted in the reference list we presume this may not have been known at the time of writing this request.

Dot Point 5 – Response as per Dot Point 3.

Dot Point 6 – Additional detail of proposed drainage system is described in Attachment 'B'.

Dot Point 7 – this is demonstrated in additional detail provided in Attachment 'B'.

Appendix G Stormwater Assessment – Waterways

Under Part 3A, consultation is required with Office of Water however there is exemption from controlled activity approvals. Office of Water has commented on submissions made at adequacy

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

stage and we have received positive commentary on the development proposal following exhibition. A number of existing drains have been maintained where practical.

5. Environment Protection Authority

Fill & Earthworks Activities
Waste

NEH has no objection to the recommended conditions ensuring that waste generated outside of the site is not to be brought to site without an appropriate license under POEO Act 1997.

It is not expected that any material will be extracted from site and so a license for this purpose is not expected to be necessary.

Stormwater Management

Paragraph 1 – Page 3, concern is raised of the discharge being of no discernible direction. This is intended as this is the current existing flow regime and necessary to maintain the same flow regime post development. From consultation with PWCS (and its environmental consultants), being the owners of the adjoining conservation lot, Lot 1002, this discharge is preferred.

Point 1 – Conditions related to bunding and spill containment systems are accepted on the basis of Australian Standard compliance.

Noise and Vibration

It is noted that the EPA has made the following comments in relation to the proposed development in terms of noise considerations:

1) No specific noise management measures (apart from standard construction hours) have been described to assist in reducing noise impacts on nearby sensitive receivers to the north; and
2) The inclusion of a noise bund / barrier on the northern side of the site will mitigate noise during construction and also provide an additional noise mitigating measure for future industrial operations in the subdivision.

With respect to point 1, in reviewing the advice from the EPA it would appear that they have not had access to all submitted documentation. The EA clearly identifies that there are noise receivers to the north of the site and that the development will need to be appropriately managed to mitigate impacts. It is noted that Table 5 on page 16 of the Noise Impact Assessment shows that the established construction noise management level of 50dB(A) will be exceeded (only a minor exceedance) when activities are close to residences. The management level is not a preclusive criterion, however, and simply defines a level at which some form of noise management must be applied.

Figure 6 of the Noise Impact Assessment (reproduced as Figure 43 of EA Report), defines areas where management measures should be applied to construction works (including internal road construction). It is noted that these areas are very small in the context of the overall site. The EA

Report identifies a comprehensive list of specific noise mitigation measures that will be implemented to reduce noise impacts in these identified areas. The noise minimisation practices will be incorporated into a Construction Noise Management Plan (CNMP) and include the following:

Daytime Construction Hours - In accordance with OEH recommendations (*Interim Construction Noise Guideline*) construction will be carried out during recommended standard hours (Monday – Friday 7am to 6pm; Saturday 8am to 1pm; and no work on Sundays or public holidays, unless agreed prior with the relevant authorities).

The construction noise management level is 50dB(A),L_{10} for daytime works. Figure 43 of the EA Report identifies the sections of the site (in Stages 2 and 4) that require construction noise management and minimisation practices to be applied. The proponent has committed to incorporating the following noise reduction and minimisation practices in the CNMP, as appropriate:

Universal Work Practices

- Workers and contractors will be trained (such as at toolbox talks) to use equipment in ways to minimise noise.
- Site managers will check the site and nearby residences and other sensitive land uses for noise problems so that solutions can be quickly applied.
- Tenders, employment contracts, subcontractor agreements and work method statements will include clauses that require minimisation of noise and compliance with directions from management to minimise noise.
- Use of radios or stereos outdoors where neighbours can be affected will be avoided.
- Overuse of public address systems will be avoided.
- Shouting, talking loudly and slamming vehicle doors will be minimised.
- Truck drivers will be informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes, and no extended periods of engine idling).
- A summary of approval or consent conditions that relate to relevant work practices, will be made available to a workplace notice board so that all site operators can quickly reference noise information.

Consultation & Notification

- Neighbours will be notified, within reasonable time, with information such as total expected building time, what works are expected to be noisy, their duration, what is being done to minimise noise and when respite periods will occur. For any works outside standard hours, inform affected residents and other sensitive land use occupants between five and 14 days before commencement.
- Information will be provided to neighbours before and during construction through media such as letterbox drops, meetings or individual contact.
- A website will be established for the project to provide information.
- A site information board will be established at the front of the site with the name of the organisation responsible for the site and their contact details, hours of operation and regular information updates. This signage should be clearly visible from the outside and include after hours emergency contact details.
- A toll-free contact phone number for enquiries during the works will be created.

- A complaints handling register will be established.

Plant & Equipment

- All machinery and equipment will be regularly inspected and maintained to ensure it is in good working order.
- Equipment will be turned off when not being used.
- Machinery and equipment idling will be limited as much as practicable.

On Site

- As much distance as practically possible between the plant or equipment and residences and other sensitive land uses will be implemented.
- Site vehicle entrances will be located away from residences and other sensitive land uses.
- The design will seek to avoid the use of reversing alarms by designing the site layout to avoid reversing, such as by including drive through for parking and deliveries.
- Where feasible and reasonable, alternatives to the typical 'beeper' alarms will be considered (taking into account the requirements of the Workplace Health and Safety legislation).
- In all circumstances, the requirements of the relevant Workplace Health and Safety legislation will be complied with.

Work Scheduling

- Work to be undertaken during the recommended standard hours where possible.
- Onsite parking will be provided for staff and on site truck waiting areas will be provided away from residences and other sensitive land uses.
- Deliveries will be scheduled to nominated hours only.

In relation to point 2) the proponent and acoustic consultant (Spectrum Acoustics) do not consider that an acoustic bund / barrier along the northern side of the site is warranted based on the following:

- The criterion exceedance is very minor in nature and the areas of the site identified for noise minimisation practices to be applied are very small in the context of the entire site (estimated at approximately 5%). Furthermore, the timing of works in these areas will represent a very minor portion of the overall site works.
- Works in the areas indentified for noise minimisation practices to be implemented will be undertaken during the standard daytime construction hours nominated. It is noted that the noise generated from Tomago Road will exceed the noise generated from construction works.
- The noise impacts presented in the assessment are based on a worst case scenario (ie. all noisy machinery operating simultaneously). It is highly unlikely that this will ever be required during the construction phase.
- It is also noted that the installation of an acoustic bund / barrier along the northern side of the site would likely have a negative impact on established view corridors currently enjoyed to and from historically significant Tomago House & Chapel.

- The Noise Impact Assessment and EA Report clearly demonstrate that the any noise impacts associated with the construction of the subdivision can be appropriately mitigated through the implementation of the above management measures.
- Any future end user development proposed within the Northbank Enterprise Hub will be subject to separate noise impact assessment. Therefore, installing an acoustic bund / barrier to reduce future operational noise from end user operations on the site is considered not necessary.

Air Quality

NEH has previously stated that it does not intend to establish pollution emitting industries. The existing Sulphur Dioxide and Fluoride in the local airshed are understood.

No objection is raised to the suggested dust control conditions.

6. NSW Office of Water

The NSW Office of Water raise no objection to the proposed development and provide their recommended conditions of approval.

7. Hunter Water

Hunter Water raise no objection to the proposed development, is satisfied with water supply options, wastewater transport and capacity of the Raymond Terrace WWTW.

8. Heritage Council of NSW

The NSW Heritage Council raises no objection to the proposed development however suggests that the appropriate timeframe for completion of the interpretation strategy would be three (3) years from issue of approval, rather than the five (5) years from approval in the EA. It is considered that the Interpretation Strategy should be completed three (3) years from issue of the first Construction Certificate for the subdivision works. This approach ensures that the timeframe is linked to actual commencement of works.

9. National Trust

NEH has recently met with the Friends of Tomago House to answer any questions that they may have in relation to the proposed development.

The historic value and setting of Tomago House has been assessed by a Heritage Architect as part of the proposed development. This report has been included with the EA submission. This has resulted in a very substantial buffer, larger than the existing buffer that Tomago House has provided for itself. The combined area of land will serve to protect to a reasonable standard an appropriate setting for Tomago House. This should address concerns about the viability of Tomago House. Indeed it is considered that the future land uses will support the viability of Tomago House through increased patronage of its rooms for meetings and the like.

Concerns in relation to drainage have been addressed in the submitted EA. Drainage provisions have been made with an *increased* drainage corridor width than existing from Tomago House to the Hunter River. The existing freshwater wetland extents over Lot 1001 are all areas providing

opportunity for extensive mosquito breeding. The filling of these areas will *reduce* the areas available for mosquito breeding opportunity adjacent to Tomago House and to this end will likely be an improvement on the current situation.

It is noted that the NSW Heritage Council raises no objection to the proposed development.

10. Port Waratah Coal Services Ltd

We have met with PWCS and their environmental consultants for agreement on the wetland interface strategy. We note that they have provided a letter of support to the proposed NEH development. The conservation and offset objectives of PWCS for their adjoining Lot 1002 are well understood and it is considered that the NEH proposal will not inhibit them. PWCS have outlined three particular issues in their letter, being management of surface water, flooding and access.

NEH is able to actively manage surface water flows to ensure that correct water flow and quality can be achieved for the PWCS conservation objectives. The submitted documentation with the Environmental Assessment (EA) Report establishes this.

In relation to flooding it is confirmed through submitted documentation that peak velocity will remain non- scouring. In relation to required minor bunding and filling to mitigate impacts, this has now been documented and included with this submission. It is considered that the predicted flood variation from the proposed development will not significantly impact on the PWCS conservation objectives. Refer to Attachment A for regional flooding details.

The existing right of way to lot 1002 across NEH lot 1001 is acknowledged. For practical reasons it may be necessary that the existing access be relocated to align with future road patterns, which NEH will consult with PWCS regarding this matter. Access to PWCS land can be expected to improve as part of the development of Lot 1001 compared to the existing track access. NEH will continue to liaise with PWCS as the development proceeds to ensure access is maintained, including during the construction phase.

11. Rural Fire Service

We note that the RFS raise no objections in relation to the proposed development and have provided recommended conditions of approval.

12. Tomago Aluminium Company Pty Ltd

NEH will maintain ownership of all lands, even when developed, and has no plans to establish polluting land uses and so it is not anticipated that there will be any significant contribution by NEH to existing levels of fluoride and sulphur dioxide emitted by the smelter.

13. Hunter Bird Observers Club

It has been established by the project ecologist and supported by OEH that the proposed development will have no significant adverse impact on the Eastern Grass Owl.

The subject site has been substantially modified over a long period of time and the existing Hunter River Levee when installed altered the hydrology such that the site became farm land. The river edge is not a natural edge that would encourage or provide for wetlands to grow landward gradually as sea level rises. Indeed the subject site has been identified for industrial purposes and it is

important that the site be protected for this purpose. Any proposed policy in relation to sea level rise is beyond the scope of this proposal and would necessarily be part of broader strategic planning.

Existing infrastructure – there is significant infrastructure close by to Lot 1001 including:

- Signalised intersection on Tomago Road;
- A sewer pump station in Westrac Drive, to take connection from Lot 1001;
- Water mains ready for extension into Lot 1001; and
- Power – Ausgrid's new zone substation providing high voltage power.

14. Residents

The small number of public submissions received during the exhibition period is an indication that the majority of residents, business and landowners are happy with the proposed development.

With respect to the submissions received from these two (2) property owners that their primary concern is in relation to drainage. We confirm that they are located to the north east of MP07_0086 project, approximately 1km from Lot 1001 at the nearest point of development. Trunk drainage for the local drainage catchment delivers Lot 1001 runoff to the Hunter River in the opposite direction from the aforementioned properties and so these cannot be conceivably related. Regional flooding as described in Attachment 'A' indicates additional protection to both of these properties from Hunter River floods, with improved flood hazard outcomes following Lot 1001 development.

K & B Stephenson

The suggestion that the WesTrac development has resulted in drainage problems to neighbouring properties is not agreed with by the proponent and is not supported by factual evidence that has been provided to DoPI and the resident. The suggestion in the letter about redirection of water will not solve the perceived concern about drainage. Waterlogging of the low lying neighbours land at the fringe of Tomago Sandbeds is a regional issue. Until recently the area has indeed received higher than average rainfall, accounting for the water logged conditions of neighbouring properties. The proponent continues to monitor drainage patterns in the locality.

Concern about increased traffic from the proposed development has been addressed as part of the submitted EA. It is acknowledged that increased traffic flows on Tomago Road continue in line with development within the region. Additional traffic flows on Tomago Road may be addressed as part of upgrades to Tomago Road and the broader network as proposed by the RMS, however the proponent is not involved with this in any way.

M Wilkinson

Concerns raised about drainage from the existing approved WesTrac development have been previously addressed with substantial information provided to DoPI and the resident in meetings and written submissions. The existing and proposed developments do not contribute to additional water on adjoining properties. The low topography results in neighbouring properties flooding from large rain events, not from the WesTrac development or the new proposed subdivision. Similarly, as per the response for Stephenson, Figure 50 of the EA Report indicates drainage direction and separation from Wilkinson's land.

As previously raised with the DoPI, the drainage channels made by this resident to its own land, is and continues to exacerbate drainage issues that were not apparent before the WesTrac development was completed.

Concern about increased traffic from the proposed development has been addressed as part of the submitted EA. It is acknowledged that increased traffic flows on Tomago Road continue in line with development within the region. Additional traffic flows on Tomago Road may be addressed as part of upgrades to Tomago Road and the broader network as proposed by the RMS, however the proponent is not involved with this in any way.

Should you have any questions in relation to the contents of this submission or would like to discuss any matter further, please do not hesitate to contact Craig Marler on (02) 49785100 or craigm@adwjohnson.com.au.

Yours sincerely,

Craig Marler
Project Director & Principal Planner
ADW Johnson

Enc:

	Attachment A	Regional Flooding Response
	Attachment B	Additional Detail to Local Drainage
	Attachment C	Flora & Fauna Response to OEH Comments re: Targeted Flora Surveys
	Attachment D	Site Card Registration Correspondence
	Attachment E	NEH Response to draft PSC Suggested Conditions of Consent
	Attachment F	Letter to NSW DoPI dated 28 March 2012

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Attachment A
Regional Flooding Response

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Attachment B
Additional Detail to Local Drainage

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Attachment C
Flora & Fauna Response to OEH Comments re: Targeted Flora Surveys

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Appendix D
Site Card Registration Correspondence

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Appendix E
NEH Response to Draft PSC Suggested Conditions of Consent

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Attachment F
Letter to NSW DoPI dated 28 March 2012

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

ADW JOHNSON PTY LIMITED

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

'ATTACHMENT A – REGIONAL FLOODING RESPONSE'

RE: MP 10_0185 NORTHBANK ENTERPRISE HUB
LOT 1001 TOMAGO ROAD, TOMAGO
REGIONAL FLOODING – ADDITIONAL ANALYSIS

1. INTRODUCTION

1.1. BACKGROUND

-
-
-

ADW JOHNSON PTY LIMITED
ABN 62 129 445 398

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. coast@adwjohnson.com.au

www.adwjohnson.com.au

hunter region
7/335 hillsborough road, warners bay 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

1.2. FLOODPLAIN DEVELOPMENT MANUAL

Provisional Flood Hazard

Hydraulic Categories

Floodways,

Flood storage,

Flood fringe,

2. PROPOSED DEVELOPMENT

-
-

3. MODELLING RESULTS

Table 1 Summary of flood modelling results for adjacent properties to the East of Lot 1001

Flood Event	Change in Peak Flood Level	Change in Peak Velocity	Change in hazard (V * D)	Comment

Table 2 Summary of flood modelling results for adjacent properties to the West of Lot 1001

Flood Event	Change in Peak Flood Level	Change in Peak Velocity	Change in hazard (V * D)	Comment

-
-
-

-

-

-

-

Lot 1002 assessment

3.1. FURTHER ASSESSMENT

On Site Investigation

-
-

-

3.2 BACKGROUND DOCUMENTATION

-
-
-

3.3 *FLOOD MITIGATION*

Whilst the BMT WBM modelling work essentially assumed a fill platform to the boundaries, minor flood mitigation work is proposed along the west boundary adjoining adjacent development. A 3m wide setback for the toe of the fill embankment from the common boundary will provide a local corridor for the continued improvement of flood conditions upstream of the site. This is shown on Sheet 3.

4. CONCLUSION

It has been demonstrated from the above assessment that:

- There is no flood regime change up to the peak 5% AEP event on the adjoining industrial properties adjacent to Lot 1001.
- There is a decrease in flood hazard for the 2% AEP and 1% AEP events on the adjoining properties adjacent to Lot 1001;
- Iterative modelling of the optimum fill extent has respectfully acknowledged the historical flood runner and floodway conveyance over floodplain when the Hunter River banks are overtopped during major events;
- Peak flood level increases upstream are significantly less than anticipated in past modelling predictions for fill and industrial development of the area. This reinforces that the fill extent determined for Lot 1001, so as to avoid the floodway, is appropriate.
- Modelling predictions of the fill extents are proved not to be significant to upstream property. By definition, had the floodway been adversely affected, there would have been significant affectation upstream. This further reinforces that the fill extents are appropriate and not over the floodway.
- There is benefit in terms of improved flood hazard to an extensive number of existing properties east of Lot 1001 in the Cabbage Tree Road, Fullerton Cove Road and Nelson Bay Road areas, post development of Lot 1001.
- It is accepted that a 3m wide corridor from the boundary to the west to the toe of the fill embankment will be provided as flood mitigation for the adjacent property.

It is concluded that this assessment has addressed the regional flood concerns of authorities in relation to floodway, hazard and flood impact as required. No submissions have been raised by these adjacent properties. If you have any questions regarding the content of this report, please don't hesitate to contact the undersigned on (02) 4978 5100 or scottd@adwjohnson.com.au

Yours faithfully,

SCOTT DAY BE (Env) MIEAust, CPENG NPER
ENVIRONMENTAL ENGINEER

ADW JOHNSON PTY LTD – (Hunter Office)

Plan of:	Floodway Analysis 2006 Aerial Image - Sheet 1 Lot 1001 D.P.1127780	Location:	Tomago Road Tomago	Datum:	N/A	Date:	20-Nov-2012
				Origin:	N/A	Sheet:	1 of 3
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	A (20/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-BUND-001-A
Our Ref:	37672

adw johnson

- N.E.H
- WESTRAC SITE
- FILL EXTENTS
- DRAINAGE CORRIDOR

N

adw johnson

TOMAGO (FRESHWATER) SANDBEDS

Road

Tomago

LOT 212
D.P.1174939

WesTrac Facility

LOT 1
D.P.1155307
313 Tomago Road
(N.E.H.)

LOT 211
D.P.1174939

Existing Part 3A Approval
07-0086 & EPBC Approval
2007/3343

LOT 22
D.P.1150980
CONSERVATION LOT
(22ha)

Tomago House

Tomago Church

ADJACENT INDUSTRIAL PROPERTIES

PUBLIC RESERVE

SEE DETAIL ON SHEET 3

LOT 1001
D.P. 1127780

TOMAGO WETLAND REHABILITATION PROJECT AREA

Hunter River

FLOODWAY (HISTORICAL FLOOD RUNNER)

LOT 1002
D.P. 1127780

SOURCE OF AERIAL PHOTO: SKM DECEMBER 2006

0 100 200 300 400 600

Bar Scale 1: 6000 (A1), 1: 12000 (A3)

Ver.	Date	Comment
A	21/11/2012	Issued to Client

adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plotted By: clintono Plot Date: 27/11/12 - 15:15 Cad File: C:\Users\clintono\appdata\local\temp\AcPublish_2868\37672-BUND-001-A.dwg

Plan of:	Floodway Analysis 1961 Aerial Image- Sheet 2 Lot 1001 D.P.1127780	Location:	Tomago Road Tomago	Datum:	N/A	Date:	20-Nov-2012
				Origin:	N/A	Sheet:	2 of 3
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

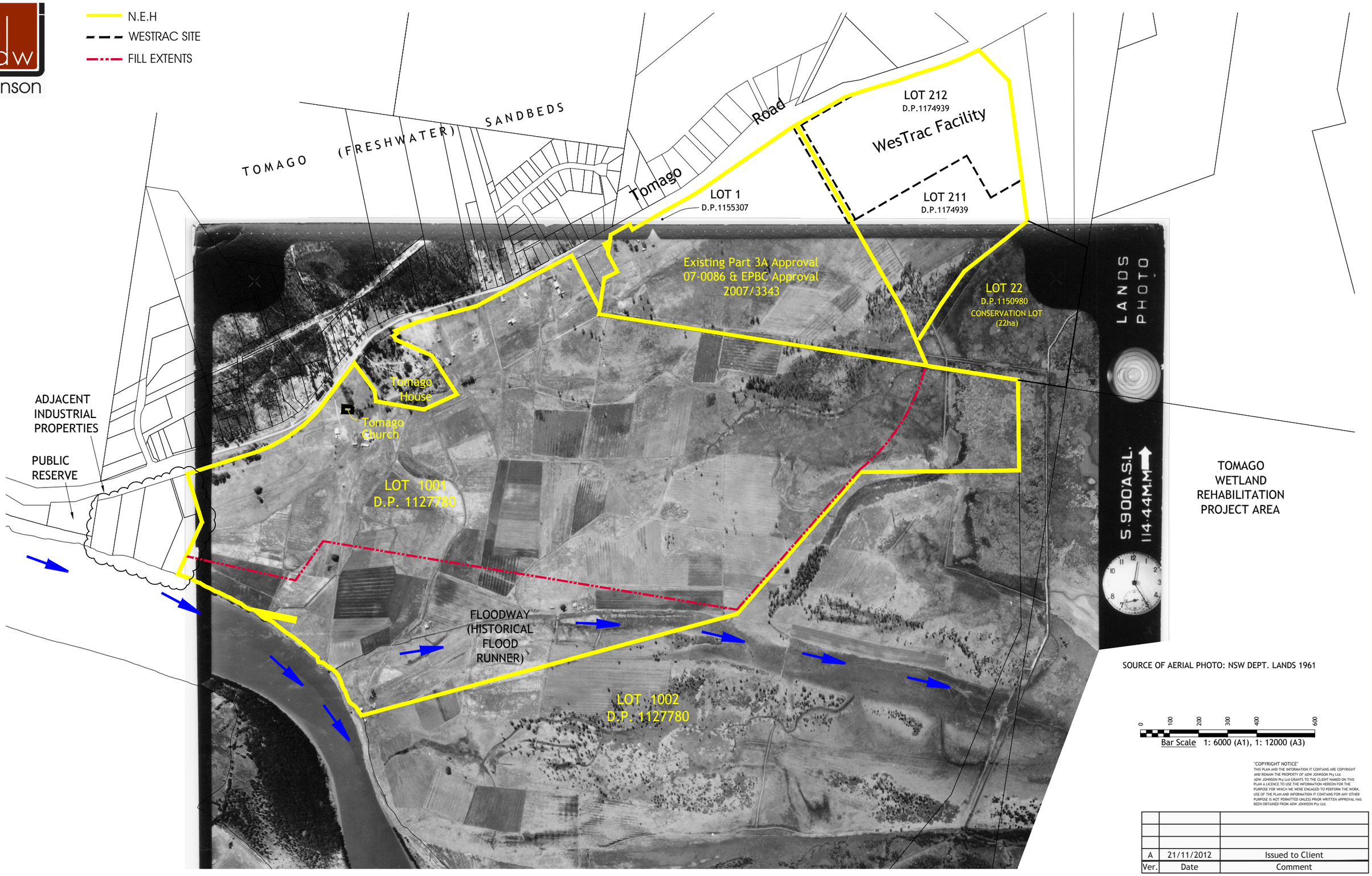
Version:	A (20/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-BUND-001-A
Our Ref:	37672

adw johnson

N.E.H
WESTRAC SITE
FILL EXTENTS

N

adw johnson



TOMAGO
WETLAND
REHABILITATION
PROJECT AREA

SOURCE OF AERIAL PHOTO: NSW DEPT. LANDS 1961

0 100 200 300 400 600

Bar Scale 1: 6000 (A1), 1: 12000 (A3)

Ver.	Date	Comment
A	21/11/2012	Issued to Client

adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plotted By: clintono Plot Date: 27/11/12 - 15:15 Cad File: C:\Users\clintono\appdata\local\temp\AcPublish_2868\37672-BUND-001-A.dwg

Plan of:	Flood Mitigation Drainage Corridor - Sheet 3 Lot 1001 D.P.1127780	Location:	Tomago Road Tomago	Datum:	N/A	Date:	20-Nov-2012
				Origin:	N/A	Sheet:	3 of 3
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	A (20/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-BUND-001-A
Our Ref:	37672

adw johnson

- N.E.H
- DRAINAGE CORRIDOR
- FILL EXTENTS

N

adw johnson

SOURCE OF AERIAL PHOTO: SKM DECEMBER 2006

0 5 10 15 25 50 100 150

Bar Scale 1: 1250 (A1), 1: 2500 (A3)

Ver.	Date	Comment
A	21/11/2012	Issued to Client

Plotted By: clintono Plot Date: 27/11/12 - 15:15 Cad File: C:\Users\clintono\appdata\local\temp\AcPublish_2868\37672-BUND-001-A.dwg

Our Ref: 37672 / ENG / JW:SD

30 November 2012

Manager – Industry, Major Projects Assessment
NSW Department of Planning & Infrastructure
PO Box 1226
Newcastle NSW 2300

Attention: Mr Chris Ritchie/Ms Emma Barnet

Dear Chris/Emma,

'ATTACHMENT B – ADDITIONAL DETAIL TO LOCAL DRAINAGE'

RE: MP 10_0185 NORTHBANK ENTERPRISE HUB
LOT 1001 TOMAGO ROAD, TOMAGO
ADDITIONAL DETAIL TO LOCAL DRAINAGE

1. INTRODUCTION

This report has been compiled to provide additional information to the assumptions and calculations made on local drainage for sizing the proposed drainage channels through the NEH development site.

1.1. BACKGROUND

BMT WBM completed Local Flooding and Drainage Assessment and Stormwater Assessment for the development. Feedback from the exhibition period is generally that additional detail is required. This letter report covers trunk drainage, local drainage and flooding for more regular storm events focussed on water quantity. Discharge controls and conveyance to the conservation lands of lot 1002 are covered in Section 6.22 – wetland interface strategy of the EAR.

1.2. EXISTING & PROPOSED STORMWATER CONTROLS

The Hunter River levee for the river frontage of Lot 1001 site is approximately 1.7mAHD upstream and 1.4mAHD downstream ends of the site, relative to the river. There are two (2) existing floodgates to the river. The upstream floodgate is a 900mm dia pipe at -0.82mAHD and the downstream floodgate is a 525mm dia pipe at -0.86mAHD. These floodgates effectively drain the majority of the Lot 1001 site. Refer to Sheet 1.

ADW JOHNSON PTY LIMITED
ABN 62 129 445 398

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. coast@adwjohnson.com.au

www.adwjohnson.com.au

hunter region
7/335 hillsborough road, warners bay 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

These existing floodgate controls will remain in place for drainage of the proposed development site.

Existing drains maintained in the proposed development site layout are:

- The lower reach of Channel 1 (900mm dia floodgate connection to river);
- The lower reach of Channel 4 (525mm dia floodgate connection to river);
- The lower reach of Channel 4 extending to Lot 1002 boundary; and
- The full length of Channel 2.

Refer to Sheets 1-5.

The existing drains currently have a function to keep groundwater levels low through Lot 1001. This was the purpose of the drains through the previous, historic landuses to enable pasture grass growth over the lands. Figure 49 from the EAR shows the extensive groundwater catchment overflow from the Tomago Sandbeds upslope.

Additionally, similar drain bases to the existing drains will be excavated in Channels 1, 3 and 4. Channel 4 being the perimeter drain within the development footprint adjacent to the perimeter berm. Channel widths are 28-41m consistent with Figure 6-1 from BMT WBM local Flooding and Drainage Assessment.

It has been modelled and anticipated that as a result of development there will be an increase the runoff water quantity reaches the floodgates at the river frontage. In the event of high tide and/or high river levels, there will be an accumulation of water in the channels at the bottom of the site adjacent to the floodgates. Provision is made for backwater ponding of this accumulated water in the following areas:

- overflow wetland rehabilitation area. This area is excavated to a base level of 0.2mAHD;
- landscaped area – variable low lying levels between the Hunter River levee and fill extents; and
- remaining area not filled between the Hunter River levee and fill extents of the NEH development area. Note that natural surface levels below the fill extents at the western, upstream river frontage of Lot 1001 are approximately 1-1.2mAHD and not contributing much storage.

Refer to Sheet 1 for details.

2. ANALYSIS

Channel storages in smaller storms

Storage has been measured to an elevation of 0.7mAHD to confirm the design storm capacities for a range of durations for smaller storm events. The elevation of 0.7mAHD was selected for the following reasons:

- Positive drainage from bioretention units to the existing drains within the channels;
- Ponding contained within overflow rehabilitation area and other low lying areas, generally not extending over the existing surface; and
- This water level is easily accommodated without disruption to site.

The digital terrain model 12D was used to measure this storage.

Assumptions:

- Starting groundwater level in baseflow drains 0.2-0.3m below top of bank;
- Bioretention units empty at storm commencement;
- Void ratio of 30% in bioretention units;
- Dimensions of bioretention units unchanged from Table 6-6 of the BMT WBM stormwater assessment;
- No storage allowance for extended detention storage above units;
- Upstream catchment area of approximately 270 hectares includes MP07_0086 lands, Tomago House, Industrial Switchgear and Centurion Civil (Lot 1001 site area is 240 hectares, retained freshwater wetland, excl.);
- Free draining piped street drainage;
- No runoff storage on roads or development land;
- Assumed no infiltration over pervious areas, ie 100% of total catchment assumed to contribute all runoff;
- Assumed no outflow for shorter duration storms; and
- No account for drawdown discharges to the wetlands of Lot 1002.

The level of 0.7mAHD is represented on the channel cross sections, Sheets 2-5. These cross sections update BMT WBM Figures 6-2 to 6-5 of the Stormwater Assessment Report and Figures 6-2 to 6-4 of the local Flooding and Drainage Report. The above assumptions are considered highly conservative and a worst case scenario.

The storage of the overflow wetland rehabilitation area, bioretention units and storage within the baseflow channels from groundwater level to a level of 0.7mAHD is approximately 85,000m^3.

Using Port Stephens Council IFD data, this storage is approximately equivalent to the full capture of the following design storm events and durations:

- 1 year, 3 hour (critical duration – 2hr);
- 6 month, 12 hour; and
- 3 month, 24 hour.

Longer durations will be subject to continued drawdown through the floodgates to the river and dependent on timing within the tidal cycle.

Channel storages in larger storms

The next level of storage analysed was 1.5mAHD. This level has been set as the maintenance access level. It is also the level at which the bioretention units will remain full, until there is a drop in water levels and positive drainage from the system.

The low lying areas closer to the river outside the fill extents, adjacent to the perimeter berm and overflow wetland rehabilitation areas were analysed to a peak level of 1.2mAHD. This is the crest level of the perimeter berm before overtopping toward Lot 1002 conservation lands. Note that the Hunter River levee is not overtopped at this level. This

analysis also makes for some allowance of hydraulic gradient, being 1.2mAHD at the lower end, rising to 1.5mAHD at the upstream ends of the channels.

From the digital terrain model and the same assumptions as that for the smaller storms, the total storage measured is 285,000m^3.

Using Port Stephens Council IFD data, this storage is approximately equivalent to the full capture of the following design storm events and durations:

- 100 year, 3 hour;
- 50 year, 4.5 hour;
- 20 year, 6 hour;
- 10 year, 12 hour.

The outcomes are:

- This is an acceptable level for the maintenance access within the drainage channel;
- An acceptable runoff capture and protection from overflows into Lot 1002;
- At the level of 1.5mAHD, there is no real effect on site other than some nuisance flooding to the low lying areas that are outside the fill extents of the development. This is to be expected during these storms.
- BMT WBM previously modelled the local drainage system to have capacity for the 100 year 9 hour storm event. This capacity aligns well with our calculation of full capacity of approximately 400,000m^3, measured to 2.5mAHD being the top of bank of the channels. Storage peaks were assumed at 1.2mAHD in the downstream low lying areas adjacent to the perimeter bund and the floodgates and 2mAHD along the perimeter berm. By comparison, the critical storm duration is the 2 hour storm for the local event.

Industrial Switchgear and Centurion Civil

These two (2) adjoining properties have been indicated on Sheet 6 in further detail. The properties are benched with a raised flat section of approximately 3mAHD for the buildings and rear property area unmaintained at approximately 1-1.5mAHD. Drainage is to the south, however vegetation growth is very dense and whilst the existing drainage channels at this location are defined, they lack continuity with informal access crossings, debris and alike. This leads to existing upslope ponding on the rear property areas of these two (2) lots.

Existing groundwater levels are high at the site frontage, approximately 2.6mAHD, tapering down to surface and drain levels at the rear of the property.

The following improvements are made following development of Lot 1001:

Extended drainage within Lot 1001 adjacent to Centurion Civil where there is currently no drainage. This will minimise the potential for elevated groundwater levels, provide additional storage, flood relief and keep localised flood levels lower adjacent to these two (2) properties.

The new drainage to the south will have a better defined channel for base flows and runoff from smaller, regular storms. This will also minimise the potential of elevated groundwater levels, in particular providing for greater storage in the channels prior to a storm occurring. The greater definition of the channel will improve the current drainage situation.

All of the above storage calculations have been made over the downstream drainage to a maximum elevation of 2.5mAHD being the equivalent top of bank level of the higher, useable pad level of these two (2) properties. The top of bank levels in downstream drainage at approximately 2.5mAHD have been shown to have significant 100 year capacity. If this elevation were to be exceeded in a major storm, flows would start entering roads of Lot 1001 and alike significantly increasing capacity and controlling levels from rising on these properties. At this point during this major storm, there are continuous outflows occurring to the river over the levee and Lot 1002, similarly controlling flood levels from increasing over these two (2) properties.

The access/egress to Tomago Road has remained unchanged for these two (2) properties.

The development potential of these two (2) properties remains uninhibited. Any proposed additional development over the low lying areas of the properties would require filling. The filling in turn would reach flood immunity from local and regional flooding and fit with the Lot 1001 development. The fill of the Lot 1001 project essentially buffers these 2 sites from regional floods and it has been demonstrated that local drainage has been accommodated for and improved post development for both minor and major events. The drainage improvements and mitigation measures proposed with lot 1001 development adequately maintain no impact on drainage, most likely improve drainage for these properties.

Tomago House

The Tomago House property, similarly to Industrial Switchgear and Centurion Civil, contains benched site levels. The house itself is located on higher ground greater than 4mAHD and so too are the majority of the grounds. From boundary overlay, a small rear portion of the property is lower lying ground.

Existing drainage downslope of the Tomago House property is not well defined. There are some discontinued drains covered with debris and access crossings. This low lying area is susceptible to flooding and waterlogging, with no formal drainage downslope.

Channel 1 as shown in the post development of Lot 1001 is to be improved with excavation through natural ground improving baseflows and providing greater control of limiting potential elevated groundwater levels. This provides greater storage for stormwater. The channel width definition is significantly improved. The Lot 1001 fill extents provide a level of protection to Tomago House from regional flooding.

From the above it is considered that there are no adverse impacts of drainage on Tomago House, only the potential for improved drainage.

Drawdown

It has been described above that there is significant capacity in the proposed channels based on an assumed outlet of high river levels for accumulated runoff storage. The existing floodgate connections to the river are a 900mm dia pipe and 525mm dia pipe. Lower river levels would be required for outflows, dependent on tide.

The ponding of water from 0.7mAHD to 1.5mAHD in the channels presents no issues to the site and is easily accommodated. There remains capacity for further storm runoff within the channels. There are no upstream impacts at these levels. Water is ponding in areas of the drains containing macrophytes and the lower lying areas such as the overflow wetland rehabilitation area are accommodating water as intended.

Drawdown during larger storms to this peak level of 1.2mAHD at the base of the site is expected to finish almost instantaneously with the finish of the storm. This is due to the long perimeter berm crest length at this level providing for outflow. The perimeter berm combined with the opportunity for water to overtop the Hunter River levee into the river, provides a maximum limitation of flood height propagation back up through the channels of the Lot 1001 development, based on this continued free outfall. This is noting that there is a significant difference in timing of the peaks between the local event and a Hunter River peak event.

Below 1.2mAHD, the drawdown will of course be governed by the river level and ponding height behind the floodgates. The river level is subject to a range of considerations including tide level, tidal range based on season and upstream rainfall and runoff conveyed in the Hunter River.

The water level drawdown from 1.5mAHD to 0.7mAHD could be in the order of 5-10 days. It should be noted that a significant storm event is required to have occurred to fill the channels to this level and as described above the water accumulated at these levels presents no real issues to the site. Based on modelling and background observations, levels will return to groundwater levels in the order of 0.2mAHD in the bottom, downstream reaches of the channels under normal weather conditions.

Water Quality/Trunk Drainage Integration

Conventionally, trunk drainage is associated with high flows and high velocities. At this site however, channel widths are considerably wider for storage due to the flat grades and restricted floodgate outlets. This results in backwater effects and very low velocities. BMT WBM estimated the peak of these to be 0.5m/s, which is considered to be non scouring. Macrophyte growth in the channels is expected to be prolific, providing further protection from scour.

The path for stormwater from the piped street drainage will be to the bioretention units. A proposed distribution pipe is to spread the stormwater the full length of the bioretention units. The units will fill with water and depending on outlet conditions, either pass through the units with positive drainage into the base drain or be captured and stored within the unit until such time as the water levels in the base drain are sufficiently low for positive drainage to occur. Note that a preceding storm event producing 85,000m3 is required to slow or prevent outflows from the bioretention unit to the base drains. The bioretention

units are designed at elevations above the top of bank of the existing drains and proposed base drains to facilitate this purpose. This describes the path for low flows requiring treatment for water quality and the bypass of higher flows into the main trunk drainage for storage and conveyance to the floodgate outlet.

The proposed trunk drainage system then has facility to be accommodating both minor and major storm events. We note that the Office of Water has accepted this methodology.

It is concluded that this assessment has addressed the additional local drainage details as requested. If you have any questions regarding the content of this report, please don't hesitate to contact the undersigned on (02) 4978 5100 or scottd@adwjohnson.com.au

Yours faithfully,

SCOTT DAY **BE (Env) MIEAust, CPENG NPER**
ENVIRONMENTAL ENGINEER

ADW JOHNSON PTY LTD – (Hunter Office)

Plan of: PLAN VIEW

Location: Tomago Road
Tomago

Council: Port Stephens

Datum:	AHD	Date:	27-Nov-2012	Version:	A (27/11/2012)
Origin:	N/A	Sheet:	1 of 6	Client:	Northbank Enterprise Hub Pty Ltd
Projection:	MGA Zone 56	Plan by:	CO	Survey:	N/A
Origin:	PM 27766	Project Manager:	SD	AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
North Direction:	Grid	Office:	Hunter	Our Ref:	37672
Contour Interval:	N/A	Plan Purpose:	Report		

adw johnson

N

adw johnson

SANDBEDS

TOMAGO

(FRESHWATER)

INDUSTRIAL SWITCHGEAR

CENTURION CIVIL

Clarkson Drive

313 Tomago Road (N.E.H.)

WesTrac Facility

EXISTING DRAIN

Existing Part 3A Approval 07-0086 & EPBC Approval 2007/3343

REFER TO SHEET 6

EXISTING FLOW SPLIT

EXISTING DRAIN

CONSERVATION LOT (22ha) TRANSFERRED TO NPWS

FUTURE LEVEE

TOMAGO WETLAND REHABILITATION (TWRP) STAGE 1 LEVEE (EXISTING)

RING DRAIN

NPWS EXISTING FLOOD GATES TO NORTH-SOUTH DRAIN

FULLERTON COVE

Tomago Road

EXTENDED DRAINAGE

Tomago House

Tomago Church

CHANNEL 1

NEH DEVELOPMENT AREA

CHANNEL 2

CHANNEL 3

DISCHARGE CONTROL PIT

CHANNEL 4 2mAHD

BERM

RETAINED FRESHWATER WETLAND

LOT 1001 FLOODGATE

LOT 1001 D.P. 1127780

TOMAGO WETLAND REHABILITATION PROJECT AREA

RIVER LEVEE 1.7m AHD

DISCHARGE CONTROL PIT

PERIMETER

'RICE PADDY'

BOUNDARY

STAGE 1 (CURRENT) INUNDATION SALTMARSH AREA

PERIMETER BERM 1.2mAHD

900mm DIA. FLOODGATE -0.82m AHD

DISCHARGE TO RIVER

NORTH SOUTH DRAIN

Hunter River

RETAINED SWAMP OAK FOREST

PONDING AREA BETWEEN LEVEE & FILL & OVERFLOW AREA

525mm DIA. FLOODGATE -0.86m AHD

BACKWATER PONDING AREA

OVERFLOW WETLAND REHABILITATION AREA (FRESH WATER) 10ha. INVERT BASE 0.2m AHD

LOT 1002

RAMSAR

NPWS

EXISTING SMART GATES STAGE 1 (2006) TIDE/SALT WATER

FLOOD GATES INSTALLATION STAGE 2 WORKS (2012) TIDE/SALT WATER

RIVER LEVEE 1.4m AHD

A/2 B/2 C/3 D/3 E/4 F/4 G/5

A/1 SECTION ID, SHEET NO.

APPROXIMATE EXISTING CATCHMENT TO NPWS FLOODGATE

FILL EXTENTS

DEMOLISHED HOUSES

0 100 200 300 400 600

Bar Scale 1: 6000 (A1), 1: 12000 (A3)

Ver.	Date	Comment
A	27/11/2012	Issued for Approval

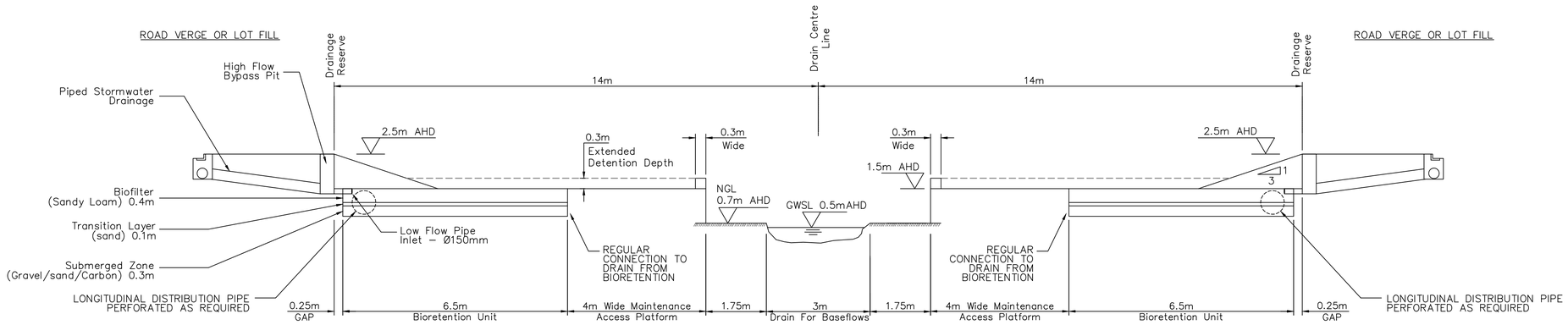
adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plotted By: clintono Plot Date: 30/11/12 - 12:31 Cad File: C:\Users\clintono\appdata\local\Temp\AcPublish_9044\37672-DRAIN-CROSS-SECTION-001-A.dwg

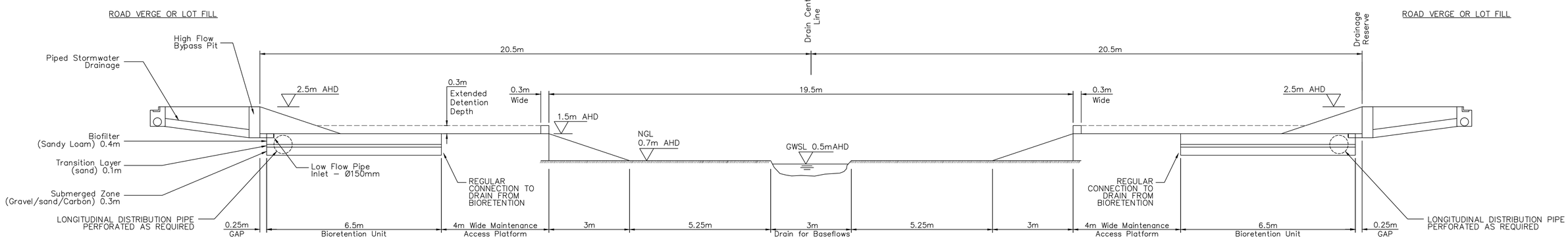
Plan of:	CROSS SECTIONS - CHANNEL 1	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	2 of 6
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	A (27/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
Our Ref:	37672

adw johnson



SECTION A
TYPICAL
SCALE 1:75



SECTION B
TYPICAL
SCALE 1:75

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

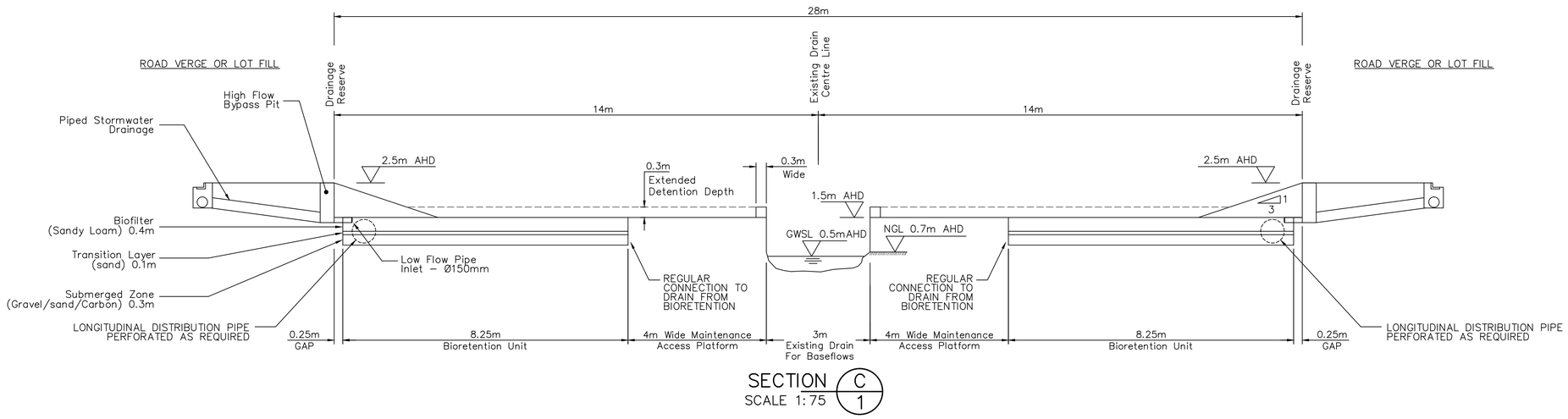
GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

Ver.	Date	Comment
A	27/11/2012	Issued for Approval

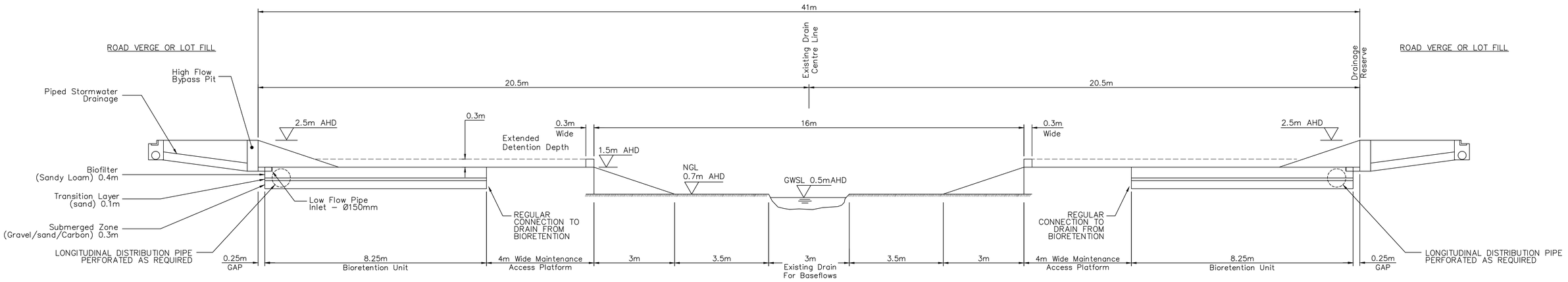
adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plan of:	CROSS SECTIONS - CHANNEL 2	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	3 of 6
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	A (27/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
Our Ref:	37672



SECTION C
SCALE 1:75



SECTION D
SCALE 1:75

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

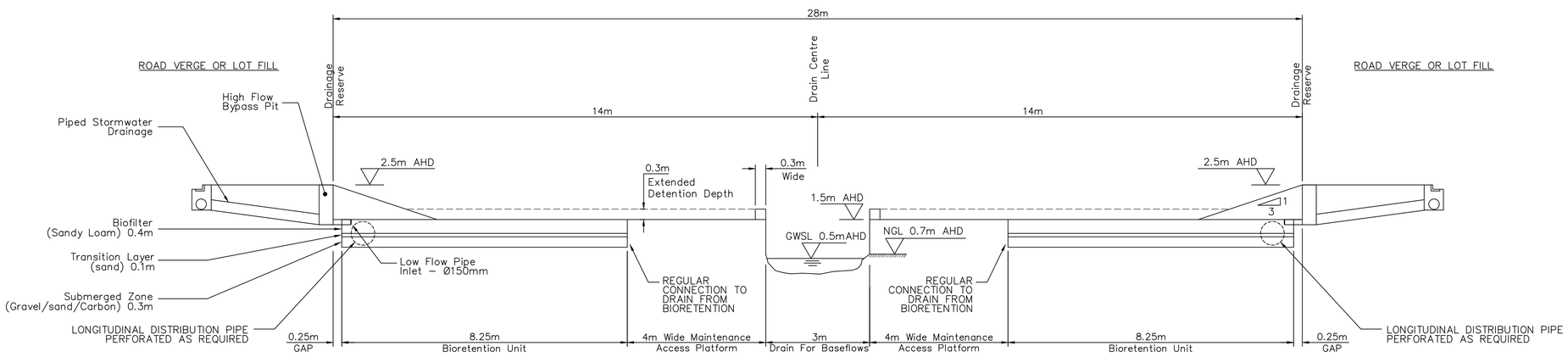
GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

Ver.	Date	Comment
A	27/11/2012	Issued for Approval

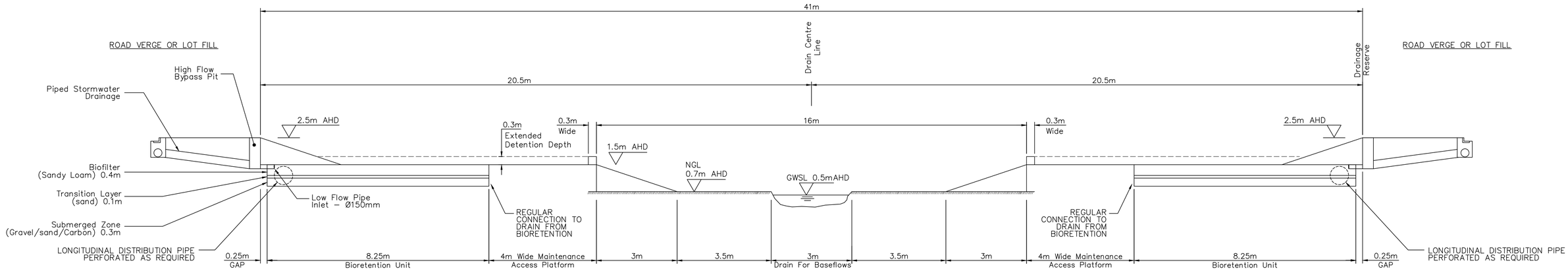
adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plan of:	CROSS SECTIONS - CHANNEL 3	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	4 of 6
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	A (27/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
Our Ref:	37672



SECTION E
SCALE 1:75
1



SECTION F
SCALE 1:75
1

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

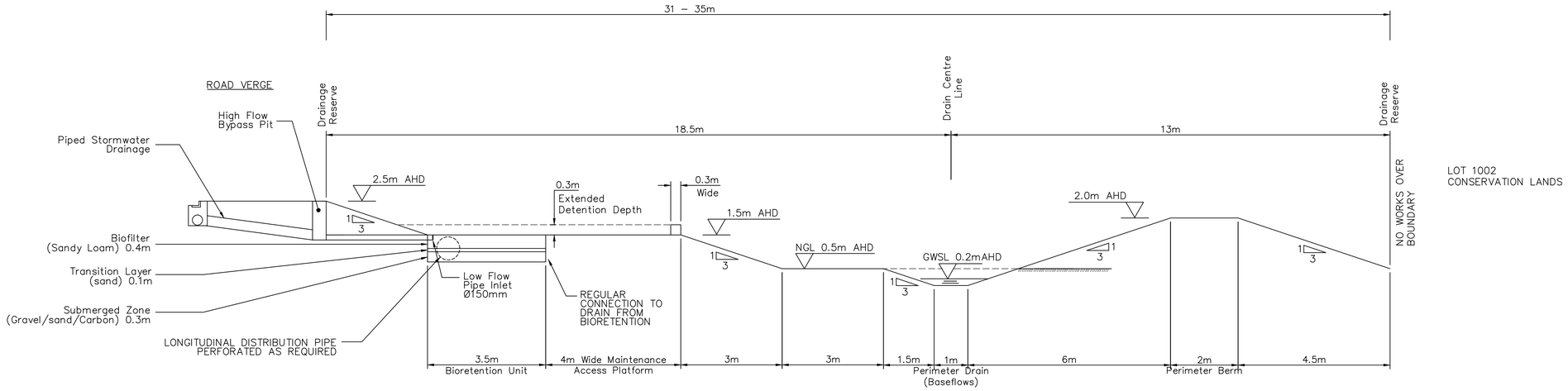
Ver.	Date	Comment
A	27/11/2012	Issued for Approval

adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plan of:	CROSS SECTIONS - CHANNEL 4	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	5 of 6
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	A (27/11/2012)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
Our Ref:	37672

adw johnson



SECTION G
SCALE 1:75 1

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

Ver.	Date	Comment
A	27/11/2012	Issued for Approval

Plan of: DETAIL

Location: Tomago Road
Tomago

Council: Port Stephens

Datum:	AHD	Date:	27-Nov-2012	Version:	A (27/11/2012)
Origin:	N/A	Sheet:	6 of 6	Client:	Northbank Enterprise Hub Pty Ltd
Projection:	MGA Zone 56	Plan by:	CO	Survey:	N/A
Origin:	PM 27766	Project Manager:	SD	AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-A
North Direction:	Grid	Office:	Hunter	Our Ref:	37672
Contour Interval:	0.1m	Plan Purpose:	Report		

adw johnson

N

adw johnson

BUILDING FLOOR LEVELS
APPROX. 3m AHD

TOP OF EMBANKMENT
APPROX. 2.5m AHD

MINOR FLOW FROM WEST

INCREASED DRAIN
STORAGE ADJACENT
(CURRENTLY NO DRAIN)

LOW LYING AREA
-1.5m AHD

SUSCEPTIBLE TO PONDING
DURING STORM EVENTS &
WATERLOGGING

IMPROVED
DRAINAGE
SOUTH

0 10 20 30 40 50 75 100

Bar Scale 1: 1000 (A1), 1: 2000 (A3)

Ver.	Date	Comment
A	27/11/2012	Issued for Approval

19 November 2012

Craig Marler
ADW Johnson – Hunter Office
7/335 Hillsborough Road
WARNERS BAY NSW 2282

RE: Response to OEH comments on the Ecological Assessment for Northbank Enterprise Hub, Tomago, relating to the adequacy of targeted threatened flora surveys.

Dear Craig

This letter has been provided to address comments provided by OEH on the Ecological Assessment for the proposed Northbank Enterprise Hub following the public exhibition period of the application. The comments relate to the adequacy of targeted threatened flora surveys conducted on the subject site. Specifically, OEH have indicated that the survey effort for two threatened flora species, *Persicaria elatior* and *Zannichellia palustris*, is not adequate due to the timing of the surveys conducted and have subsequently recommended that additional surveys be carried out in summer (December-February) across the site. Response to these comments are provided below, including justification for the adequacy of previous surveys conducted to detect any populations of these two species within the site.

***Persicaria elatior* (Tall Knot-weed)**

It is recognised that the flowering period for *Persicaria elatior* is mostly within summer (DSEWPaC 2012). The targeted threatened flora searches across the Northbank site were conducted during late November (22/11/2010 and 29/11/2011). As these surveys were conducted within one week of the recommended flowering period, and based on the presence of other common *Persicaria* species flowering within the site, it is considered likely that any *P.elatior* individuals would have been flowering at the time of the surveys. Additionally, flowers or fruit of *P.elatior* are not required to distinguish this species from other locally occurring *Persicaria* species (*P.decipiens* and *P.strigosa* were recorded on the site). *P.elatior* is typically identified and distinguished from other similar species through the presence of stalked glandular hairs on most parts of the plant (Harden 2000). For any populations of *Persicaria* encountered during the flora surveys which were not in flower, samples were collected and analysed for the presence of stalked glandular hairs; no specimens collected from the site contained stalked glandular hairs.

***Zannichellia palustris* (Horned Pondweed)**

As stated in Harden (1993), the flowering period for *Zannichellia palustris* is within the warmer months of the year. The targeted threatened flora searches across the Northbank site were conducted during late November (22nd and 29th). As these surveys were conducted within one week of summer, it is considered that the survey period was conducted within the warmer months of the year and that any populations of *Z.palustris* would have been flowering. Additionally, *Z.palustris* would have been detectable at the time of the survey without flowers as it would have been in a relatively advanced life-cycle stage (i.e. annuals which die-back during winter).

Based on the responses above, it is considered that the flora surveys conducted during November 2010 and 2011 across the Northbank site were appropriately timed to detect these two threatened flora species due to the proximity of the survey timing to summer, and as both species can be detected and identified without the presence of reproductive components (i.e. flowers and fruit).

Regards,

Kleinfelder/ecobiological

A. Mulcahy

Aaron Mulcahy (Botanist)

References

DSEWPaC (2012). Persicaria elatior – Knotweed profile. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=5831#description

Harden, G.J. (ed) (1993). *Flora of New South Wales, Volume Four*. Kensington, NSW: University of NSW Press.

Mathew Radnidge

From: Craig Marler
Sent: Tuesday, 13 November 2012 9:48 AM
To: Mathew Radnidge
Subject: FW: site cards
Attachments: Site Card Tom2.pdf; Site Card Tom1.pdf; Site Card Tom1 PAD.pdf; Fig 6.3 Sites & PAD.pdf

FYI

From: Penny McCardle [mailto:mcheritage@iprimus.com.au]
Sent: Monday, 12 November 2012 12:14 PM
To: 'Sharlene Freeburn'
Cc: Craig Marler
Subject: site cards

Hi Sharlene,

Please see the attached sites cards for registration. Please let me know what the AHIMS site number will be.

Thanks
Penny

Penny McCardle
Principal Archaeologist & Forensic Anthropologist
McCardle Cultural Heritage
PO Box 166
ADAMSTOWN NSW 2289
M: 0412 702 396
F: 02 4952 5501

For large files send through:
http://dropbox.yousendit.com/PennyMcCardle1259955

Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville NSW 2220

AHIMS Aboriginal Heritage Information Management System

NSW Government | Office of Environment & Heritage

Office Use Only

Site Number

Date received / / Date entered into system / / Date catalogued / /

Entered by (I.D.)

Information Access

☐ Gender/male ☐ Gender/female ☐ Location restriction ☐ General restriction ☐ No access

Office Use Only

For Further Information Contact:

☐ **Nominated Trustee**

Title | Surname | First Name | Initials

Organisation

Address

Phone number | Fax

Client on system ☐

☐ **Knowledge Holder**

Title | Surname | First Name | Initials

Organisation

Address

Phone number | Fax

Client on system ☐

Aboriginal Heritage Unit or Cultural Heritage Division Contacts

Geographic Location

Site Name: Tom 1

Easting: 381860 Northing: 6367096 AGD/GDA: AGD

Mapsheet: Newcastle

Zone 56 Location Method: Non-Differential GPS

Other Registration:

Primary Recorder

Title: Ms Surname: McCardle First Name: Penny Initials:

Organisation: McCardle Cultural Heritage

Address: PO Box 166 Adamstown 2289

Phone number: 41270239 6 Fax: 49525501

Date recorded: 1/6/2012

Client on system ☐

NPWS Aboriginal Site Recording Form - Site Information

OPEN/CLOSE SITE Open Site

Site Context

Landform

- [ ] Mountainous
- [ ] Plain
- [ ] Rolling hills
- [ ] Steep hills
- [ ] Undulating plain

Slope

[ ] degrees

Landform Unit

- [ ] Beach
- [ ] Coastal rock platform
- [ ] Dune
- [ ] Intertidal flat
- [ ] Lagoon
- [ ] Tidal Creek
- [ ] Tidal Flat
- [ ] Cliff
- [ ] Crest
- [ ] Flat
- [ ] Lower slope
- [ ] Mid slope
- [ ] Upper slope
- [ ] Plain
- [ ] Ridge
- [ ] Tor
- [ ] Valley flat
- [ ] Levy
- [x] Stream bank
- [ ] Stream channel
- [ ] Swamp
- [ ] Terrace
- [ ] Terrace flat

Vegetation

- [ ] Closed forest
- [ ] Grasslands
- [ ] Isolated clumps of trees
- [ ] Open forest
- [ ] Open woodland
- [ ] Scrub
- [ ] Woodland
- [ ] Cleared
- [ ] Revegetated
- [ ] N/A

Land use

- [ ] Conservation
- [ ] Established urban
- [ ] Farming-intensive
- [ ] Farming-low intensity
- [ ] Forestry
- [ ] Industrial
- [ ] Mining
- [ ] Pastoral/grazing
- [ ] Recreation
- [ ] Semi-rural
- [ ] Service corridor
- [ ] Transport corridor
- [ ] Urban expansion
- [ ] Residential

Water

Distance to permanent water source [ ] metres

Distance to temporary water source [ ] metres

Name of nearest permanent water source

Name of nearest temporary water

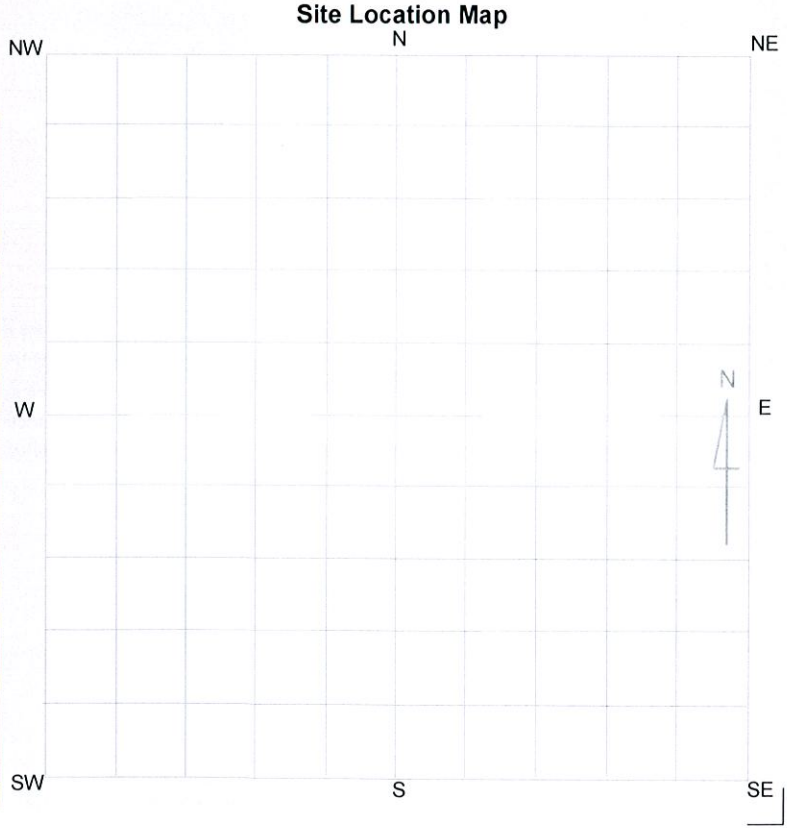
Directions for Relocation

Current Land Tenure

- [ ] Public — National Park / other Government Dept.
- [ ] Private

Primary report **I.D.** [ ] (I.D. Office Use only)

Site Location Map



NPWS Aboriginal Site Recording Form - Site Information

General Site Information

Closed Site

Shelter/Cave Formation

- ☐ Boulder
- ☐ Wind erosion
- ☐ Water erosion
- ☐ Rock collapse

Rock Surface Condition

- ☐ Boulder
- ☐ Sandstone platform
- ☐ Silica gloss
- ☐ Tessellated
- ☐ Weathered
- ☐ Other platform

Condition of Ceiling

- ☐ Boulder
- ☐ Sandstone platform
- ☐ Silica gloss
- ☐ Tessellated
- ☐ Weathered
- ☐ Other platform

Shelter Aspect

- ☐ North
- ☐ North East
- ☐ East
- ☐ South East
- ☐ South
- ☐ South West
- ☐ West
- ☐ North West

Open Site

Site Orientation

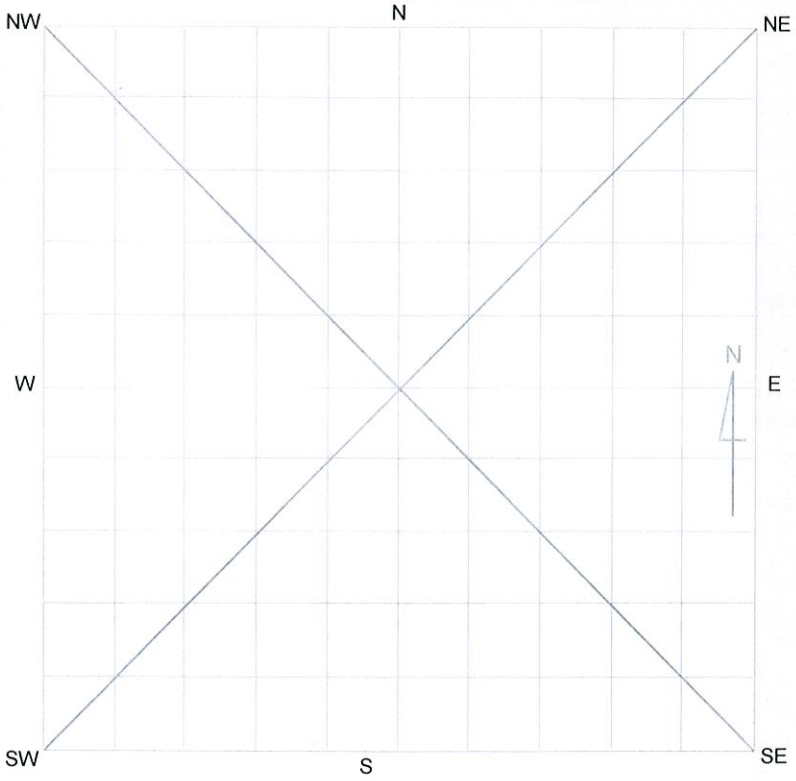
- ☐ N-S
- ☐ NE-SW
- ☐ E-W
- ☐ SE-NW
- ☑ N/A

Features

- ☐ 1. Aboriginal Ceremony & Dreaming
- ☐ 2. Aboriginal Resource & Gathering
- ☐ 3. Art
- ☑ 4. Artefact
- ☐ 5. Burial
- ☐ 6. Ceremonial Ring
- ☐ 7. Conflict
- ☐ 8. Earth Mound
- ☐ 9. Fish Trap
- ☐ 10. Grinding Groove
- ☐ 11. Habitation Structure
- ☐ 12. Hearth
- ☐ 13. Non Human Bone & Organic Material
- ☐ 14. Ochre quarry
- ☐ 15. Potential Archaeological Deposit
- ☐ 16. Stone Quarry
- ☑ 17. Shell
- ☐ 18. Stone Arrangement
- ☐ 19. Modified Tree
- ☐ 20. Water Hole

Site Plan

Indicate scale, boundaries of site, features



Site Dimensions

Closed Site Dimensions (m)

- ☐ Internal length
- ☐ Internal width
- ☐ Shelter height
- ☐ Shelter floor area

Open Site Dimensions (m)

- 20m Total length of visible site
- 5m Average width of visible site
- ☐ Estimated area of visible site
- ☐ Length of assessed site area

Aboriginal Community Interpretation and Management Recommendations

Shell midden, test excavation

Preliminary Site Assessment

Site Cultural & Scientific Analysis and Preliminary Management Recommendations

Moderate significance

Test excavation

This section should only be filled in by the Endorsees

Endorsed by: ☐ Knowledge Holder ☐ Nominated Trustee ☐ Native Title Holder ☐ Community Consensus

Title	Surname	First Name	Initials

Organisation

Address

Phone number Fax

Attachments (No.)

- ☐ A4 location map
- ☐ B/W photographs
- ☐ Colour photographs
- ☐ Slides
- ☐ Aerial photographs
- ☐ Site plans, drawings
- ☐ Recording tables
- ☐ Other
- ☐ Feature inserts-No. ☐

Comments

This site is located along the dune in the north and along a first order stream and the visible extent is approximately 20 metres in length and 5 metres on the southern side of the creek. Exposed through creek bank erosion, this site includes pieces of pipi and oyster. Its extent is unknown as the surrounding area is covered in dense pasture grass. This site forms part of TOM1/PAD

NPWS FEATURE RECORDING FORM - ARTEFACT

Site I.D. | Site Name | **Importance**

First recorded date

No. of instances

Recorded by

	Yes	No
Stone artefacts only		
Artefacts collected		
Permit issued		

Percentage of Non-stone Artefacts to Percentage of Stone Artefacts

0-9% | 10-19% | 20-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% | 80-89% | 90-100%

Feature Context & Condition

Scatter No. | Easting | Northing

Density (Artefact count per square metre)

Dimensions Length (m) | Width (m) | Depth (m)

	Yes	No
In situ		
Stratified		

Feature Condition

- Very good
- Good
- Poor

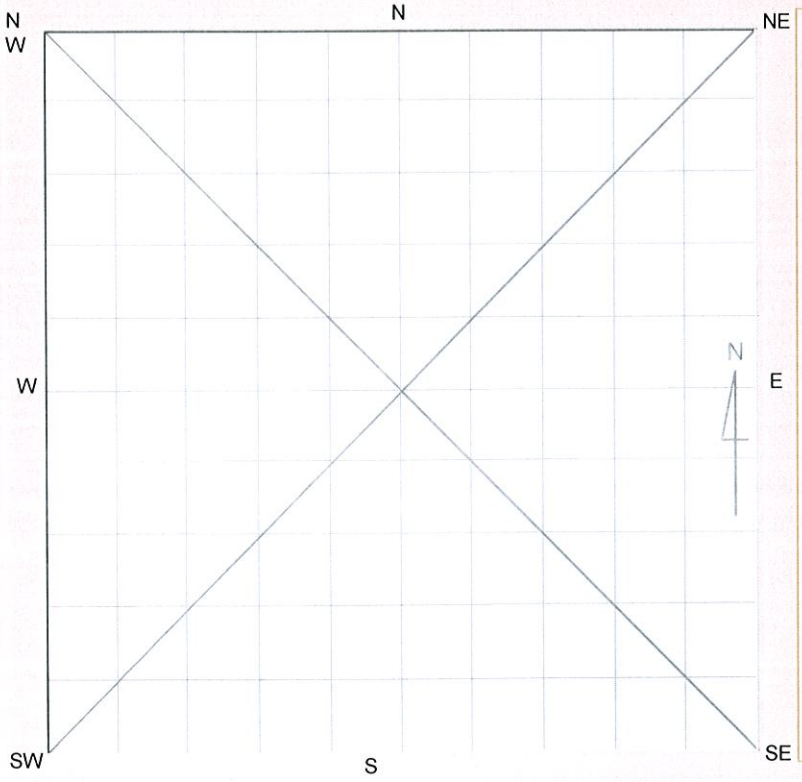
General Condition

- Weathered
- Vehicle damage
- Surface water wash
- Fire damage
- Erosion
- Stock damage
- Exposed archaeological material

Recommended Action

- Boardwalk
- Fencing
- Closure to public
- Continued inspection
- Fire hazard reduction
- Expert assessment
- Meeting with land manager
- Revegetation
- Signage
- Soil erosion control
- Track closure/re-routing
- Additional recording

Feature Plan (Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source

Name of nearest temporary water

Stone Artefact

Instance No.	Recording Date	Artefact Material	Artefact Type	Platform Surface	Platform Type	Termination	Cross Section	Length (mm)	Width (mm)	Thickness (mm)

Other Artefact Type

Instance No.	Recording Date	Artefact Material	Artefact Type	Description	Length (mm)	Width (mm)	Thickness (mm)

Material

Basalt
Chert
Fine grained siliceous
Granite
Quartz
Quartzite
Sandstone
Silcrete
Green glass
Amber glass
Amethyst glass
Clear glass
Ceramic
Porcelain
Tin can
Wire
Nail
Button
Shell
Bone
Wood
Resin

Artefact Description

Adze
Anvil
Axe
Backed blade
Blade
Core
Core tool
Cyclon
Distal fragment
Eloura
Flake
Flake tool
Flaked piece
Hammerstone
Manuport
Milling slab
Mortar
Muller
Nuclear tool
Pirri
Proximal fragment
Tula
Other diagnostic type
Modified
Unworked

Platform Surface

Cortex
Flake scar
More than one flake scar
Faceted
Ground
Indeterminate
Bipolar

Platform Type

W
Focal
Shattered
Indeterminate
Bipolar

Termination

Feather
Hinge
Step
Outrepasse
Bipolar

Cross Section

High/strong
High/weak
Low/weak
Irregular

Comments:

NPWS FEATURE RECORDING FORM - MODIFIED TREE

Site I.D. | Site Name

First recorded date | **Importance** | **Aboriginal Information Recorded?**

No. of instances

Recorded by

Feature description

Easting | Northing

No. of scars

No. of carved panels

Feature Condition

- Very good
- Good
- Poor

Condition

- Weathered
- Ringbarked
- Fire damage
- Vehicle damage
- Insects/termites
- Rot
- Limb fall
- Stock damage

Recommended Action

- Fencing
- Closure to public
- Continued inspection
- Expert assessment
- Fire hazard reduction
- Insect removal
- Meeting with land manager
- Rubbish removal
- Signage
- Tree health assessment
- Track closure/re-routing
- Additional recording

Feature environment

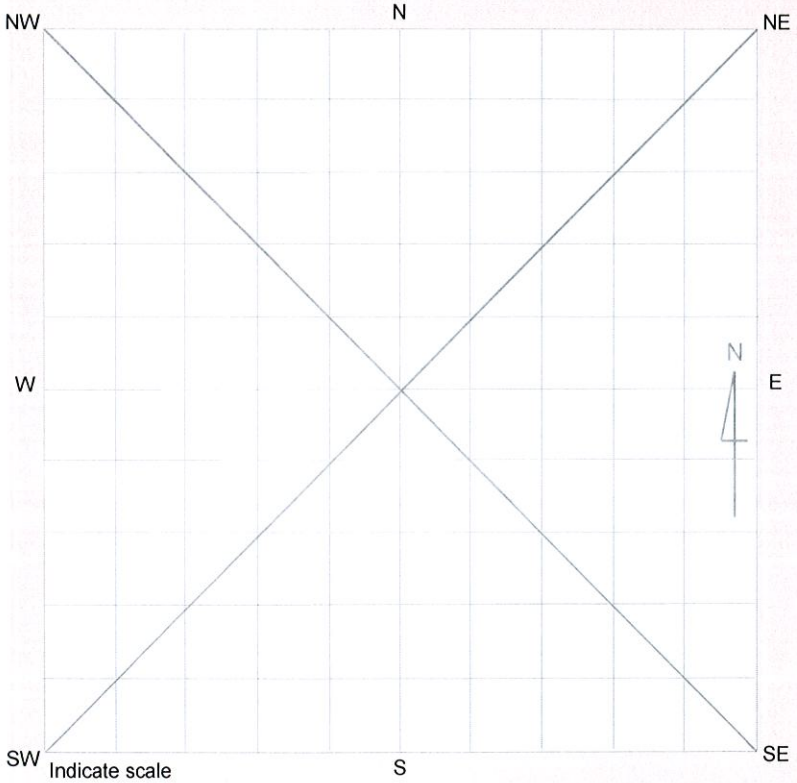
(Complete when *feature* environment differs to *site* environment, use attributes from cover card, page 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

- Distance to permanent water source ____ metres
- Distance to temporary water source ____ metres
- Name of nearest permanent water source
- Name of nearest temporary water

Feature Location Plan



Indicate scale

Scar/Carved Panel Drawing

Attach additional drawings

NPWS FEATURE RECORDING TABLE - MODIFIED TREE

Instance No.	Recording Date	Type	Species	Living Status	Tree Status	Regrowth	Length of Scar	Width of Scar	Depth	Height Above Ground	No. of Scars	Shape	No. of Carved Panels	Carving Type	Orientation	Axe Marks

Type of Tree	**Tree Species**	**L iving Status**	**Tree Status**	**Regrowth**
Carved Tree	Eucalypt	Dead	Standing	Yes
Scarred Tree	Red Gum	Alive	Lying down	No
Carved/Scarred Tree	Angotha	Dying	Partially felled	
			Subject to salinity	
			Not *in situ*	

Scar Shape	**Carving Type**	**Axe Marks**	**Orientation**
Oval	Linear	Metal	North East
Rectangular	Geometric	Stone	East
Square	Pictorial	Indeterminate	South East
Round			South
Other			South West
			West
			North West
			North

Comments:

NPWS FEATURE RECORDING FORM - GROOVE

Site I.D. ☐ Site Name ☐

First recorded date ☐/☐/☐ **Importance** ☐ **Aboriginal Information Recorded?** ☐

No. of instances ☐

Recorded by ☐

Feature Description

Type of Grinding Feature

- ☐ Broad
- ☐ Narrow/point
- ☐ Hollow
- ☐ Flat

Seed Species Present Recording date ☐/☐/☐

Groove Function

Dimensions

Profile Shape

- ☐ 'U' shaped
- ☐ 'V' shaped
- ☐ Flat

Smallest	Largest	
Length (mm)	Length (mm)	Groove count
Width (mm)	Width (mm)	Cluster count
Depth (mm)	Depth (mm)	

Feature Context & Condition

Easting ☐☐☐☐☐☐ Northing ☐☐☐☐☐☐☐

Dimensions of Whole Feature ☐ Length (m) ☐ Width (m)

Feature Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised

General Condition ctd

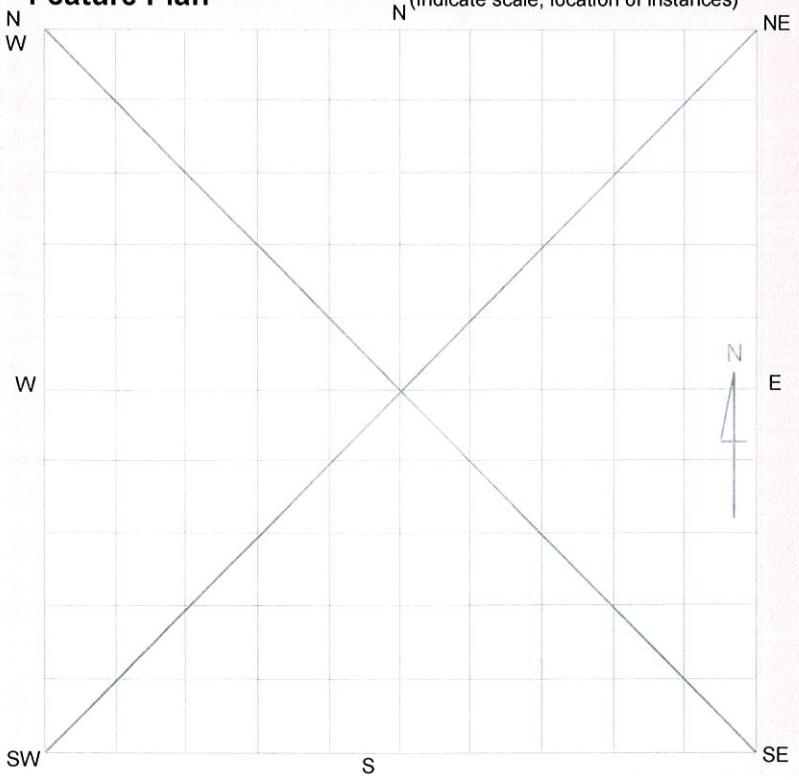
- ☐ Fire damage
- ☐ Surface water wash
- ☐ Graffiti
- ☐ Vehicle damage
- ☐ Erosion
- ☐ Stock damage

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Expert assessment
- ☐ Graffiti removal
- ☐ Meeting with land manager
- ☐ Revegetation
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Plan

N (Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- ☐ Land form
- ☐ Land form unit
- ☐ Slope
- ☐ Vegetation
- ☐ Land use

Water

Distance to permanent water source ☐ metres

Distance to temporary water source ☐ metres

Name of nearest permanent water source ☐

Name of nearest temporary water ☐

NPWS FEATURE RECORDING FORM - ART

Site I.D. ____ Site Name ____

First recorded date ____/____/____ **Importance** ____ **Aboriginal Information Recorded?** ____

No. of instances ____

Recorded by ____

Feature Context & Condition

Easting ____ Northing ____

Pigment ☐ Engraved ☐ Super-impositioning ☐

Artwork Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised
- ☐ Surface water wash
- ☐ Mineralisation
- ☐ Graffiti
- ☐ Fire damage
- ☐ Insects/termites
- ☐ Erosion
- ☐ Stock
- ☐ Unstable structure

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Dripline
- ☐ Expert assessment
- ☐ Fire hazard removal
- ☐ Graffiti removal
- ☐ Insect/bird nest removal
- ☐ Meeting with land manager
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

____ Land form

____ Land form unit

____ Slope

____ Vegetation

____ Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source ____

Name of nearest temporary water ____

Art Sketch Plan

Sketch and number motif groups

NPWS FEATURE RECORDING TABLE - ART MOTIF

Instance	Recording Date	Motif	Application Technique	Form	Main Colour	Location	Condition

Motif

Anthropomorphic
Bird
Bird Track
Canoe
Circle
Contact material culture
Duck
Eel
Emu
Emu track
European figure
Female
Fish
Foot
Hand
Jellyfish
Kangaroo
Line
Lizard
Macropod
Macropod Track
Male
Marine-Other
Other
Pattern
Quadruped
Reptile
Rifle
Shield
Ship
Snake
Spear
Wallaby

Application Technique

Abraded
Drawn
Other
Painted
Pecked
Pigment & Engraved
Stencilled

Form

Fill
Line
Line+ Fill
Other
Pattern

Main Colour

Black
Mauve *
N/A
Orange *
Other
Red *
White *
Yellow *

Art Location

All over shelter surfaces
ceiling
Floor
Mostly near largest sheltered space
Mostly on out of the way surfaces
Other
Wall

Condition

Faded
Stained
Mineralisation Evident
V brant Colours
Unweathered
Weathered

Comments:

NPWS FEATURE RECORDING FORM - SHELL

Site I.D. [ ] Site Name TOM1

First recorded date 1/6/2012 **Importance** Cannot be presently determined **Aboriginal Information Recorded?** [ ]

No. of instances [ ]

Recorded by MCH

Feature Context & Condition

Easting 3 8 1 8 6 0 Northing 6 3 6 7 0 9 6

Dimensions of Whole Feature 20 Length (m) 5 Width (m) [ ] Depth (m)

Shell Distribution

- [x] Surface scatter
- [ ] Stratified deposit
- [ ] Mounded

[ ] Distance to high water mark (m)

Feature Condition

- [ ] Very good
- [x] Good
- [ ] Poor

General Condition

- [x] Weathered
- [ ] Vandalised
- [ ] Surface water wash
- [ ] Mineralisation
- [ ] Graffiti

General Condition ctd

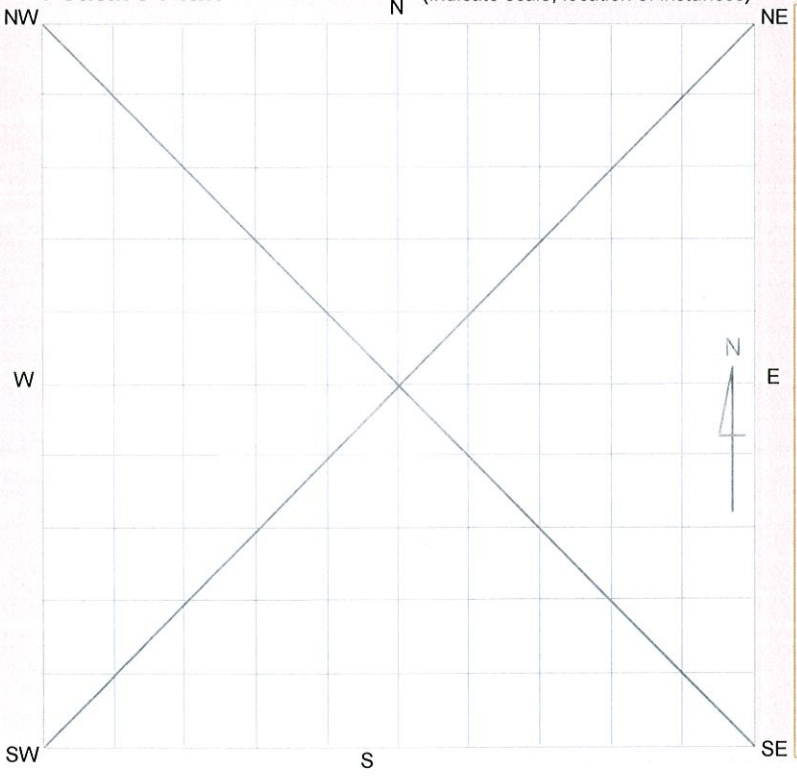
- [ ] Fire damage
- [ ] Vehicle damage
- [ ] Insects/termites
- [x] Erosion
- [x] Stock damage
- [ ] Unstable structure
- [ ] Exposed bone material
- [ ] Exposed archaeological material

Recommended Action

- [ ] Boardwalk
- [ ] Cage/barrier/fencing
- [ ] Closure to public
- [ ] Continued inspection
- [ ] Expert assessment
- [ ] Fire hazard removal
- [ ] Graffiti removal
- [ ] Meeting with land manager
- [ ] Insect/bird nest removal
- [ ] Revegetation
- [ ] Rubbish removal
- [ ] Signage
- [ ] Erosion control
- [ ] Track closure/re-routing
- [ ] Additional recording

Feature Plan

(Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- [ ] Land form
- [ ] Land form unit
- [ ] Slope
- [ ] Vegetation
- [ ] Land use

Water

Distance to permanent water source [ ] metres

Distance to temporary water source [ ] metres

Name of nearest permanent water source [ ]

Name of nearest temporary water [ ]

NPWS FEATURE RECORDING TABLE - SHELL

Instance No.	Recording Date	Shell Species	% of this species shell to % total of other shell

Species		Percentage of this Species Shell to Percentage Total of other Shell
Anadara	Nerita	0 – 9%
Bimbala	Ocean Snail	10 – 19%
Chiton	Periwinkle	20 – 29%
Cowrie	P	30 – 39%
Dog Cockle	Ribbed Cockle	40 – 49%
Duck Bill	Rock Oyster	50 – 59%
Limpit	Whiad	60 – 69%
Mud oyster	Triton	70 – 79%
Mutton Fish	Turban (large)	80 – 89%
		90 – 100%

Comments:

Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville NSW 2220

Office of Environment & Heritage

Office Use Only

Site Number _ _ _ _ _ _

Date received / / Date entered into system / / Date catalogued / /

Entered by (I.D.)

Information Access

☐ Gender/male ☐ Gender/female ☐ Location restriction ☐ General restriction ☐ No access

Office Use Only

For Further Information Contact:

☐ **Nominated Trustee**

Title | Surname | First Name | Initials

Organisation

Address

Phone number | Fax

Client on system ☐

☐ **Knowledge Holder**

Title | Surname | First Name | Initials

Organisation

Address

Phone number | Fax

Client on system ☐

Aboriginal Heritage Unit or Cultural Heritage Division Contacts

Geographic Location

Site Name: Tom 2

Easting: 381984 Northing: 6367199 AGD/GDA: AGD

Mapsheet: Newcastle

Zone 56 Location Method: Non-Differential GPS

Other Registration

Primary Recorder

Title | Surname | First Name | Initials

Ms | McCardle | Penny

Organisation: McCardle Cultural Heritage

Address: PO Box 166 Adamstown 2289

Phone number: 41270239 6 Fax: 49525501

Date recorded: 1/6/2012

Client on system ☐

NPWS Aboriginal Site Recording Form - Site Information

OPEN/CLOSE SITE Open Site

Site Context

Landform

- [ ] Mountainous
- [ ] Plain
- [ ] Rolling hills
- [ ] Steep hills
- [ ] Undulating plain

Slope

[ ] degrees

Landform Unit

- [ ] Beach
- [ ] Coastal rock platform
- [ ] Dune
- [ ] Intertidal flat
- [ ] Lagoon
- [ ] Tidal Creek
- [ ] Tidal Flat
- [ ] Cliff
- [ ] Crest
- [ ] Flat
- [ ] Lower slope
- [ ] Mid slope
- [ ] Upper slope
- [ ] Plain
- [ ] Ridge
- [ ] Tor
- [ ] Valley flat
- [ ] Levy
- [ ] Stream bank
- [ ] Stream channel
- [ ] Swamp
- [x] Terrace
- [ ] Terrace flat

Vegetation

- [ ] Closed forest
- [ ] Grasslands
- [ ] Isolated clumps of trees
- [ ] Open forest
- [ ] Open woodland
- [ ] Scrub
- [ ] Woodland
- [x] Cleared
- [ ] Revegetated
- [ ] N/A

Land use

- [ ] Conservation
- [ ] Established urban
- [ ] Farming-intensive
- [ ] Farming-low intensity
- [ ] Forestry
- [ ] Industrial
- [ ] Mining
- [x] Pastoral/grazing
- [ ] Recreation
- [ ] Semi-rural
- [ ] Service corridor
- [ ] Transport corridor
- [ ] Urban expansion
- [ ] Residential

Water

Distance to permanent water source [ ] metres

Distance to temporary water source [ ] metres

Name of nearest permanent water source

Name of nearest temporary water

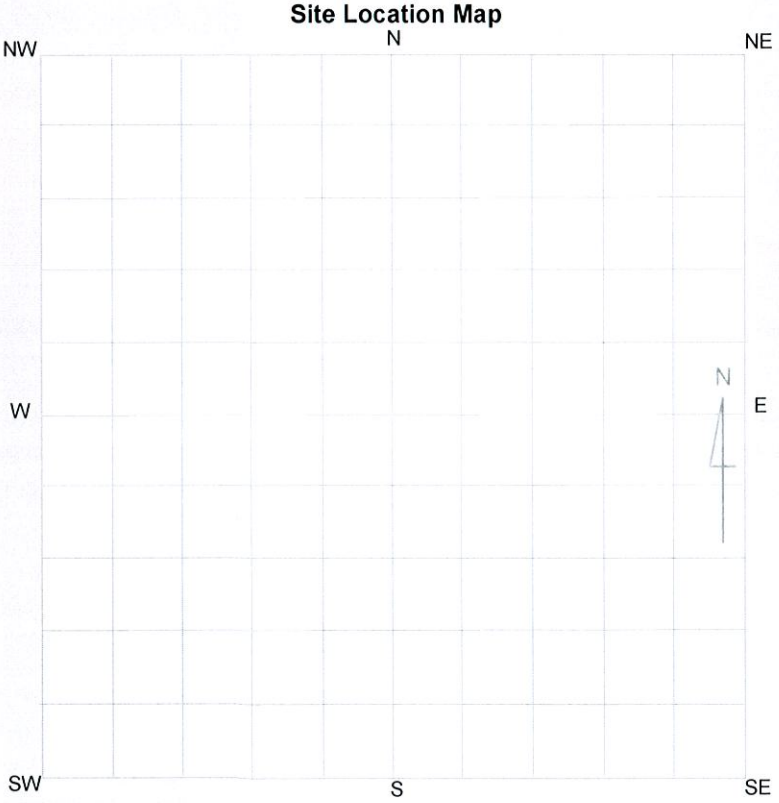
Directions for Relocation

Current Land Tenure

- [ ] Public — National Park / other Government Dept.
- [ ] Private

Primary report **I.D.** [ ] (I.D. Office Use only)

Site Location Map



NPWS Aboriginal Site Recording Form - Site Information

General Site Information

Closed Site

Shelter/Cave Formation

- [ ] Boulder
- [ ] Wind erosion
- [ ] Water erosion
- [ ] Rock collapse

Rock Surface Condition

- [ ] Boulder
- [ ] Sandstone platform
- [ ] Silica gloss
- [ ] Tessellated
- [ ] Weathered
- [ ] Other platform

Condition of Ceiling

- [ ] Boulder
- [ ] Sandstone platform
- [ ] Silica gloss
- [ ] Tessellated
- [ ] Weathered
- [ ] Other platform

Shelter Aspect

- [ ] North
- [ ] North East
- [ ] East
- [ ] South East
- [ ] South
- [ ] South West
- [ ] West
- [ ] North West

Open Site

Site Orientation

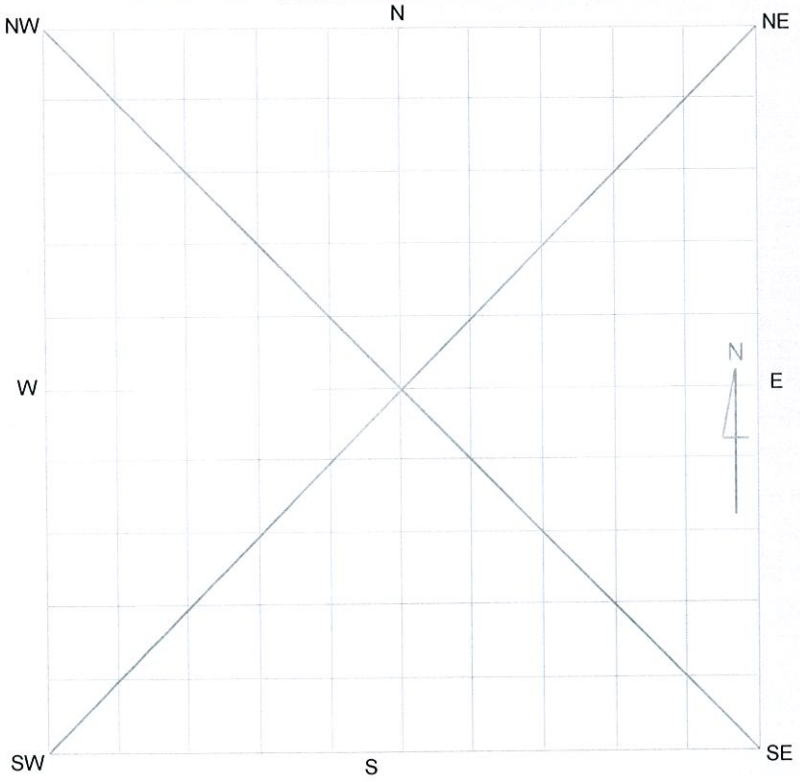
- [ ] N-S
- [ ] NE-SW
- [ ] E-W
- [ ] SE-NW
- [x] N/A

Features

- [ ] 1. Aboriginal Ceremony & Dreaming
- [ ] 2. Aboriginal Resource & Gathering
- [ ] 3. Art
- [x] 4. Artefact
- [ ] 5. Burial
- [ ] 6. Ceremonial Ring
- [ ] 7. Conflict
- [ ] 8. Earth Mound
- [ ] 9. Fish Trap
- [ ] 10. Grinding Groove
- [ ] 11. Habitation Structure
- [ ] 12. Hearth
- [ ] 13. Non Human Bone & Organic Material
- [ ] 14. Ochre quarry
- [ ] 15. Potential Archaeological Deposit
- [ ] 16. Stone Quarry
- [x] 17. Shell
- [ ] 18. Stone Arrangement
- [ ] 19. Modified Tree
- [ ] 20. Water Hole

Site Plan

Indicate scale, boundaries of site, features



Site Dimensions

Closed Site Dimensions (m)

- [ ] Internal length
- [ ] Internal width
- [ ] Shelter height
- [ ] Shelter floor area

Open Site Dimensions (m)

- [20m] Total length of visible site
- [10m] Average width of visible site
- [ ] Estimated area of visible site
- [ ] Length of assessed site area

Aboriginal Community Interpretation and Management Recommendations

Shell midden, test excavation

Preliminary Site Assessment

Site Cultural & Scientific Analysis and Preliminary Management Recommendations

Moderate significance

Test excavation

This section should only be filled in by the Endorsees

Endorsed by: ☐ Knowledge Holder ☐ Nominated Trustee ☐ Native Title Holder ☐ Community Consensus

Title	Surname	First Name	Initials

Organisation

Address

Phone number Fax

Attachments (No.)

- ☑ A4 location map
- ☐ B/W photographs
- ☐ Colour photographs
- ☐ Slides
- ☐ Aerial photographs
- ☐ Site plans, drawings
- ☐ Recording tables
- ☐ Other
- ☐ Feature inserts-No. ☐

Comments

This site is located along the dune to the north. Exposed through house demolition, tracks and erosion, the visible extent of this site is spread over an area of approximately 10 metres in length and 20 metres in width. Containing large and small pieces of pipi and oyster as well as tuff artefacts, the surface material is highly disturbed through previous land uses. This site forms part of TOM1/PAD

NPWS FEATURE RECORDING FORM - ARTEFACT

Site I.D. | Site Name | **Importance**

First recorded date

No. of instances

Recorded by

	Yes	No
Stone artefacts only		
Artefacts collected		
Permit issued		

Percentage of Non-stone Artefacts to Percentage of Stone Artefacts

0-9% | 10-19% | 20-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% | 80-89% | 90-100%

Feature Context & Condition

Scatter No. | Easting | Northing

Density (Artefact count per square metre)

Dimensions Length (m) | Width (m) | Depth (m)

	Yes	No
In situ		
Stratified		

Feature Condition

- Very good
- Good
- Poor

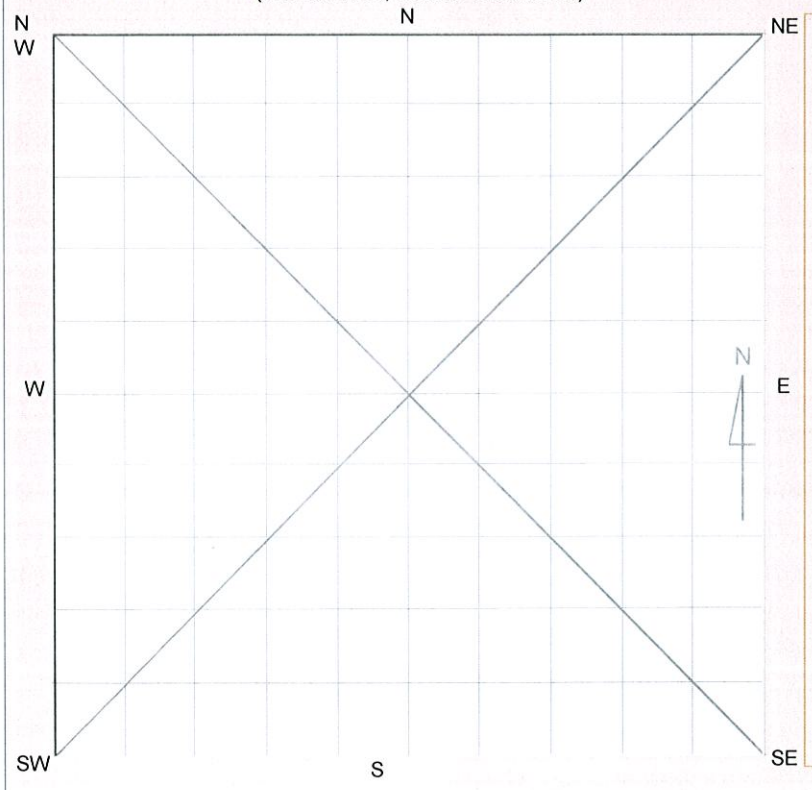
General Condition

- Weathered
- Vehicle damage
- Surface water wash
- Fire damage
- Erosion
- Stock damage
- Exposed archaeological material

Recommended Action

- Boardwalk
- Fencing
- Closure to public
- Continued inspection
- Fire hazard reduction
- Expert assessment
- Meeting with land manager
- Revegetation
- Signage
- Soil erosion control
- Track closure/re-routing
- Additional recording

Feature Plan (Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source

Name of nearest temporary water

NPWS FEATURE RECORDING TABLE - ARTEFACT

Stone Artefact

Instance No.	Recording Date	Artefact Material	Artefact Type	Platform Surface	Platform Type	Termination	Cross Section	Length (mm)	Width (mm)	Thickness (mm)

Other Artefact Type

Instance No.	Recording Date	Artefact Material	Artefact Type	Description	Length (mm)	Width (mm)	Thickness (mm)

Material

Basalt
Chert
Fine grained siliceous
Granite
Quartz
Quartzite
Sandstone
Silcrete
Green glass
Amber glass
Amethyst glass
Clear glass
Ceramic
Porcelain
Tin can
Wire
Nail
Button
Shell
Bone
Wood
Resin

Artefact Description

Adze
Anvil
Axe
Backed blade
Blade
Core
Core tool
Cyclon
Distal fragment
Eloura
Flake
Flake tool
Flaked piece
Hammerstone
Manuport
Milling slab
Mortar
Muller
Nuclear tool
Pirri
Proximal fragment
Tula
Other diagnostic type
Modified
Unworked

Platform Surface

Cortex
Flake scar
More than one flake scar
Faceted
Ground
Indeterminate
Bipolar

Termination

Feather
Hinge
Step
Outrepasse
Bipolar

Platform Type

W
Focal
Shattered
Indeterminate
Bipolar

Cross Section

High/strong
High/weak
Low/weak
Irregular

Comments:

NPWS FEATURE RECORDING FORM - MODIFIED TREE

Site I.D. | Site Name

First recorded date | **Importance** | **Aboriginal Information Recorded?**

No. of instances

Recorded by

Feature description

Easting | Northing

No. of scars

No. of carved panels

Feature Condition

- Very good
- Good
- Poor

Condition

- Weathered
- Ringbarked
- Fire damage
- Vehicle damage
- Insects/termites
- Rot
- Limb fall
- Stock damage

Recommended Action

- Fencing
- Closure to public
- Continued inspection
- Expert assessment
- Fire hazard reduction
- Insect removal
- Meeting with land manager
- Rubbish removal
- Signage
- Tree health assessment
- Track closure/re-routing
- Additional recording

Feature environment

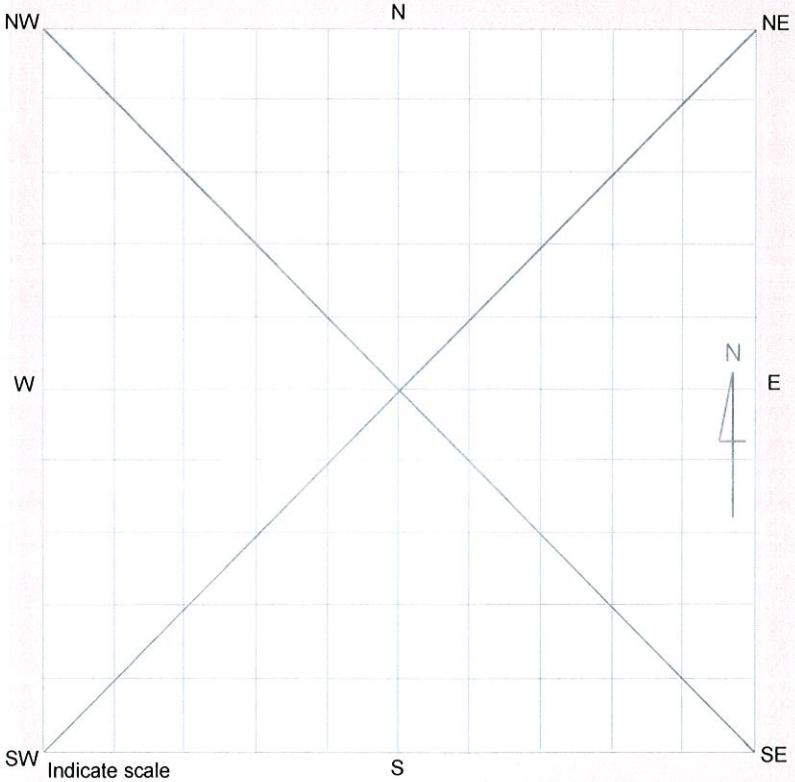
(Complete when *feature* environment differs to *site* environment, use attributes from cover card, page 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

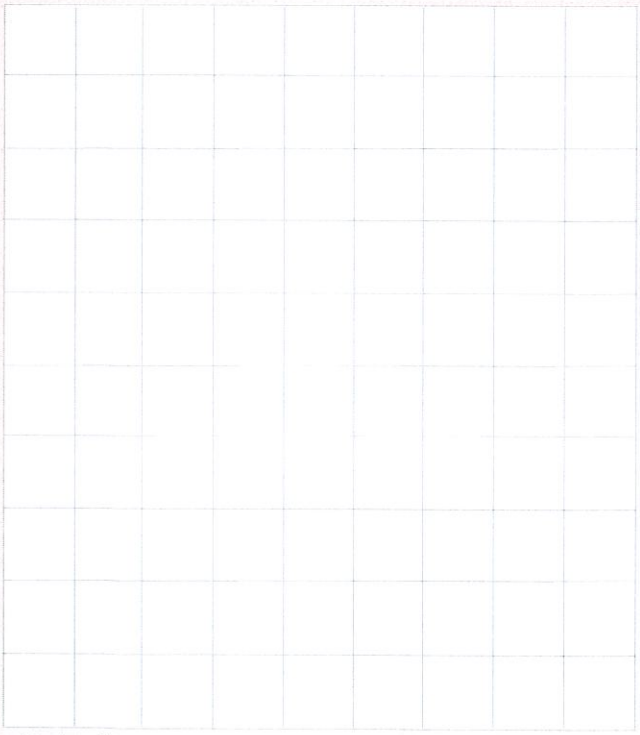
- Distance to permanent water source ____ metres
- Distance to temporary water source ____ metres
- Name of nearest permanent water source
- Name of nearest temporary water

Feature Location Plan



Indicate scale

Scar/Carved Panel Drawing



Attach additional drawings

NPWS FEATURE RECORDING TABLE - MODIFIED TREE

Instance No.	Recording Date	Type	Species	Living Status	Tree Status	Regrowth	Length of Scar	Width of Scar	Depth	Height Above Ground	No. of Scars	Shape	No. of Carved Panels	Carving Type	Orientation	Axe Marks

Type of Tree	**Tree Species**	**L iving Status**	**Tree Status**	**Regrowth**
Carved Tree	Eucalypt	Dead	Standing	Yes
Scarred Tree	Red Gum	Alive	Lying down	No
Carved/Scarred Tree	Angotha	Dying	Partially felled	
			Subject to salinity	
			Not *in situ*	

Scar Shape	**Carving Type**	**Axe Marks**	**Orientation**
Oval	Linear	Metal	North East
Rectangular	Geometric	Stone	East
Square	Pictorial	Indeterminate	South East
Round			South
Other			South West
			West
			North West
			North

Comments:

NPWS FEATURE RECORDING FORM - GROOVE

Site I.D. ☐ Site Name ☐

First recorded date ☐/☐/☐ **Importance** ☐ **Aboriginal Information Recorded?** ☐

No. of instances ☐

Recorded by ☐

Feature Description

Type of Grinding Feature

- ☐ Broad
- ☐ Narrow/point
- ☐ Hollow
- ☐ Flat

Seed Species Present

Recording date ☐/☐/☐

Groove Function

Dimensions

Profile Shape

- ☐ 'U' shaped
- ☐ 'V' shaped
- ☐ Flat

Smallest	Largest	
Length (mm)	Length (mm)	Groove count
Width (mm)	Width (mm)	Cluster count
Depth (mm)	Depth (mm)	

Feature Context & Condition

Easting ☐☐☐☐☐☐☐ Northing ☐☐☐☐☐☐☐

Dimensions of Whole Feature ☐ Length (m) ☐ Width (m)

Feature Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised

General Condition ctd

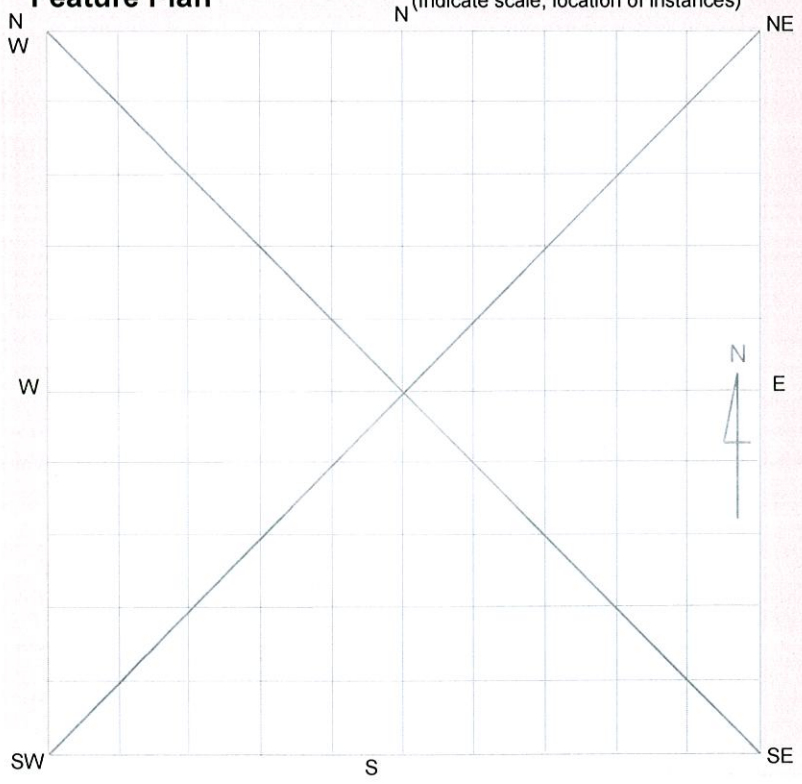
- ☐ Fire damage
- ☐ Surface water wash
- ☐ Graffiti
- ☐ Vehicle damage
- ☐ Erosion
- ☐ Stock damage

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Expert assessment
- ☐ Graffiti removal
- ☐ Meeting with land manager
- ☐ Revegetation
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Plan

(Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- ☐ Land form
- ☐ Land form unit
- ☐ Slope
- ☐ Vegetation
- ☐ Land use

Water

Distance to permanent water source ☐ metres

Distance to temporary water source ☐ metres

Name of nearest permanent water source ☐

Name of nearest temporary water ☐

NPWS FEATURE RECORDING FORM - ART

Site I.D. ____ Site Name ____

First recorded date ____/____/____ **Importance** ____ **Aboriginal Information Recorded?** ____

No. of instances ____

Recorded by ____

Feature Context & Condition

Easting ____ Northing ____

Pigment ☐ Engraved ☐ Super-impositioning ☐

Artwork Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised
- ☐ Surface water wash
- ☐ Mineralisation
- ☐ Graffiti
- ☐ Fire damage
- ☐ Insects/termites
- ☐ Erosion
- ☐ Stock
- ☐ Unstable structure

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Dripline
- ☐ Expert assessment
- ☐ Fire hazard removal
- ☐ Graffiti removal
- ☐ Insect/bird nest removal
- ☐ Meeting with land manager
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

____ Land form

____ Land form unit

____ Slope

____ Vegetation

____ Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source ____

Name of nearest temporary water ____

Art Sketch Plan

Sketch and number motif groups

NPWS FEATURE RECORDING TABLE - ART MOTIF

Instance	Recording Date	Motif	Application Technique	Form	Main Colour	Location	Condition

Motif

Anthropomorphic
Bird
Bird Track
Canoe
Circle
Contact material culture
Duck
Eel
Emu
Emu track
European figure
Female
Fish
Foot
Hand
Jellyfish
Kangaroo
Line
Lizard
Macropod
Macropod Track
Male
Marine-Other
Other
Pattern
Quadruped
Reptile
Rifle
Shield
Ship
Snake
Spear
Wallaby

Application Technique

Abraded
Drawn
Other
Painted
Pecked
Pigment & Engraved
Stencilled

Form

Fill
Line
Line+ Fill
Other
Pattern

Main Colour

Black
Mauve *
N/A
Orange *
Other
Red *
White *
Yellow *

Art Location

All over shelter surfaces
ceiling
Floor
Mostly near largest sheltered space
Mostly on out of the way surfaces
Other
Wall

Condition

Faded
Stained
Mineralisation Evident
V brant Colours
Unweathered
Weathered

Comments:

NPWS FEATURE RECORDING FORM - SHELL

Site I.D. | Site Name: TOM2

First recorded date: 1/6/2012 | **Importance:** Cannot be presently determined | **Aboriginal Information Recorded?**

No. of instances

Recorded by: MCH

Feature Context & Condition

Easting: 3 8 1 9 8 4 | Northing: 6 3 6 7 1 9 9

Dimensions of Whole Feature: 20 Length (m) | 10 Width (m) | Depth (m)

Shell Distribution

- [x] Surface scatter
- [ ] Stratified deposit
- [ ] Mounded

Distance to high water mark (m)

Feature Condition

- [ ] Very good
- [x] Good
- [ ] Poor

General Condition

- [x] Weathered
- [ ] Vandalised
- [ ] Surface water wash
- [ ] Mineralisation
- [ ] Graffiti

General Condition ctd

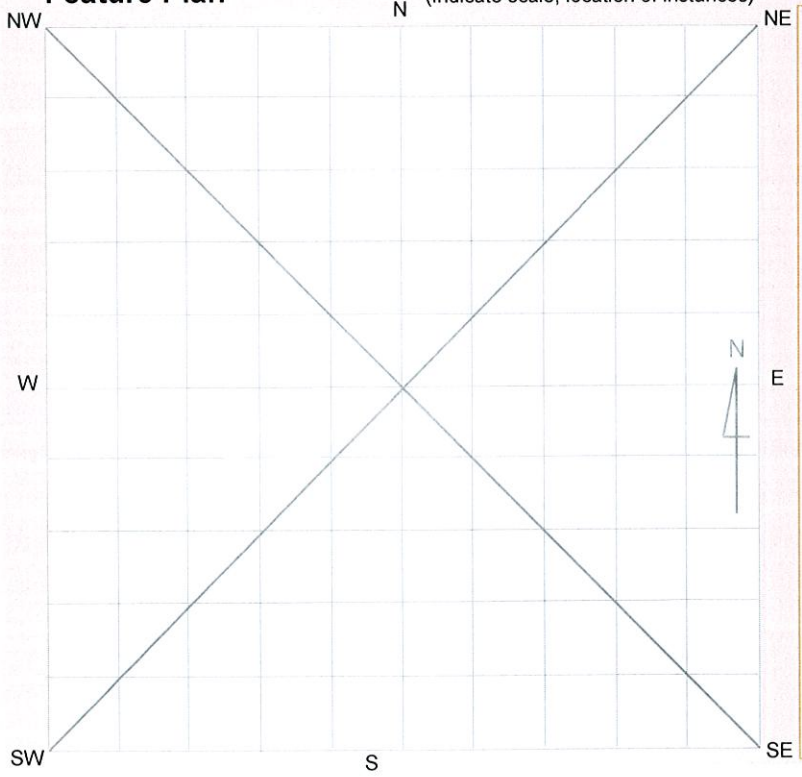
- [ ] Fire damage
- [ ] Vehicle damage
- [ ] Insects/termites
- [x] Erosion
- [x] Stock damage
- [ ] Unstable structure
- [ ] Exposed bone material
- [ ] Exposed archaeological material

Recommended Action

- [ ] Boardwalk
- [ ] Cage/barrier/fencing
- [ ] Closure to public
- [ ] Continued inspection
- [ ] Expert assessment
- [ ] Fire hazard removal
- [ ] Graffiti removal
- [ ] Meeting with land manager
- [ ] Insect/bird nest removal
- [ ] Revegetation
- [ ] Rubbish removal
- [ ] Signage
- [ ] Erosion control
- [ ] Track closure/re-routing
- [ ] Additional recording

Feature Plan

(Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

Distance to permanent water source: metres

Distance to temporary water source: metres

Name of nearest permanent water source

Name of nearest temporary water

NPWS FEATURE RECORDING TABLE - SHELL

Instance No.	Recording Date	Shell Species	% of this species shell to % total of other shell

Species		Percentage of this Species Shell to Percentage Total of other Shell
Anadara	Nerita	0 – 9%
Bimbala	Ocean Snail	10 – 19%
Chiton	Periwinkle	20 – 29%
Cowrie	P	30 – 39%
Dog Cockle	Ribbed Cockle	40 – 49%
Duck Bill	Rock Oyster	50 – 59%
Limpit	Whiad	60 – 69%
Mud oyster	Triton	70 – 79%
Mutton Fish	Turban (large)	80 – 89%
		90 – 100%

Comments:

Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville NSW 2220

Office of Environment & Heritage

Office Use Only

Site Number | | | - | | - | | | |

Date received / / Date entered into system / / Date catalogued / /

Entered by (I.D.)

Information Access

☐ Gender/male ☐ Gender/female ☐ Location restriction ☐ General restriction ☐ No access

Office Use Only

For Further Information Contact:

☐ **Nominated Trustee**

Title | Surname | First Name | Initials

Organisation

Address

Phone number | Fax

Client on system ☐

☐ **Knowledge Holder**

Title | Surname | First Name | Initials

Organisation

Address

Phone number | Fax

Client on system ☐

Aboriginal Heritage Unit or Cultural Heritage Division Contacts

Geographic Location

Site Name: Tom1 PAD

Easting: 381984 Northing: 6367199 AGD/GDA: AGD

Mapsheet: Newcastle

Zone 56 Location Method: Non-Differential GPS

Other Registration

Primary Recorder

Title | Surname | First Name | Initials

Ms | McCardle | Penny |

Organisation: McCardle Cultural Heritage

Address: PO Box 166 Adamstown 2289

Phone number: 41270239 6 Fax: 49525501

Date recorded: 1/6/2012

Client on system ☐

NPWS Aboriginal Site Recording Form - Site Information

OPEN/CLOSE SITE Open Site

Site Context

Landform

- [ ] Mountainous
- [ ] Plain
- [ ] Rolling hills
- [ ] Steep hills
- [ ] Undulating plain

Landform Unit

- [ ] Beach
- [ ] Coastal rock platform
- [ ] Dune
- [ ] Intertidal flat
- [ ] Lagoon
- [ ] Tidal Creek
- [ ] Tidal Flat
- [ ] Cliff
- [ ] Crest
- [ ] Flat
- [ ] Lower slope
- [ ] Mid slope
- [ ] Upper slope
- [ ] Plain
- [ ] Ridge
- [ ] Tor
- [ ] Valley flat
- [ ] Levy
- [ ] Stream bank
- [ ] Stream channel
- [ ] Swamp
- [x] Terrace
- [ ] Terrace flat

Slope

[ ] degrees

Vegetation

- [ ] Closed forest
- [ ] Grasslands
- [ ] Isolated clumps of trees
- [ ] Open forest
- [ ] Open woodland
- [ ] Scrub
- [ ] Woodland
- [x] Cleared
- [ ] Revegetated
- [ ] N/A

Land use

- [ ] Conservation
- [ ] Established urban
- [ ] Farming-intensive
- [ ] Farming-low intensity
- [ ] Forestry
- [ ] Industrial
- [ ] Mining
- [x] Pastoral/grazing
- [ ] Recreation
- [ ] Semi-rural
- [ ] Service corridor
- [ ] Transport corridor
- [ ] Urban expansion
- [ ] Residential

Water

Distance to permanent water source [ ] metres

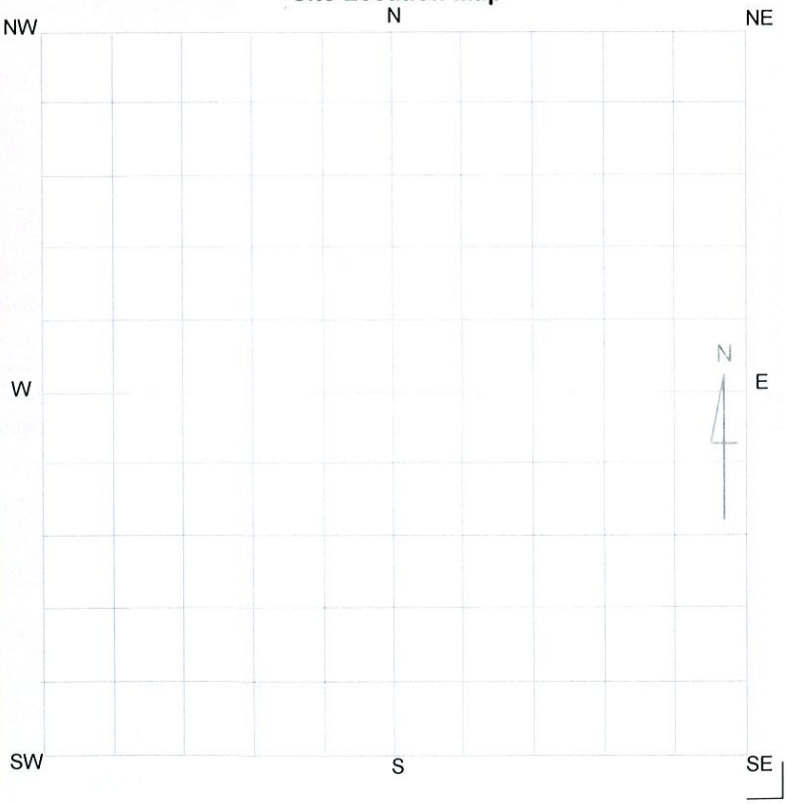
Distance to temporary water source [ ] metres

Name of nearest permanent water source

Name of nearest temporary water

Directions for Relocation

Site Location Map



Current Land Tenure

- [ ] Public — National Park / other Government Dept.
- [ ] Private

Primary report I.D. [ ] (I.D. Office Use only)

NPWS Aboriginal Site Recording Form - Site Information

General Site Information

Closed Site

Shelter/Cave Formation

- [ ] Boulder
- [ ] Wind erosion
- [ ] Water erosion
- [ ] Rock collapse

Rock Surface Condition

- [ ] Boulder
- [ ] Sandstone platform
- [ ] Silica gloss
- [ ] Tessellated
- [ ] Weathered
- [ ] Other platform

Condition of Ceiling

- [ ] Boulder
- [ ] Sandstone platform
- [ ] Silica gloss
- [ ] Tessellated
- [ ] Weathered
- [ ] Other platform

Shelter Aspect

- [ ] North
- [ ] North East
- [ ] East
- [ ] South East
- [ ] South
- [ ] South West
- [ ] West
- [ ] North West

Open Site

Site Orientation

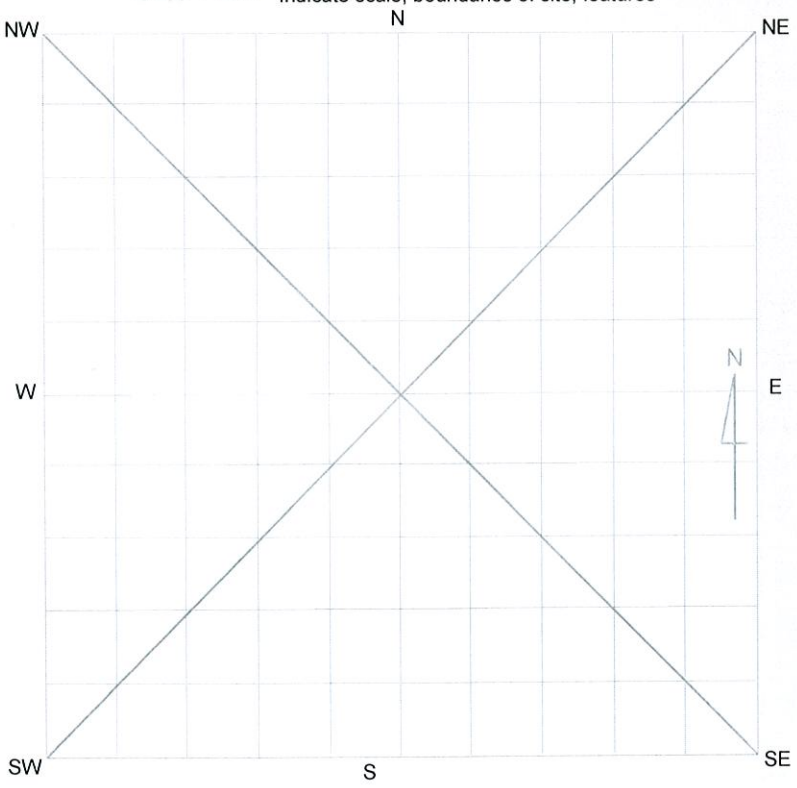
- [ ] N-S
- [ ] NE-SW
- [ ] E-W
- [ ] SE-NW
- [x] N/A

Features

- [ ] 1. Aboriginal Ceremony & Dreaming
- [ ] 2. Aboriginal Resource & Gathering
- [ ] 3. Art
- [x] 4. Artefact
- [ ] 5. Burial
- [ ] 6. Ceremonial Ring
- [ ] 7. Conflict
- [ ] 8. Earth Mound
- [ ] 9. Fish Trap
- [ ] 10. Grinding Groove
- [ ] 11. Habitation Structure
- [ ] 12. Hearth
- [ ] 13. Non Human Bone & Organic Material
- [ ] 14. Ochre quarry
- [ ] 15. Potential Archaeological Deposit
- [ ] 16. Stone Quarry
- [x] 17. Shell
- [ ] 18. Stone Arrangement
- [ ] 19. Modified Tree
- [ ] 20. Water Hole

Site Plan

Indicate scale, boundaries of site, features



Site Dimensions

Closed Site Dimensions (m)

	Internal length
	Internal width
	Shelter height
	Shelter floor area

Open Site Dimensions (m)

100	Total length of visible site
80	Average width of visible site
	Estimated area of visible site
	Length of assessed site area

Aboriginal Community Interpretation and Management Recommendations

Shell midden, test excavation

Preliminary Site Assessment

Site Cultural & Scientific Analysis and Preliminary Management Recommendations

Moderate significance

Test excavation

This section should only be filled in by the Endorsees

Endorsed by: ☐ Knowledge Holder ☐ Nominated Trustee ☐ Native Title Holder ☐ Community Consensus

Title	Surname	First Name	Initials

Organisation

Address

Phone number Fax

Attachments (No.)

- ✓ A4 location map
- ☐ B/W photographs
- ☐ Colour photographs
- ☐ Slides
- ☐ Aerial photographs
- ☐ Site plans, drawings
- ☐ Recording tables
- ☐ Other
- ☐ Feature inserts-No. ☐

Comments

This PAD includes the north dune overlooking the flood plain Included are the two surface sites (see above). Parts of this PAD have been subject to moderate disturbances such as the house construction and demolition, however, the majority appears to be relatively undisturbed. The PAD includes sites TOM1 and TOM2.

NPWS FEATURE RECORDING FORM - ARTEFACT

Site I.D. | Site Name | **Importance**

First recorded date

No. of instances

Recorded by

	Yes	No
Stone artefacts only		
Artefacts collected		
Permit issued		

Percentage of Non-stone Artefacts to Percentage of Stone Artefacts

0-9% | 10-19% | 20-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% | 80-89% | 90-100%

Feature Context & Condition

Scatter No. | Easting | Northing

Density (Artefact count per square metre)

Dimensions Length (m) | Width (m) | Depth (m)

	Yes	No
In situ		
Stratified		

Feature Condition

- Very good
- Good
- Poor

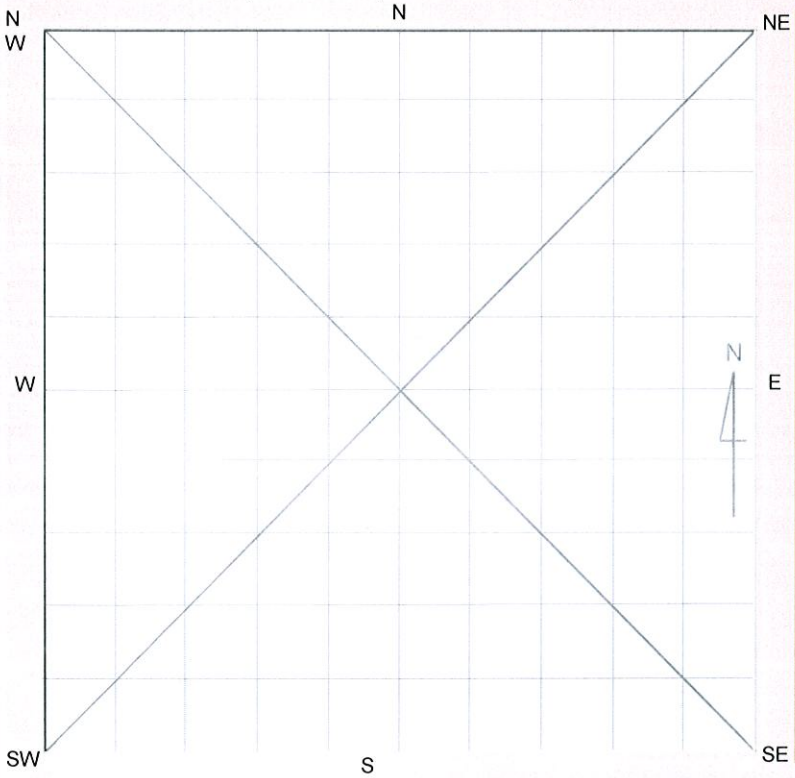
General Condition

- Weathered
- Vehicle damage
- Surface water wash
- Fire damage
- Erosion
- Stock damage
- Exposed archaeological material

Recommended Action

- Boardwalk
- Fencing
- Closure to public
- Continued inspection
- Fire hazard reduction
- Expert assessment
- Meeting with land manager
- Revegetation
- Signage
- Soil erosion control
- Track closure/re-routing
- Additional recording

Feature Plan (Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source

Name of nearest temporary water

NPWS FEATURE RECORDING TABLE - ARTEFACT

Stone Artefact

Instance No.	Recording Date	Artefact Material	Artefact Type	Platform Surface	Platform Type	Termination	Cross Section	Length (mm)	Width (mm)	Thickness (mm)

Other Artefact Type

Instance No.	Recording Date	Artefact Material	Artefact Type	Description	Length (mm)	Width (mm)	Thickness (mm)

Material

- Basalt
- Chert
- Fine grained siliceous
- Granite
- Quartz
- Quartzite
- Sandstone
- Silcrete
- Green glass
- Amber glass
- Amethyst glass
- Clear glass
- Ceramic
- Porcelain
- Tin can
- Wire
- Nail
- Button
- Shell
- Bone
- Wood
- Resin

Artefact Description

- Adze
- Anvil
- Axe
- Backed blade
- Blade
- Core
- Core tool
- Cyclon
- Distal fragment
- Eloura
- Flake
- Flake tool
- Flaked piece
- Hammerstone
- Manuport
- Milling slab
- Mortar
- Muller
- Nuclear tool
- Pirri
- Proximal fragment
- Tula
- Other diagnostic type
- Modified
- Unworked

Platform Surface

- Cortex
- Flake scar
- More than one flake scar
- Faceted
- Ground
- Indeterminate
- Bipolar

Termination

- Feather
- Hinge
- Step
- Outrepasse
- Bipolar

Platform Type

- W
- Focal
- Shattered
- Indeterminate
- Bipolar

Cross Section

- High/strong
- High/weak
- Low/weak
- Irregular

Comments:

NPWS FEATURE RECORDING FORM - MODIFIED TREE

Site I.D. | Site Name

First recorded date | **Importance** | **Aboriginal Information Recorded?**

No. of instances

Recorded by

Feature description

Easting | Northing

No. of scars

No. of carved panels

Feature Condition

- Very good
- Good
- Poor

Condition

- Weathered
- Ringbarked
- Fire damage
- Vehicle damage
- Insects/termites
- Rot
- Limb fall
- Stock damage

Recommended Action

- Fencing
- Closure to public
- Continued inspection
- Expert assessment
- Fire hazard reduction
- Insect removal
- Meeting with land manager
- Rubbish removal
- Signage
- Tree health assessment
- Track closure/re-routing
- Additional recording

Feature environment

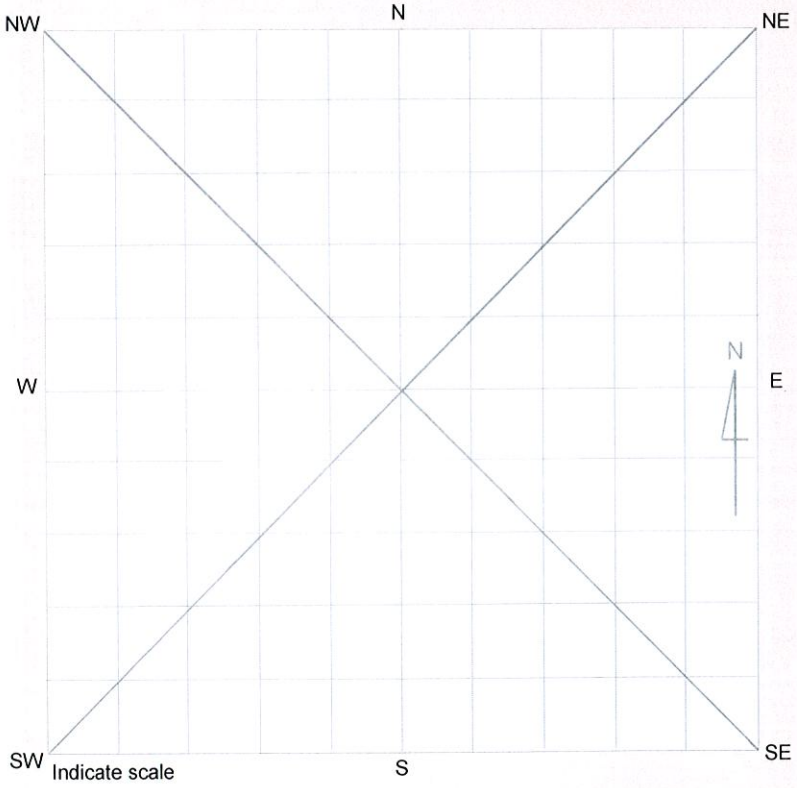
(Complete when *feature* environment differs to *site* environment, use attributes from cover card, page 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

- Distance to permanent water source ____ metres
- Distance to temporary water source ____ metres
- Name of nearest permanent water source
- Name of nearest temporary water

Feature Location Plan



Indicate scale

Scar/Carved Panel Drawing

Attach additional drawings

NPWS FEATURE RECORDING TABLE - MODIFIED TREE

Instance No.	Recording Date	Type	Species	Living Status	Tree Status	Regrowth	Length of Scar	Width of Scar	Depth	Height Above Ground	No. of Scars	Shape	No. of Carved Panels	Carving Type	Orientation	Axe Marks

Type of Tree	**Tree Species**	**L iving Status**	**Tree Status**	**Regrowth**
Carved Tree	Eucalypt	Dead	Standing	Yes
Scarred Tree	Red Gum	Alive	Lying down	No
Carved/Scarred Tree	Angotha	Dying	Partially felled	
			Subject to salinity	
			Not *in situ*	

Scar Shape	**Carving Type**	**Axe Marks**	**Orientation**
Oval	Linear	Metal	North East
Rectangular	Geometric	Stone	East
Square	Pictorial	Indeterminate	South East
Round			South
Other			South West
			West
			North West
			North

Comments:

NPWS FEATURE RECORDING FORM - GROOVE

Site I.D. ____ Site Name ____

First recorded date ____/____/____ **Importance** ____ **Aboriginal Information Recorded?** ____

No. of instances ____

Recorded by ____

Feature Description

Type of Grinding Feature

- ☐ Broad
- ☐ Narrow/point
- ☐ Hollow
- ☐ Flat

Seed Species Present

Recording date ____/____/____

Groove Function

Profile Shape

- ☐ 'U' shaped
- ☐ 'V' shaped
- ☐ Flat

Dimensions

Smallest	Largest	
Length (mm)	Length (mm)	Groove count
Width (mm)	Width (mm)	Cluster count
Depth (mm)	Depth (mm)	

Feature Context & Condition

Easting ____ Northing ____

Dimensions of Whole Feature ____ Length (m) ____ Width (m)

Feature Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised

General Condition ctd

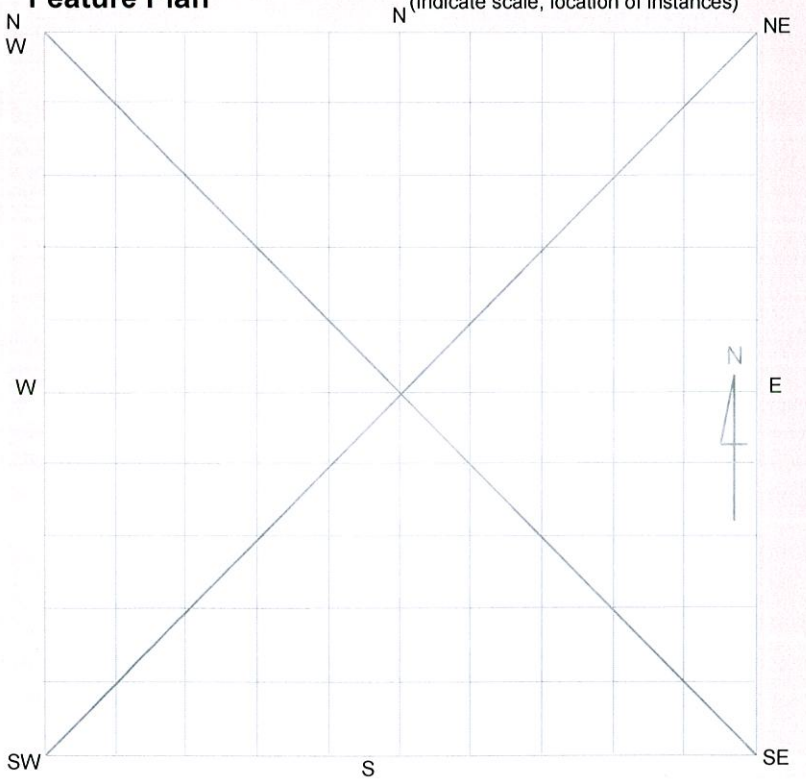
- ☐ Fire damage
- ☐ Surface water wash
- ☐ Graffiti
- ☐ Vehicle damage
- ☐ Erosion
- ☐ Stock damage

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Expert assessment
- ☐ Graffiti removal
- ☐ Meeting with land manager
- ☐ Revegetation
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Plan

(Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- ____ Land form
- ____ Land form unit
- ____ Slope
- ____ Vegetation
- ____ Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source ____

Name of nearest temporary water ____

NPWS FEATURE RECORDING FORM - ART

Site I.D. ____ Site Name ____

First recorded date ____/____/____ **Importance** ____ **Aboriginal Information Recorded?** ____

No. of instances ____

Recorded by ____

Feature Context & Condition

Easting ____ Northing ____

Pigment ☐ Engraved ☐ Super-impositioning ☐

Artwork Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised
- ☐ Surface water wash
- ☐ Mineralisation
- ☐ Graffiti
- ☐ Fire damage
- ☐ Insects/termites
- ☐ Erosion
- ☐ Stock
- ☐ Unstable structure

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Dripline
- ☐ Expert assessment
- ☐ Fire hazard removal
- ☐ Graffiti removal
- ☐ Insect/bird nest removal
- ☐ Meeting with land manager
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

____ Land form

____ Land form unit

____ Slope

____ Vegetation

____ Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source ____

Name of nearest temporary water ____

Art Sketch Plan

Sketch and number motif groups

NPWS FEATURE RECORDING TABLE - ART MOTIF

Instance	Recording Date	Motif	Application Technique	Form	Main Colour	Location	Condition

Motif

Anthropomorphic
Bird
Bird Track
Canoe
Circle
Contact material culture
Duck
Eel
Emu
Emu track
European figure
Female
Fish
Foot
Hand
Jellyfish
Kangaroo
Line
Lizard
Macropod
Macropod Track
Male
Marine-Other
Other
Pattern
Quadruped
Reptile
Rifle
Shield
Ship
Snake
Spear
Wallaby

Application Technique

Abraded
Drawn
Other
Painted
Pecked
Pigment & Engraved
Stencilled

Form

Fill
Line
Line+ Fill
Other
Pattern

Main Colour

Black
Mauve *
N/A
Orange *
Other
Red *
White *
Yellow *

Art Location

All over shelter surfaces
ceiling
Floor
Mostly near largest sheltered space
Mostly on out of the way surfaces
Other
Wall

Condition

Faded
Stained
Mineralisation Evident
V brant Colours
Unweathered
Weathered

Comments:

NPWS FEATURE RECORDING FORM - SHELL

Site I.D. | Site Name: TOM2

First recorded date: 1/6/2012 | **Importance:** Cannot be presently determined | **Aboriginal Information Recorded?**

No. of instances

Recorded by: MCH

Feature Context & Condition

Easting: 3 8 1 9 8 4 | Northing: 6 3 6 7 1 9 9

Dimensions of Whole Feature

100 Length (m) | 80 Width (m) | Depth (m)

Shell Distribution

- [x] Surface scatter
- [ ] Stratified deposit
- [ ] Mounded

Distance to high water mark (m)

Feature Condition

- [ ] Very good
- [x] Good
- [ ] Poor

General Condition

- [x] Weathered
- [ ] Vandalised
- [ ] Surface water wash
- [ ] Mineralisation
- [ ] Graffiti

General Condition ctd

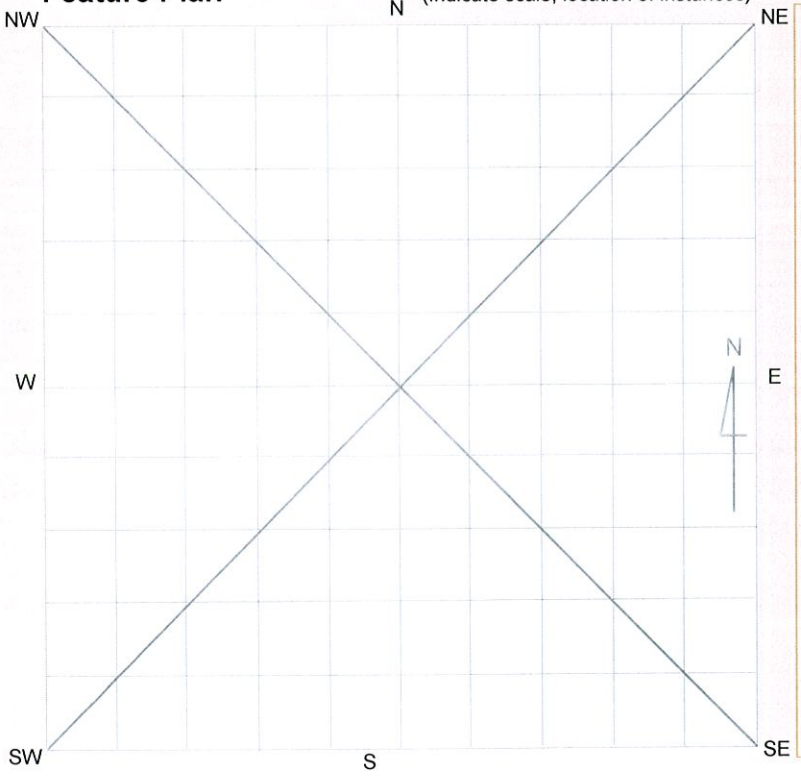
- [ ] Fire damage
- [ ] Vehicle damage
- [ ] Insects/termites
- [x] Erosion
- [x] Stock damage
- [ ] Unstable structure
- [ ] Exposed bone material
- [ ] Exposed archaeological material

Recommended Action

- [ ] Boardwalk
- [ ] Cage/barrier/fencing
- [ ] Closure to public
- [ ] Continued inspection
- [ ] Expert assessment
- [ ] Fire hazard removal
- [ ] Graffiti removal
- [ ] Meeting with land manager
- [ ] Insect/bird nest removal
- [ ] Revegetation
- [ ] Rubbish removal
- [ ] Signage
- [ ] Erosion control
- [ ] Track closure/re-routing
- [ ] Additional recording

Feature Plan

(Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

- Land form
- Land form unit
- Slope
- Vegetation
- Land use

Water

Distance to permanent water source: metres

Distance to temporary water source: metres

Name of nearest permanent water source

Name of nearest temporary water

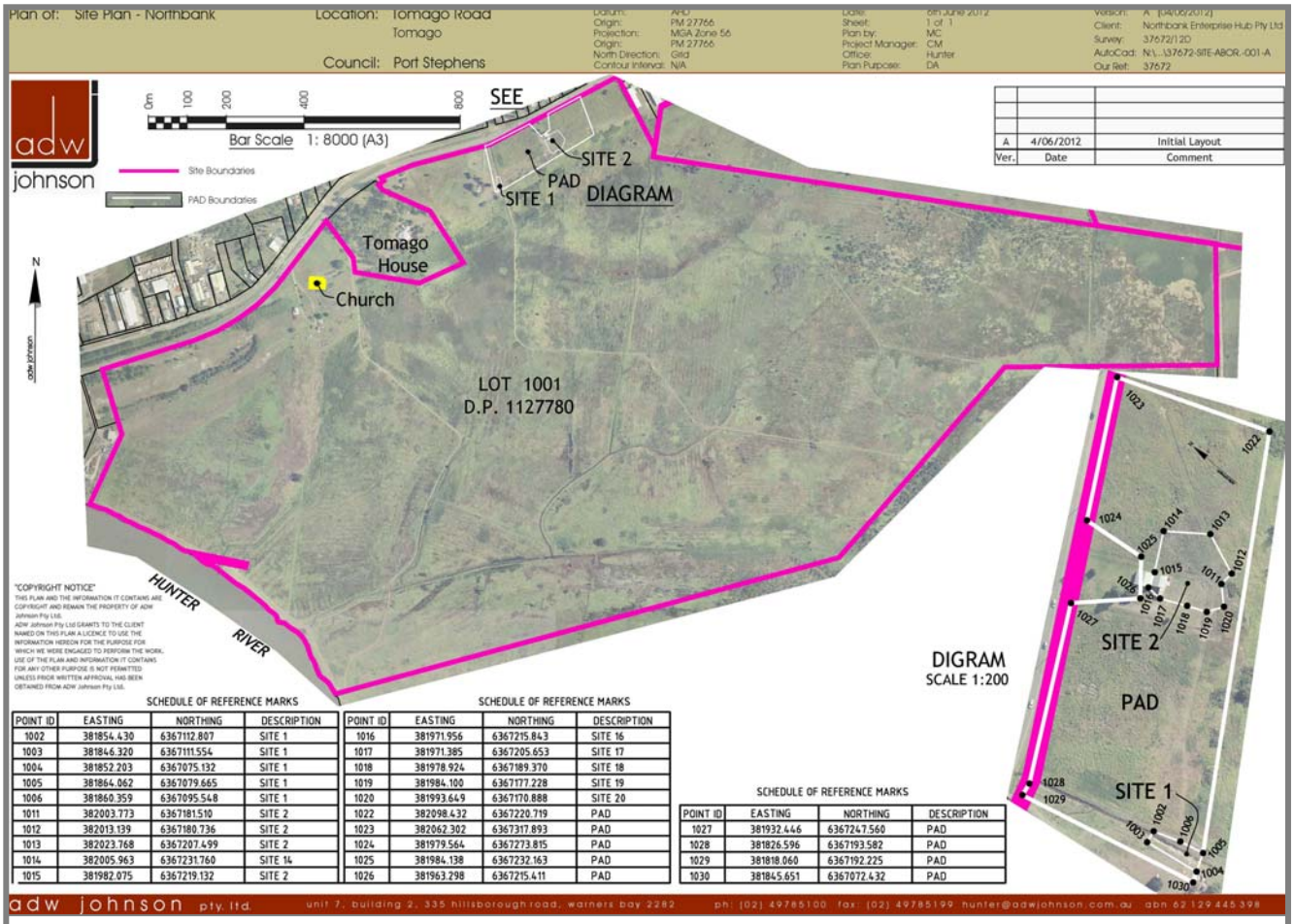
NPWS FEATURE RECORDING TABLE - SHELL

Instance No.	Recording Date	Shell Species	% of this species shell to % total of other shell

Species		Percentage of this Species Shell to Percentage Total of other Shell
Anadara	Nerita	0 – 9%
Bimbala	Ocean Snail	10 – 19%
Chiton	Periwinkle	20 – 29%
Cowrie	P	30 – 39%
Dog Cockle	Ribbed Cockle	40 – 49%
Duck Bill	Rock Oyster	50 – 59%
Limpit	Whiad	60 – 69%
Mud oyster	Triton	70 – 79%
Mutton Fish	Turban (large)	80 – 89%
		90 – 100%

Comments:

MCH:



POINT ID	EASTING	NORTHING	DESCRIPTION
1002	381854.430	6367112.807	SITE 1
1003	381846.320	6367111.554	SITE 1
1004	381852.203	6367075.132	SITE 1
1005	381864.062	6367079.665	SITE 1
1006	381860.359	6367095.548	SITE 1
1011	382003.773	6367181.510	SITE 2
1012	382013.139	6367180.736	SITE 2
1013	382023.768	6367207.499	SITE 2
1014	382005.963	6367231.760	SITE 14
1015	381982.075	6367219.132	SITE 2

POINT ID	EASTING	NORTHING	DESCRIPTION
1016	381971.956	6367215.843	SITE 16
1017	381971.385	6367205.653	SITE 17
1018	381978.924	6367189.370	SITE 18
1019	381984.100	6367177.228	SITE 19
1020	381993.649	6367170.888	SITE 20
1022	382098.432	6367220.719	PAD
1023	382062.302	6367317.893	PAD
1024	381979.564	6367273.815	PAD
1025	381984.138	6367232.163	PAD
1026	381963.298	6367215.411	PAD

POINT ID	EASTING	NORTHING	DESCRIPTION
1027	381932.446	6367247.560	PAD
1028	381826.596	6367193.582	PAD
1029	381818.060	6367192.225	PAD
1030	381845.651	6367072.432	PAD

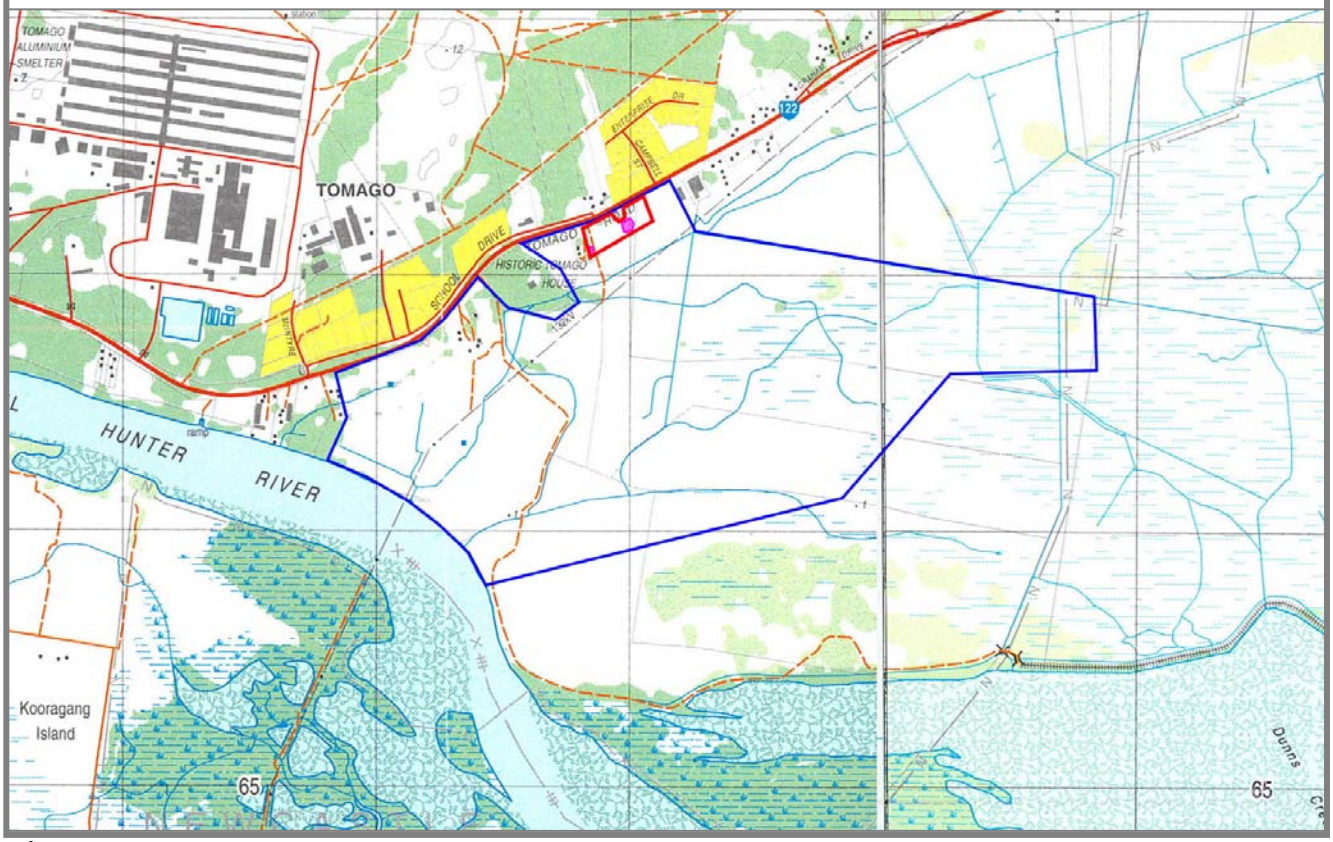


Figure 6.3 Sites Tom/1 and Tom/2 & TOM1/PAD1

Our Ref: N:\37672 Northbank\Worddocs\Report\Submission NSW DoPI 7 February 2013

7 February 2013

Mr Chris Ritchie
Manager – Industry
Major Projects Assessment
NSW Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Ritchie,

NORTHBANK ENTERPRISE HUB (MP 10_0185)

Thank you for providing a copy of the following submissions in relation to the proposed Northbank Enterprise Hub (NEH) development:

1. Letter from the Hunter-Central Rivers Catchment Management Authority dated 30 October 2012 (received by NEH on 22 January 2013); and
2. Letter from Equatica dated 20 December 2012 (received by NEH on 14 January 2013).

Following the meeting on 31 January 2013 between the NSW Department of Planning & Infrastructure (DoPI), the Office of Environment & Heritage (OEH), Equatica, ADW Johnson, WBM BMT and NEH to discuss the general matters raised in these submissions, we now provide a response to each matter raised.

We have also enclosed with this submission (see Attachment A) the amended Development Plans in response to the email from Emma Barnet dated 24 January 2012. The amended Development Plans clearly demonstrate that Lot 1 DP 534526, which is owned by the State Property Authority, does not form part of the subject development site.

CONTENTS

1. Hunter – Central Rivers Catchment Management Authority

CMA Comment:

Climate Change and Sea Level Rise

The CMA is concerned that the proposed filling of 154ha of wetland and the potential loss of its future value as a saltmarsh retreat area following predicted sea level rise. The CMA also has concerns regarding the sheer volume of fill, 3.7 million cubic metres, including the source and composition of the material and the final height of the development above sea level. The CMA comment that current flood modeling does not account for the predicted sea level rise of 90cm by 2100 and the problems associated with inundation of the development as a result of the combined forces of a major flood event, sea level rise and coastal setup processes.

NEH Response:

The subject site when owned by the NSW Government was rezoned by the NSW Government via the inclusion of the site as a State Significant Site under SEPP Major Projects 2005 (later called SEPP Major Developments). The rezoning of these lands followed the introduction of the Lower Hunter Regional Strategy that identified the subject site as employment lands and also identified relevant conservation lands around the site. The proposed development of the site remains consistent with the outcomes of the Lower Hunter Regional Strategy and rezoning. It is therefore not recognised as a potential saltmarsh retreat area.

Fill volume, source and composition of material has been previously identified in the submission. Runoff control during construction when the fill surface is exposed is proposed in accordance with standard control practices. Runoff flow direction toward the river rather than the conservation wetlands adjacent and monitoring is also proposed.

If in the event that sea level rise is shown to occur over the future generations, we have considered and allowed for several different contingency opportunities for maintaining the proposed development in its current form. There is currently over 2m elevation difference between the invert level of the floodgate for drainage and the peak water level during major storm events, hence potential of 0.9m rise can be accommodated. There is also a very high level of on site storage within the open drains for containing stormwater runoff during major events and as a result providing continuing protection to the adjacent wetlands.

We consider the flood modelling and design to adequately cater for the potential sea level rise over time, and as stated have in place an adaptable design to deal with changes as they may occur.

CMA Comment:

The potential negative impacts of freshwater runoff from the development on the surrounding Tomago Wetlands.

The CMA has been involved with ongoing work to plan and rehabilitate the Tomago Wetlands for nearly twenty years due primarily to its importance as migratory shorebird habitat. The project has received over $330,000 funding from the State and Federal Governments since 2005 and involves a significant contribution from National Parks & Wildlife Service (NPWS) and major 'in-

kind' support from Hunter Bird Observers Club (HBOC) and other community based organisations. The key restoration activity has been the installation of structures to allow the controlled opening of floodgates and the restoration of tidal saltwater flushing to the wetlands in this area.

The CMA notes that significant impacts on local drainage and flooding are likely to occur as a result of this proposal. The proposed filling of this wetland area to create a development footprint of over 154ha in immediately adjacent to internationally significant Ramsar wetlands will have a major effect on local hydrology and migratory shorebird habitat.

The CMA is concerned that increased levels of freshwater and contaminated runoff from the proposed development, especially during flooding, has the potential to jeopardize the Tomago Wetlands.

NEH Response:

NEH acknowledges the importance of the Tomago Wetlands and has a good track record of working with the relevant authorities to ensure that this remains the case. As outlined in Section 6.22 of the Environmental Assessment Report dated 24 August 2012 (and also confirmed in Attachment G of our submission dated 12 December 2012), there has been careful consideration for the wetland interface strategy that is dedicated to the ongoing protection of the conservation lands of Lot 1002 and Tomago Wetland Rehabilitation Project. Furthermore this plan has been developed in consultation with Port Waratah Coal Services (the adjoining owners) and their consultants to meet their conservation objectives of salt water inundation of Lot 1002. The water management for the proposed development provides for the delineation of freshwater inundation from upslope with discharge to the river and the limits for saltwater inundation, continuing the existing NPWS levee. Additionally, flexibility has been built into the water management system for ongoing adaptive management and adjustment to suit changes to conservation objectives of Lot 1002 adjacent to the proposed development.

NEH considers its wetland interface strategy to adequately demonstrate our detailed understanding of how to both protect our own site and the environmentally sensitive surrounds.

CMA Comment:

Impacts of the development on Threatened Species including the Eastern Grass Owl, 9 species of native bat and the Grey-headed Flying Fox and the potential for negative impacts on habitat for migratory bird species.

The CMA has concerns related to the impact that the proposal will have on biodiversity, threatened species and migratory shorebirds at the site. It is reported in the flora and fauna study by Ecobiological that a significant portion of the north/south vegetation corridor will be severed as a result of the development of Lot 1001.

This area contributes to the broader regional linkages that make up the Biodiversity 'Green Corridor' between Port Stephens, Hexham Swamp and the Sugarloaf Range south to the Watagans. This corridor is highly significant and recognised by the community and government as a very important resource for the conservation of regional Biodiversity. The area was officially identified as a 'coastal climate managed fauna retreat corridor' by Department of Environment and Climate Change in 2007 (now Office of Environment and Heritage).

The CMA notes that the proposal will result in the loss of at least one group of Eastern Grass Owls from the study area. Ecobiological completed a study of Grass Owls in the area in 2011 and identified 7 'Groups'. Although the consultant's report states that the loss of one Group is unlikely to reduce the long term viability of the local population they also state that further habitat loss and the effects of cumulative development may place the local population under extreme pressure for survival in the medium to long term. This proposal needs to be considered within the context of existing and future proposals planned for this area and the cumulative impacts that it will have on the Eastern Grass Owl population.

Hunter Bird Observers Club (HBOC) have been conducting monthly surveys over several years to document the results of restoring Tomago Wetlands as habitat for shorebirds , particularly international migratory shorebirds ,through the reinstatement of tidal flows. One measure of success is the numbers of waterbirds which appear after the restoration indicating that it is helping to redress the decline of many species of migratory shorebirds in the Hunter Estuary where some species show a decline as much as 80% and several species show declines of 50%. All migratory shorebirds are listed under the Environment Protection and Biodiversity Conservation Act.

The shorebird season 2012/2013 (September to April) has shown to date (October 2012) an increase in the diversity and numbers of shorebirds and an increase in other waterbirds such as Royal Spoonbills, Australian White Ibis, Black Swan, White- faced Heron, White-necked Heron, Australian Spotted Crake. So far this season seven species of migratory shorebirds have been seen: Latham's Snipe, Pacific Golden Plover, Marsh Sandpiper, Common Greenshank, Sharp-tailed Sandpiper , Eastern Curlew and Bar-tailed Godwit compared with previous years when only Sharp-tailed Sandpiper and Latham's Snipe have been present. Numbers of the resident shorebird Black-winged Stilt have increased and two additional resident shorebirds have been present, Black-fronted and Red-kneed Dotterel. Although numbers are small, they are significant in that they show that the wetland is becoming suitable once again as shorebird habitat with the prospect of improved functioning over time.

The Australasian Bittern is listed as endangered under national and state legislation and has always been present on site.

NEH Response:

<u>Corridor</u>

The subject site when owned by the NSW Government was rezoned by the NSW Government via the inclusion of the site as a State Significant Site under SEPP Major Projects 2005 (later called SEPP Major Development). The rezoning of these lands followed the introduction of the Lower Hunter Regional Strategy that identified the subject site as employment lands and also identified relevant conservation lands around the site. The proposed development of the site remains consistent with the outcomes of the Lower Hunter Regional Strategy and rezoning. The ecological work completed for the project does not identify any specific impacts on any corridors.

<u>Eastern Grass Owl</u>

The Ecological report has determined that the proposed impact on the Eastern Grass Owl across the region is not considered significant and this has been accepted by OEH. The subject site since 2006 has been identified in the Lower Hunter Regional Strategy as Employment lands with other lands

identified nearby for conservation. The proposed development does not impact on those lands identified for conservation.

Shorebirds

The Ecological report has established that the proposed development will have no significant impacts on shorebirds. The ecological reports includes reference to work completed by the Hunter Bird Observers. It is envisaged that an EPBC referral will be completed, despite the site not having development adjoining the immediate RAMSAR Wetlands.

CMA Comment:

Proposed Clearing of Endangered Ecological Communities (EEC) and Offsets

The CMA notes that there are 3 EECs proposed to be removed as part of the development proposal including Swamp Sclerophyll Forest (1.4ha); Swamp Oak Floodplain Forest (14.82ha) and Freshwater Wetlands on Coastal Floodplains (70.59ha). The CMA recommends retaining the 1.4ha of Swamp Sclerophyll Forest into the development proposal due to its habitat value, relatively small size and function as a visual and particulate screen and to incorporate the other EEC communities where possible.

The CMA expects the proponent to develop an offset package using either the Environmental Outcomes Assessment Methodology (EOAM) or Biobanking methodology and carried out by a qualified Biobanking practitioner. At the very least the proponent should incorporate the principles underpinning Biobanking and/or the EOAM in the development of offsets that meet the 'improve or maintain' test.

The CMA would appreciate the opportunity to review the package once completed.

The CMA notes that the amount of offset required could be reduced by retaining the Swamp Sclerophyll Forest and other EECs as outlined above. As the EIS does not contain adequate details of a specific offset package, the CMA is unable to properly assess or support the proposal at this time.

NEH Response:

NEH has had significant discussions and meetings with the Department of Planning & Infrastructure (DoPI) and OEH regrading the offsets package. After considering over 150 offset sites, NEH has identified and will shortly contract to acquire a site with strong biodiversity values in NSW. NEH will provide its offset consistent with the requirements of NSW DoPI and OEH.

CMA Comment:

Consistency with the Hunter-Central Rivers Catchment Action Plan

The Catchment Action Plan (CAP) is a whole-of government approach to natural resource management which has been endorsed by the NSW Government. The CAP contains specific guiding principles that outline how natural resource management should occur in the Hunter-Central Rivers region to improve or maintain environmental outcomes. The guiding principles for

biodiversity, land use planning and estuary and marine have particular relevance to this project. The CMA requests that these CAP guiding principles be taken into consideration both in the EIS and during implementation for the life of the project.

The following is a list of specific guiding principles with particular relevance to this proposal.

1. *The Landuse Planning Guiding Principles outlined in the CAP include "New release areas for residential and industrial development should be restricted to lands without significant natural resource constraints, including those areas already cleared of native vegetation (including significant native grassland), areas outside rural resource land, areas with less than 20% slope or those not comprising highly erodible soils (including acid sulfate soils)". This development clearly does not meet this Guiding Principle in the CAP and therefore cannot be supported by the CMA.*

2. *Minimising habitat destruction and improving the condition of habitat- The CMA will support in principle planning measures which reduce or avoid impacts of development on threatened species and communities such as Regional Conservation Plans and the Biodiversity Offsets 'Biobanking' scheme.*

3. *Maintain or improve the condition of estuary and marine areas -**If** estuarine or marine aquatic habitat must be disturbed as a result of development then other areas of wetland habitat should offset this loss.*

4. *To prevent species, populations and ecological communities from becoming threatened or extinct, it is important to preserve high quality saltmarsh, mangrove, estuarine, seagrass, marine and marine shoreline habitat that remains in the long-term. It is also important to improve degraded saltmarsh, mangrove, estuarine, seagrass, marine and marine shoreline habitat to increase the limited wetland habitat that now exists.*

5. *Habitat should be restored to a healthy state so native species are able to outcompete exotic species.*

6. *The cumulative impacts of development activities on our natural resources should be taken into consideration in landuse planning.*

7. *The use and development of natural resources should be sustainable.*

8. *Where practical, future development should be restricted to primarily cleared land. Where loss of vegetation is unavoidable, native vegetation offsets should be used.*

The CMA is also concerned about access arrangements to the Tomago Wetland restoration site should the development be approved. The CMA requires continued access for monitoring and evaluation purposes at this site.

NEH Response:

1. The site rezoning process has already been completed by the NSW Government which has determined that the locality is suitable as an employment zone. The proposed development is consistent with the objectives of the zone.

2. The proposed development has achieved an appropriate balanced outcome relative to the objectives of the Lower Hunter Regional Strategy. In addition to retention of on site habitat / vegetation an appropriate offset package has been developed.

3. An aquatic ecology report (refer to Appendix E of the EA Report dated 24 August 2012) has been submitted that establishes the proposed development has no significant adverse impact on estuarine or marine aquatic habitat.

4. The proposed development has maintained where possible EEC on site and has otherwise provided for an improved outcome through the offset process.

5. Existing habitat retained on site and new plantings will be typically of native vegetation maintained to a high standard.

6. This is a matter for determination as part of the land use rezoning process, and which has already been determined for this locality. In addition the proposed development provides for an appropriate offset arrangement.

7. The proposed development provides for a sustainable outcome, via the retention where possible of on site natural resources as otherwise make a significant contribution via an appropriate offset package.

8. The subject site is substantially cleared land. Where the existing native vegetation is proposed to be removed offsets are being provided for.

Access Arrangements - The proposed development will maintain and indeed improve access arrangements to nearby Tomago Wetland Restoration area.

We trust this adequately addresses the questions raised by the CMA.

2. Equatica

Equatica Comment:

Regional flooding
We note that the justification for not addressing impacts on flood levels immediately upstream of the site is due to current landuses. This is generally not considered a relevant factor.

NEH Response:

We understand that Equatica is satisfied with the flood modelling and results presented with respect of regional flooding. We note however that a separate document clarifying the regional flooding results will be forwarded to Equatica and OEH in due course.

The focus of this response is on the local drainage system and interactions to the wetlands, being the content of the letter dated 20 December 2012.

Equatica Comment:

Local Flooding and Drainage
There is a risk that the proposed development will have adverse impacts on drainage from neighbouring properties, as there are some properties along Tomago Road that drain through the site. The development has the potential to impede drainage from these properties, particularly in events where there is a large volume of runoff which fills site storages and can only drain slowly to the Hunter River.

Additional information is required to demonstrate how this risk will be addressed, including:

- *Additional information, including a catchment map of the areas north and west of Tomago Rd which drain through the site (if any areas west of Tomago Rd do drain through the site) as this is currently unclear;*
- *Additional information is requested on the storage assessment including:*
    - *A marked up plan showing the surface area of all storage areas (channels, overflow wetland, landscaped areas subject to ponding) with existing contours overlaid on this map;*
    - *The normal water level of the overflow wetland (as this will reduce storage volume available);*
    - *How the bioretention system provides any storage below 0.7 m AHD (as stated); and*
    - *It is noted that the calculated storage included in this response (285 ML) is different to that estimated by WBM of 100 ML (original submission).*
- *Additional information on the calculation of the drawdown time as:*
    - *5 to 10 days is a long duration over which drawdown occurs;*
    - *Due to the long drainage times of the storages (5 to 10 days) the analysis of relatively short rainfall events (e.g. 3 hours) is not a relevant comparison. The assessment needs to consider durations of 5 to 10 days; and*
    - *No mention has been made of increasing capacity of the existing flood gates.*

- *We note that there is low lying property upstream (Sheet 6 of 6) which could potentially be affected by afflux noting the long distances from the outlets to the low lying land on these properties;*
- *In consideration of all these issues, and as recommended in our reply on 16 November 2012, we recommend undertaking hydraulic modelling of the drainage system in the minor and major events to show hydraulic grade lines of the stormwater drainage system in an appropriate range of minor events with durations relevant to the length of drawdown.*

NEH Response:

Catchment Plan

External catchment delineation has been added to Sheet 1 of the existing set of plan sheets from the previously submitted Attachment 'B' (see submission dated 12 December 2012). Survey has confirmed that the box culvert under Tomago Road east of Tomago House has an invert level of 2.3mAHD. The box culvert is 1.2m wide x 0.3 high. The upslope catchment area of Lot 1001 is approximately 45ha over highly permeable sands and contains a number of sinks or low points which would accumulate stormwater prior to runoff to the culvert. Surface runoff is expected to be very low, whilst contribution to groundwater flows will be very high by comparison to conventional stormwater runoff and infiltration. The culvert level does however give good indication for peak acceptable levels of ponding within Lot 1001 without impeding any upstream flows drained through this culvert. BMT WBM's peak flood level for Channel 2 which will take this runoff is approximately 2.1mAHD, indicating that flow is not impeded during this event. Similarly, piped drainage from the small industrial subdivision north of Centurion Civil and Industrial Switchgear also within the catchment is also unimpeded.

Storage Areas

The existing contours and downstream storage areas have been overlaid and are indicated on Sheet 7. The area of channel widths is unchanged from Figure 6-1 of the BMT WBM Flooding and Drainage Assessment, August 2012 (see Appendix F of the EA Report) and the typical sections re-presented in this current submission (unchanged from our submission 12 December 2012).

There is approximately 29 hectares of storage area over landscaped areas between the levee bank and the fill platform extent. The average natural surface level is approximately 0.8mAHD. Digital terrain model results indicate a volume of 130ML of storage in this area measured from natural ground to the perimeter berm crest level of 1.2mAHD (and bound by the Hunter River levee bank). No allowance has been made for the storage within the decorative pond indicated on the plans, that will be similar to the overflow wetland. Only a very small proportion of this storage lies on the western side of the 900mm dia floodgate. As described previously, the overflow wetland area is 10 hectares, providing 100ML when measured from the long term groundwater level 0.2mAHD in this area up to 1.2mAHD perimeter berm crest level, or 70ML when starting levels are assumed to be 0.5mAHD. To clarify, there is no duplication of the channel storages with this downstream storage area outside the fill platform.

Normal water level of overflow wetland

Groundwater modelling indicates that the water level in the overflow wetland is predicted to be 0.2mAHD as the long term average post development. This level is equivalent to the base invert

level of the overflow wetland being created. The overflow wetland area lies adjacent to the floodgate outlet with invert level of -0.86mAHD, having approximately 1m of head at this elevation at low tide. The area is expected to remain ponded with standing water after rainfall, potentially 5-10 days after the event, depending on starting conditions such as tide/river level, storm duration and rainfall pattern and any lead up prior rain events.

Bioretention system provides storage below 0.7mAHD

This point is made from text contained under Section 2 Analysis 'Channel storages in smaller storms' summary in Attachment 'B'. We agree that there is no bioretention system storage below 0.7mAHD. To clarify, the storage measure provided was a summed total availability for stormwater from within the channel storage above a base groundwater level 0.5mAHD to 0.7mAHD combined with the void storage in the gravels of the bioretention system. This was intended to quantify the capacity of the lower base level of the stormwater system for runoff from only minor storms and provides a guide to the stage/storage of the water management system.

Difference to WBM storage

The BMT WBM report indicating 100ML of storage is referring to the overflow wetland storage of 10 hectares. The description didn't include any of the channel storage or aboveground storage of landscaped area adjacent to the overflow wetland. The ADWJ comment regarding 285ML is from Section 2 Analysis 'Channel storages in larger storms' summary in Attachment 'B' is a different reference. Further clarification of the storage areas is provided on Sheets 1 and 7.

5-10 days long duration

It is accepted this is a longer duration for drawdown than conventional development, however there is no consequence to the proposed development or adjoining lands when this water remains in the channels for this period of time. In our view this is a positive in terms of increased residence time for improving water quality (although not relied upon in the water quality modelling). It is also an ecological benefit to have continuing ephemeral freshwater wetland corridors up through the site, adjacent to the conservation wetlands.

Capacity for longer durations

The BMT WBM 1 ARI year, 7 day maximum runoff volume is predicted to be 210ML post development (From BMT WBM Stormwater Assessment, 17 August 2012) for the modelled period of 1999 to 2006. WBM has completed a check of the rainfall data for the entire record period for Williamtown (1953 to 2010) and compared this with the rainfall totals for the modelled period (1999 to 2006). The maximum 7-day average runoff volume of 58ML/day (i.e. total of 7 x 58 = 406ML) shown in the plots in the WBM report occurred in May 2001 over a 7 day period where a total rainfall of 238mm fell. Within the entire record for Williamtown this 7 day total is only exceeded for four 'events'. The May 2001 event is then approximately a 10 year ARI 7-day event based on the entire record.

The five highest 7-day rainfall totals on record for Williamtown are:

9/5/2001	238mm
12/6/64	241mm
7/5/98	243mm

28/4/63 270mm
8/2/90 527mm

Within a 7 day event, it is expected that for half the event period the floodgates will drain on the diurnal cycle and for the remainder, river levels will most likely be too high and the runoff stored on site. Total storage on site is approximately 400ML, based on a starting storage of 0.5mAHD in the channels with no outflow. The 0.5mAHD starting storage is considered to be conservative due to the long term modelled level of 0.2mAHD from groundwater modelling and a monitored peak level of 0.6mAHD from the adjacent site (described further below). Results of longer duration rain events are shown below in Table 1.

Table 1 – Runoff containment results for maximum 7 day rain events

Rainfall Total (mm)	Approximate Runoff Total (ML)	Approx. Equivalent ARI	Overtopped Perimeter Berm/Discharge to Wetland
120	210	1 year	No
238	406	10 year	No
241	413	10 year	No
243	418	10 year	No
270	483	20 year	Potentially*
527	1100+	>100 year (1.5 times the volume of the 100 year, 48hr storm)	Yes

*- dependent on initial conditions, river/tide levels and rainfall pattern over the duration.

It is considered that in terms of wetland impact assessment, the on site capacity for post development runoff storage for storms of 7 day durations up to 10 years recurrence interval and potentially 20 year recurrence is a significantly high level of protection and positively demonstrating that the development can be completed without hydrological impact to the downstream wetlands. As a result this demonstrates having met objectives for water management of the proposed development.

Upgrade of existing floodgates

The assumption is correct, no upgrade of the existing floodgates is proposed with the development of Lot 1001.

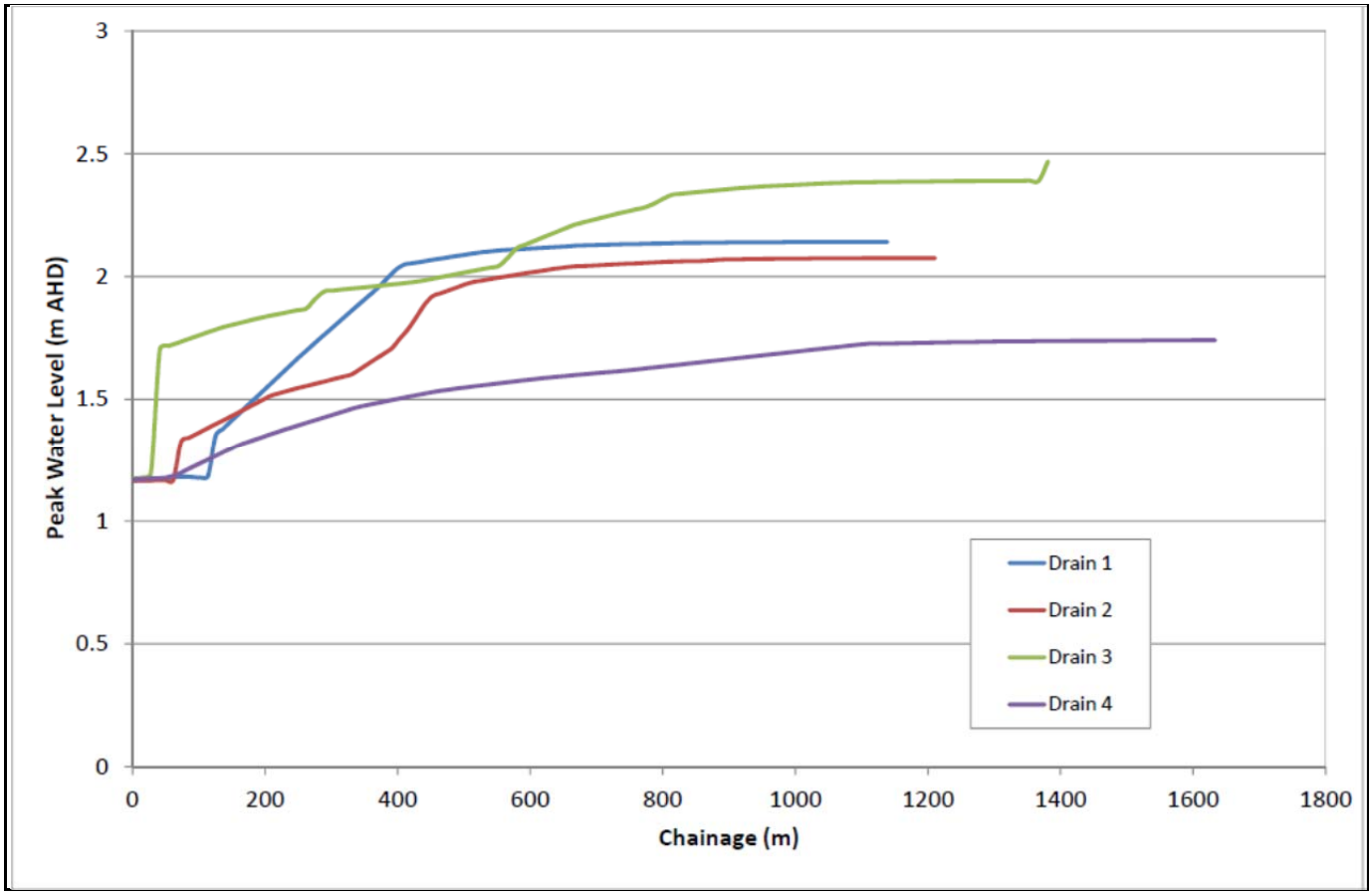
Distance to Outlets

This matter is addressed under the 'Catchment Plan' heading above.

Hydraulic Modelling

We can confirm that BMT WBM has completed hydraulic modelling of the stormwater drainage system. Refer to the plots below of the peak water level during the 100 year, 2 hour event which was the critical storm to the sizing of the open channels.

Plots – Stormwater Drainage System



Equatica Comment:

Water Quality

The following questions remain over the water quality strategy:

- *What is the regional groundwater level at the location of the bioretention systems?*
- *The bioretention surface level is at 1.5 m AHD. The development level is at 2.5 m AHD. Assuming there is 600 mm cover to the stormwater pipe at the road boundary this only allows 400 mm for the stormwater pipe/culvert itself if there is to be free drainage to the bioretention system surface. Please confirm that this will be feasible.*
- *The bioretention system inlet design is non-standard and is not recommended. Relevant design guidelines should be adopted.*

NEH Response:

Regional Groundwater Level

The regional groundwater level is variable through the site and for site coverage had to be a broad scale model. The bioretention systems are located in close proximity to the open channel trunk

drainage so as to remain free of groundwater. The base level of the bioretention at 0.7mAHD was selected after continuous monitoring results through wet periods from the MP07_0086 site adjacent. Peak levels were of the order 0.6mAHD associated with a large rainfall event on an already waterlogged system (approximately 140mm of rainfall over 5 days in July 2011 following above average rainfall through April, May and June), hence a minimum level of 0.7mAHD was selected for the bioretention systems.

Bioretention levels/pipe cover

The assumed 400mm cover is feasible. The channel sections A-G from Attachment 'B' indicate the low flow connections with bioretention systems at the lowest points of the road, 2.5mAHD. This is the lowest level of the roads. Road levels increase for minimum road level and earthworks gradings and additionally low flows are conveyed to the bioretention systems at regular intervals. High flow bypass, where larger pipe sizes may be required are indicated on the channel section plans and shown to bypass the higher flows entering the trunk drainage channels. Detailed design will be required, however the levels provided in concept are sufficient to demonstrate the cover and alike for drainage works to be installed and meet requirements and functions.

Bioretention system non standard

A standard condition can be accepted in this regard to design the bioretention systems in accordance with best practices.

Equatica Comment:

Hydrology
Changes in hydrology are a potential concern for the wetlands adjacent to the site, including SEPP14 and Ramsar-listed wetlands.

While it is noted that a monitoring strategy is in place, and that we concur that monitoring is a good practice to observe changes, modelling is the only available tool which allows predicted impacts due to proposed changes in landuse. Monitoring is not able to predict these changes prior to the changes occurring. Modelling is therefore recommended to demonstrate that the proposed strategy is feasible.

Modelling needs to address the following:

- *With regards to hydrology ADW Johnson response states that drying hydrology is important. However this has not been translated to quantifiable objectives;*
- *With regards to hydrology it is clear from ADW Johnson's response that the strategy allows some flows to discharge to sensitive wetlands off site. When water levels in events ponds above approximately 1.2 to 1.4 m AHD, it appears that water will overtop the perimeter berm directly into SEPP14 wetlands, and possibly also affect the Ramsar listed wetlands.*

    - *The frequency of this occurrence has not been documented;*
    - *The volumes of this occurrence have not been documented;*

- *The frequency and volumes have not been compared to quantifiable objectives for the wetlands; and*
- *These flows have not been compared to existing hydrology to determine impacts.*

- *We recommend following the procedure outlined in Water Sensitive Urban Design Solutions for Catchments above Wetlands; Appendix B: Catchment Hydrologic Indices and Urban Water Management Performance Objectives. In particular note the step by step process in Appendix B. We note that the work done to date by WBM on hydrology shows significant changes to hydrology although we also note that this is for the total site runoff and not for that portion of runoff draining to adjacent wetlands. This analysis will allow a demonstration that the proposed strategy it is capable of meeting its stated objectives. Currently this has not been demonstrated.*

In addition, there needs to be more information provided on how flows will move through the drainage and storage systems at the downstream end of the site, as it is not clear how flows will be prevented from escaping beyond the end of the bund and into the wetlands. This could potentially be addressed with a section through the overflow wetland area showing the normal water level and how water is detained, particularly on the southern side of the overflow wetland rehabilitation area beyond where the perimeter berm ceases.

NEH Response:

Hydrology

In Section 6.22 of the Wetland Interface Strategy of the Environmental Assessment Report, we had previously identified the wetland vegetation types downstream, the hydrology and overview interaction of the Lot 1001 site relative to these wetlands. As requested, we now provide further detail in accordance with the procedures of "*Water Sensitive Urban Design Solutions for Catchments above Wetlands; Appendix B: Catchment Hydrologic Indices and Urban Water Management Performance Objectives." Hunter & Central Coast Regional Environmental Management Strategy (HCCREMS)* as to how we arrived at these conclusions and worked collaboratively with the adjoining land owners to meet their preferences and objectives.

The plan view attached (Sheet 1) has been revised to add the wetland locations of interest as per the Wetland Interface Strategy of the Environmental Assessment Report. The assessment is shown in Table 2 below.

Table 2 – Wetland hydrologic objective summary

Location Identifier	Description	HCCREMS Classification	Hydrologic Objectives	Frequency of Duration	Reference Duration	Hydrologic Pathways	Catchment sources of inflows	Potential Impacts	Mitigation/ Intervention Post Development
'A'	Retained Freshwater Wetland (within Lot 1001)	Shallow Marsh (70%) and Deep Marsh (30%)	Drying Hydrology – Low Flow Duration & Low Flow Spell	Shallow Marsh 3 – 6 months Deep Marsh 1.5-3 years	Shallow Marsh – 30- 60 days Deep Marsh – 2-3 years	Groundwater expression (window to groundwater), overbank flow, rainfall fed	Regional groundwater, upstream of North/South Drain floodgates, NPWS conservation lot	HCCREMS identifies drying hydrology as critical. Additional freshwater could turn the shallow marsh to deep marsh.	Perimeter drain to river. Low flows/base flows prevented from entering systems to preserve drying hydrology opportunities. Adjustable pit control.
'B'	Retained Swamp Oak Forest (within Lot 1001)	Forest Swamp Wet	Drying Hydrology – Low Flow Duration & Low Flow Spell	1-1.5 years	60 days	Groundwater expression (window to groundwater), overbank flow, rainfall fed	Regional groundwater, overbank flow, rainfall fed	Additional freshwater could lead to shallow/deep marsh development	Perimeter drain to river. Low flows/base flows prevented from entering systems to preserve drying hydrology opportunities. Adjustable pit control.
'C'	Overflow Wetland Rehabilitation Wetland (within Lot 1001)	Not applicable to assessment. To be formed, not existing.	-	-	-	-	-	-	-
'D'	Swamp Oak Forest North	Forest Swamp Wet	Drying Hydrology – Low Flow Duration & Low Flow Spell	1-1.5 years	60 days	Groundwater expression (window to groundwater), rare overbank flow, rainfall fed	Regional groundwater, overbank flow, rainfall fed	Additional freshwater could lead to shallow/deep marsh development	Perimeter drain to river. Low flows/base flows prevented from entering systems to preserve drying hydrology opportunities. Adjustable pit control.
'E'	Swamp Oak Forest South	Forest Swamp Wet	Drying Hydrology – Low Flow Duration & Low Flow Spell	1-1.5 years	60 days	Groundwater expression (window to groundwater), rare overbank flow, rainfall fed	Regional groundwater, overbank flow, rainfall fed	Additional freshwater could lead to shallow/deep marsh development	Perimeter drain to river. Low flows/base flows prevented from entering systems to preserve drying hydrology opportunities. Adjustable pit control.

Further to Table 2 we make the following additional commentary on the hydrologic objectives at all of the wetland locations

Drying Hydrology

Drying Hydrology is the key hydrologic consideration for water management control on Lot 1001. The downstream wetlands are supported by water sources from a range of different catchments and types and only a small intermittent, less frequent proportion of discharge from Lot 1001 passes to 'D' and 'E' off site.

The overbank flow from Lot 1001 to these wetland areas is not frequent. This is due to extensive on site ponding within lower lying areas of Lot 1001 before overflow discharge into Lot 1002 and confirmed by site topography which for the large majority slopes back internally away from the common boundary with Lot 1002. It is confirmed by site observation and vegetation types along these flowpaths that flows are irregular. This indicates long drying durations for hydrologic analysis should be long, 60 days or greater. As described in HCCREMS, this is difficult to achieve where development sites flow directly toward wetlands and usually requires a flow diversion to be adopted for low flow duration and low flow spell objectives to be achieved. A flow diversion has been adopted for the water management at this site where baseflow discharge is via a perimeter drain to the Hunter River.

Additionally, the perimeter drain and perimeter bank for the diversion of freshwater to the river are a necessity for the effective continuing expansion of the Tomago Wetland Rehabilitation Project. The perimeter bank providing an effective limit to saltwater tidal inundation extents and a continuation of the existing NPWS levee is already in place for this purpose. The objective of providing drying hydrology with diversion will also assist in the establishment of the proposed and desired saltmarsh species on Lot 1002. We note that PWCS as the owners of Lot 1002 with their subconsultants are also proposing a perimeter berm along the same boundary for these same reasons.

With the existing discharge points identified, we are nonetheless providing discharge control pits with facility for increasing, decreasing or closing off discharges toward Lot 1002, passing through the perimeter berm. Monitoring will be undertaken as described in the Environmental Assessment Report.

Discharges to Lot 1002

Groundwater modelling indicates that regional groundwater flow pre to post development will remain unchanged. Due to hydraulic conductivities being low, this is only 5% of the recharge along the common boundary with Lot 1002.

The frequency of overtopping of the leveeperimeter bank is expected to be very low. Long duration events over 7 days do yield a greater volume, increasing storage, however then opportunity commences for drawdown by tidal discharge to the Hunter River. We acknowledge the request to review the performance under 7 day volumes as a good test of the capacity. From the results of Table 1 there still remains capacity for on site storage for all recorded storms except for the 1990 storm event which was exceptionally large. It is concluded overtopping may occur in a 20 year 7 day event, depending on several factors. This is considered to be a very high level of protection and

higher on site capacity than the existing uncontrolled discharges from Lot 1001 to Lot 1002 in long duration major events. It has to be expected that low lying areas containing wetland vegetation will be inundated during these major events, hence they are not critical to the assessment. Flooding hydrology is not critical to these wetland types who are inundated from several catchment sources. Based on the drying hydrology, the critical hydrological objective, being addressed with a perimeter drain, the conservation objectives proposed for Lot 1002 and this type of rare event not being critical to downstream wetland vegetation types, we consider the water management to not be having any adverse impact on the downstream wetlands.

We have previously indicated that subject to initial conditions and river levels at the time of the peak rainfall and rainfall pattern, the following major design storms are likely to overtop the perimeter berm:

- 100 year, 12 hour storm (and longer duration 100 year storms)
- 50 year, 24 hour storm (and longer duration 50 year storms)

It is considered that we have adequately addressed this point in the above additional information, in particular the maximum 7 day duration events requested to be reviewed.

Flows Escaping

At your request we have prepared a section through the overflow wetland that is contained within Sheet 6. This clearly demonstrates that low flows will not escape at this location.

In summary, it has been demonstrated through the water management system that:

- Design will not impede upstream drainage;
- Design has been made for the drying hydrology (the critical hydrology to the downstream wetlands and wetlands maintained on site) via a perimeter drain to the Hunter River;
- Freshwater and saltwater delineation via the perimeter berm for the enhancement and continuing expansion of the Tomago Wetland Rehabilitation Project, continuing the NPWS levee;
- A high level of containment of on site flows during major storms prior to overtopping the perimeter berm into Lot 1002;
- A monitoring program for the ongoing monitoring of the wetlands post development;
- Design of an adjustable, flexible water management system has been provided with the range to match different objectives for ongoing change if required; and
- There is an overall willingness shown by NEH to work with PWCS as the owners of Lot 1002 and its consultants and the Tomago Wetland Rehabilitation Project to meet conservation objectives and enhance the downstream wetlands where possible.

Should you have any questions in relation to the contents of this submission or would like to discuss any matter further, please do not hesitate to contact Craig Marler on (02) 49785100 or craigm@adwjohnson.com.au.

Yours sincerely,

Craig Marler
Project Director & Principal Planner
ADW Johnson

Enc: Attachment A Amended Development Plans
Attachment B Local Drainage Plans (Updated)

Attachment A
Amended Development Plans

Attachment B
Local Drainage Plans (Updated)

NORTHBANK ENTERPRISE HUB
PTY LIMITED
ABN 77 063 271 625

28 March 2012

Peter Jamieson
Head Regional Operations Unit – Hunter Region
Environment Protection Authority
117 Bull Street
NEWCASTLE NSW 2302

Dear Mr Jamieson,

Northbank Enterprise Hub (Major Project Application No.10_0185)
Environmental Assessment - Aboriginal Archaeology

We refer to your letter 27 January 2012 to NSW Department of Planning and Infrastructure, a copy of which has been provided to us (**EPA Letter**).

Enclosed, for your information, is a copy of a letter we have sent to Chris Wilson, Executive Director, Major Projects Assessment, Department of Planning and Infrastructure responding to the comments in the EPA Letter, to the effect that NEH is in breach of section 89A of the NPW Act.

You will see from the enclosed letter that NEH is of the view that it is not in breach of section 89A of the NPW Act.

If, having considered the matters in the enclosed letter, EPA is still of the view that NEH has an obligation to notify the Director General, NEH requests EPA to inform it accordingly and provide reasons in support of that view.

NEH will then obtain further legal advice in relation to this issue.

Yours faithfully

ROBIN WATERS
Director - Northbank Enterprise Hub

30 Kings Park Road, WEST PERTH WA 6005, AUSTRALIA
PO Box 1398, WEST PERTH WA 6872 | Telephone: +61 8 9215 8888 | Facsimile: +61 8 9215 8889

NORTHBANK ENTERPRISE HUB
PTY LIMITED
ABN 77 063 271 625

28 March 2012

Chris Wilson
Executive Director
Major Projects Assessment
Department of Planning and Infrastructure
GPO Box 93
SYDNEY NSW 2001

Dear Mr Wilson,

Northbank Enterprise Hub (Major Project Application No.10_0185)
Environmental Assessment - Aboriginal Archaeology

I refer to your letter dated 14 March 2012 to Craig Marler enclosing a copy of a letter from the Environment Protection Authority to NSW Department of Planning and Infrastructure dated 27 January 2012 (EPA letter).

The purpose of this letter is to respond to the comments in the EPA Letter to the effect that NEH is in breach of s.89A of the NPW Act and is under a "final warning".

NEH takes its obligations to comply with all applicable laws very seriously, however in this circumstance we do not agree that NEH is in breach of s. 89A of the NPW Act. We highlight the history of the matter and our legal understanding of the Act, as stated below.

History of Aboriginal Archaeological Assessment

NEH notes there are currently two conflicting experts reports relating to Aboriginal Archaeology, both of which were submitted by NEH to DOPI, which forms the basis of the issue.

1. As part of the preparation of the EA for the Application, NEH engaged Indigenous Outcomes Pty Limited (Indigenous Outcomes) to report on Aboriginal archaeological matters.

2. Indigenous Outcomes carried out field studies in the second half of 2010 and prepared a report, dated December 2010, which was included in the EA forwarded to the Department of Planning (Indigenous Outcomes Report).

3. We note that The Indigenous Outcomes Report:

   - Identifies 4 sites on Lot 1001; and

   - Identifies 1 site on the WesTrac site (not related to Lot 1001),

   Not 8 sites as claimed by EPA.

4. Because of alleged shortcomings with the Indigenous Outcomes report, reflected by the issues raised by EPA in the EA adequacy review, NEH wanted the EPA issues addressed by Indigenous Outcomes.

5. Following public allegations and a pending investigation against the Managing Director of Aboriginal Outcomes, namely Cheryl Kitchener, (on matters not related to NEH or its development) Ms Kitchener requested she be relieved as the Aboriginal Archaeological consultant for the project.

   Her request was accepted by NEH.

6. NEH engaged McCardle Cultural Heritage Pty Ltd (MCH) as the replacement consultant to start afresh and carry out a thorough survey and report, specifically including the 4 sites referred to in the Indigenous Outcomes Report.

7. MCH prepared a formal written report (MCH Report) which was submitted to the Director General in further support of the Application. In summary that report states:

   - There were no Aboriginal objects found on Lot 1001; and

   - That it is unlikely that Aboriginal objects would be found noting that the topography of the land and other aspects is not conducive with the expectation of finding Aboriginal objects.

8. MCH has advised NEH that they attempted to find, without success, the previously identified sites in the Indigenous Outcomes Report. MCH suggested that it is probable that the finds were not Aboriginal objects and were more likely items from a former seabed, particularly noting the topography as mentioned above.

   NEH has relied upon their expert opinion.

9. MCH also confirmed to NEH that it is standard practice for a consultant engaged to do the Aboriginal cultural heritage study to inform the Director General of the location of any Aboriginal objects found by completing the appropriate registration cards to satisfy s.89 of the NPW Act.

10. NEH (including its employees) is not personally aware of the location of any Aboriginal objects on Lot 1001. NEH (like DOPI and EPA) is only aware of what is in the Indigenous Outcomes Report.

11. Given this history, and until this issue is resolved, NEH believes registration of the 4 sites referred to in the Indigenous Outcome Report would not serve any purpose, and could in fact be misleading.

NEH's understanding of s.89A of the NPW Act

Further to the history of events stated above, we also note that Section 89A of the NPW Act states:

"A person who is aware of the location of an Aboriginal object that is the property of the Crown or, not being the property of the Crown, is real property, and does not, in the prescribed manner, notify the Director-General thereof within a reasonable time after the

person first becomes aware of that location is guilty of an offence against this Act unless the person believes on reasonable grounds that the Director-General is aware of the location of that Aboriginal object."

NEH does not have expertise in matters relating to Aboriginal Cultural Heritage and the NPW Act, and therefore relies completely on the advice of appropriately qualified external consultants who NEH understands are familiar with their obligations under s.89A of the NPW Act.

Self-evidently:

- The person who finds an Aboriginal object (in this case the archaeological consultant) is the person s.89A of the NPW Act is aimed at; and

- Consistent with this, we note it is the normal practice in such matters for the consultant to notify the Director General (and we note that this is precisely what occurred in the case of our Redlake development for the WesTrac project).

In summary:

- Whilst NEH is aware of the Indigenous Outcomes Report, NEH is not itself aware of the location of any Aboriginal objects on Lot 1001 (and based on MCH's latter report, NEH does not believe that the objects located on Lot 1001 and in the Indigenous Outcomes Report were Aboriginal objects); and

- Even if NEH is a person referred to in s.89A, in light of established industry practice, NEH had reasonable grounds to believe that the Director General was made aware in the prescribed manner by Indigenous Outcomes, and therefore NEH is not in breach of that section.

As NEH views this matter very seriously, NEH has instructed MCH to again check the locations on Lot 1001, as identified in the Indigenous Outcomes Report, and to formally address the issue within their report which will be provided in support of the EA in due course.

NEH has sent a copy of this letter to EPA under cover of a letter inviting EPA's comments.

Should you have any questions please contact NEH's representative Kurt Robinson on 04162 253 707.

Yours faithfully

ROBIN WATERS
Director - Northbank Enterprise Hub

cc Peter Jamieson, EPA

Number	Draft Condition	Comment
General Conditions		
1	A Subdivision Certificate for the development site shall not be released until a site specific chapter in Council's Development Control Plan has been adopted by Port Stephens Council.	PSC to delete.
2	All adjustments to existing utility services made necessary by the development are to be undertaken by the developer at no cost to Port Stephens Council.	Council's position noted.
Building Issues		
3	A report which identifies the satisfactory remediation of all identified site contamination is to be provided **prior to the issue of a Subdivision Certificate**.	Council's position noted.
Section 94A Contributions		
4	Pursuant to section 80A(1) of the Environmental Planning and Assessment Act 1979 and the Port Stephens Section 94A Development Contributions Plan, a contribution of the cost of development shall be paid to Council, as determined in accordance with clause 25j of the Environmental Planning and Assessment Regulation 2000 and as outlined in Table 1 below. <u>Table 1</u> Development Cost and Levy Rate Proposed cost of carrying out the development is up to and including $100,000 - Nil Proposed cost of carrying out the development is more than $100,000 and up to and including $200,000 - 0.5% of that cost Proposed cost of carrying out the development is more than $200,000 - 1% of that cost A Cost Summary Report Form setting out an estimate of the proposed cost of carrying out the development in accordance with Schedule 1 of the Port Stephens Section 94A Development Contributions Plan, must be approved by Council **prior to issue of the**	NEH at this point does not accept full payment of a s94A contribution and will take up this matter with the DoPI having regard to s94B of the EP&A Act 1979.

	Construction Certificate. Where the estimated cost of carrying out the whole of the development is more than $1,000,000, the Cost Summary Report Form must be completed by a Quantity Surveyor who is a registered Associate member or above, of the Australian Institute of Quantity Surveyors.	
Environmental		
5	**Prior to the issue of any Construction Certificate or commencement works or Subdivision Certificate** a positive covenant shall be created under Section 88E of The Conveyancing Act 1919 on the title of the land. The public positive covenant shall give effect to the following: For the areas marked "Conservation Area" and "Rehabilitation Area" as shown on approved plans, the area shall be managed in strict accordance with the approved Vegetation Management Plans. The "Conservation Area" is in the south of the site where it provides a buffer to the SEPP 14 Wetland and incorporates a section of Swamp Oak Floodplain Forest EEC which must not be cleared or impacted upon. The "Rehabilitation Area" is in the western part of the subject site, directly adjacent to the Hunter River. This area shall not be subject to industrial allotments but shall be revegetated to create a riparian corridor along the Hunter River. The "Conservation Area" and "Rehabilitation Area" as marked on approved plans shall at all times remain free from: o all stockpiles, o importation of fill, o parking or movement of vehicles/machinery, o disposal, mixing or spillage of building waste or materials, o placement of temporary buildings, o grazing of livestock, o building work (paving, excavation or construction), o clearing or trenching for services, o drainage works,	PSC to delete. Not required. SEPP 14 does not apply. Development footprint is governed by DoPI and State Govt agencies therefore an additional layer of development control is not required.

	○ onsite sewage system or stormwater infrastructure, ○ planting of non-indigenous plants, and ○ asset protection zones. Within the "Conservation Area" and "Rehabilitation Area" all native vegetation (trees, shrubs and groundcovers) shall be retained. This includes regeneration/re-growth. Note, the requirements of the Section 88E Instrument do not apply to the works that are required to be undertaken by the Hunter Valley Flood Mitigation Scheme/ OEH.	
6	A Vegetation Management Plan (VMP) for the area on the subject site (Lot 1001) designated as the "**Conservation Area**" shall be prepared by a suitably qualified and experienced bush regeneration company or equivalent. A second Vegetation Management Plan for the area on the subject site (Lot 1001) designated as the "**Rehabilitation Area**" shall be prepared by a suitably qualified and experienced bush regeneration company or equivalent. These are to be submitted and deemed satisfactory by Port Stephens Council **prior to issue of the Subdivision Certificate**.	PSC to delete. Not required. SEPP 14 does not apply. Development footprint is governed by DoPI and State Govt agencies therefore an additional layer of development control is not required.
7	The Plans should cover a timeframe of at least 7 years from the commencement of construction. If commencement of construction is delayed, the start date for the weed management and restoration activities within the VMPs shall be no later than 6 months from the date of subdivision DA approval. The covenants and the content of the VMPs shall ensure areas are restored and maintained for the life of the development.	PSC to delete. Not required. SEPP 14 does not apply. Development footprint is governed by DoPI and State Govt agencies therefore an additional layer of development control is not required.
8	The VMPs are to be divided into stages and Stage 1 should be implemented in full **prior to release of the occupation certificate** relating to any part of the first stage of the development. Stage 1 for the Conservation Area should at a minimum be site fencing and signage, primary and secondary weed management and progress reporting. Stage 1 for the Rehabilitation Area should at a minimum include site delineation and signage, primary weed management, tubestock planting throughout the site, initial stages of weed and plant maintenance and progress reporting. The VMPs shall include the following:	PSC to delete. Not required. SEPP 14 does not apply. Development footprint is governed by DoPI and State Govt agencies therefore an additional layer of development control is not required.

	a. A map with different treatment zones defined; b. Strategies for preservation, protection and restoration of vegetation and for staged weed management using bush regeneration techniques and encouragement of natural regeneration from the soil seed bank; c. For any zone where planting is required, include a Plant Schedule table detailing species, identify planting densities, source of planting stock and mulch, and any use of tree guards, jute matting, water crystals; d. A Schedule of Works (preferably table format or similar) which aligns the actions for each zone into stages, assigns responsibility for the actions, defines a method and schedule of monitoring and reporting; e. Details of the work within each zone, the proposed weed control methods and seasonal timing of works; f. Detail of any on-site protection measures (any fencing or barriers with signage); g. Detailed costings of work associated with zones and stages; h. Proposed disposal method for weed propagules and green waste; i. Incorporate the requirements of the consent conditions, 88E instruments, landscape plans, tree protection plans, clearing method statements, or bushfire mitigation measures which may apply to the property; j. Landscaping requirements for future landowners/leasees including a list of indigenous and non-invasive species that can be planted on the allotments; and k. Details of erosion, sediment and stormwater runoff controls.	
9	Services including water and sewer are to be laid with appropriate measures in place to prevent and/or manage by best practice any acid sulphate soil disturbance.	Council's position noted.
10	Implement Pre-clearing fauna surveys as per page 149 of Ecobiological report, Appendix D) and any directions contained in Vegetation Management Plans applying to the site.	Council's position noted.

11	40 suitable sized nest boxes for micro-chiropteran (small insectivorous) bats and 20 medium sized nest boxes shall be attached to trees on Lot 1001 DP 1127780 or Lot 1002 DP 1127780 and positioned at a suitable height off the ground. The boxes shall be installed and certified by a fauna ecologist. Harvesting of existing hollows can be undertaken where possible in lieu of using nest boxes, but a total of 60 harvested hollows or nest boxes are required to be installed into trees. A copy of the certification must be submitted to the Principle Certifying Authority (PCA) **prior to issue of the Construction Certificate**.	Council's position noted.
12	Weeds present on site include, but are not limited to, Alligator Weed, Bitou Bush, Mother of Millions, Groundsel Bush, Lantana, Blackberry, Castor Oil, Camphor Laurel, Crofton Weed, Lacy Ragweed, Pampas Grass, Prickly Pear, Moth Vine, Dock, Fennel and Weeping Willow. During the construction phase development must provide: o Controls to prevent the spread of weeds on machinery including a disposal and wash down area; o An area for storage of contaminated spoil that is separate from clean material; o Certification that any fill, soil, mulch and plants brought onto the site is free of weeds and weed seeds; and o Site inductions for all personnel and visitors that includes weed management practices including signs placed at the site entry. Written confirmation that the above has been undertaken must be submitted to the Principal Certifying Authority **prior to issue of the Occupation Certificate**.	Council's position noted.
13	A 'Wetland Management and Monitoring Plan' is required **prior to issue of the subdivision certificate**. This WMMP should protect and monitor all sensitive areas downslope from the development for 10 years from commencement of construction on site. A bond of $80,000 shall be submitted to DoPI or OEH and tied to appropriate implementation of the Wetland Management and Monitoring Plan. Reports interpreting the water quality results should be submitted regularly to the DoPI and OEH.	PSC to delete.
14	A Vegetation Management Plan for the **Offset Area** on Lot 1002 shall be prepared and a $200,000 bond lodged with DoPI or OEH to ensure restoration in accordance with the	PSC to delete.

	Offset Area VMP. The VMP setting out the designated zones, implementation stages with detailed schedule of works and costing for each zone is required **prior to issue of the Subdivision Certificate**. The Schedule of Works should describe bush regeneration work on the site commencing within 6 months from the date of subdivision DA approval and continuing for at least a 5 year period. It is paramount that Alligator Weed and Pampas Grass are regularly controlled on site. Evidence that the cover of these weeds and other weeds is steadily reduced is required and must be demonstrated within periodic reports. The bond will provide security of $200,000 for the on-ground works to achieve weed management and restoration of the offset area. The VMP should be prepared by a suitably qualified and experienced bush regeneration company or equivalent. (This VMP requires active onground work, above and beyond that which may be set out in the proposed 'Wetland Management and Monitoring Report' described in the Ecobiological report p. 150-151).	
15	Preparation of a Vegetation Management Plan for the Landscaped Watercourses and Riverside Park in the southern section of the development is required **prior to issue of the subdivision certificate**. This should be prepared by a bush regeneration company with expertise in environmental restoration. It should detail the revegetation and vegetation management, and provide further detail than the Landscape Plan. The VMP should be divided into stages. Stage 1 and 2 (initial weed management, soil stockpiling, site clearing protocols, planting of the Landscaped Watercourses, Pocket Parks, Riverside Park and the Floodplain/Ponding Zone with endemic native species, and initial maintenance) should be implemented in full **prior to issue of the occupation certificate** relating to any part of the first stage of the industrial development.	Council's position noted.
16	Development shall be prohibited within: a. all areas identified as Saltmarsh, ○ the 50 metre buffer area surrounding the mapped SEPP 14 wetland ○ the 50 metre buffer area surrounding the mapped Ramsar wetland ○ the riparian buffer along the Hunter River (excluding the Hunter Flood Mitigation Scheme infrastructure/ levee banks) Within these areas, there will be no clearing, trenching for services, importation of fill, stockpiling, storage of any materials, mixing of materials, disposal of liquids,	PSC to delete.

	vehicle/machinery parking, positioning of offices or sheds, asset protection zones nor planting of non-indigenous vegetation without prior written agreement from Council.	
Trees ***(The following are recommended conditions of consent on the chance the consent authority may decide to not support Council's position on street trees).***		
17	The location of street trees must be no closer than 50 metres apart and shown on the construction certificate plans and demonstrated to have sufficient clearance from services, light poles and the preferred location of driveway crossings to not impede their functioning. Supply and installation of street trees must comply with Council's Infrastructure Specification – Design. Details shall be approved by Council **prior to issue of the Construction Certificate.**	Council's position noted.
18	Street trees shall be of a species as nominated in the following list, and certified by a qualified landscape architect to be suitable for the soil (fill) materials on the site. Acmena smithii, Cupaniopsis anacardiodes, Elaeocarpus Reticularis, Flindersia australis, Harpullia pendula, Syzygium australa, Syzygium Paniculatum, Tristaniopsis laurina, Waterhousia floribunda, *Acmena hemilampra.* Details shall be approved by Council **prior to issue of the Construction Certificate.**	Council's position noted.
19	The landscaping with native grasses within the road reserve shall be located within the first two metres immediately adjacent to the private property frontages. No landscaping shall occur against the kerb as shown in the concept landscaping plans. Details shall be approved by Council **prior to issue of the Construction Certificate.**	Council's position noted.
20	No street trees or landscaping is to occur within the proposed road reserves. Construction plans shall specify turf verges. Details shall be approved by Council **prior to issue of the Construction Certificate.**	Council's position noted.
Public Stormwater		
21	An application shall be submitted to and approved by Port Stephens Council for any works within public drainage systems and/or easements, pursuant to section Part B, Section 68 of the Local Government Act 1993. This shall include connection of new subdivision stages back into previously stages now dedicated as public systems and/or	Council's position noted.

	easements A **Construction Certificate cannot be issued** until this application is submitted to and approved for construction by Port Stephens Council. An **Occupation Certificate cannot be issued** until Port Stephens Council has determined that the development has been completed and issued a Certificate of Completion for works approved under the Local Government Act.	
Filling		
22	**Prior to the issue of Construction Certificate** details are to be submitted to Council showing all finished lots surfaces shall be graded towards the internal roads, this shall be at a min 1% to the road boundary. Details shall be approved by Council **prior to the issue of Subdivision Certificate**.	Suggest rewording: 'Finished surfaces of development areas should be graded to road boundaries or drainage reserves to avoid ponding'.
23	Where depth of filling exceeds 300mm it is to be constructed in horizontal layers not exceeding 150 mm compacted thickness. Each layer shall be compacted to at least 95% of the maximum dry density, when tested, in accordance with AS 1289 - 1993 Clauses 5.1.1 and 5.3.1. Verification of the compaction is to be provided to Council by a Certificate from a Geotechnical Engineer, incorporating a location plan indicating filled areas in relation to road and lot boundaries, from a registered N.A.T.A. testing laboratory **prior to the issue of Subdivision Certificate**.	Suggest rewording: 'Bulk earthworks methods to be in accordance with a suitably qualified and experienced geotechnical engineer'.
24	Where retaining walls are required, they shall be designed, supervised and certified by a qualified structural or civil engineer in accordance with AS 4678 Earth Retaining Structures code of Australia. The retaining walls shall be located fully within the boundaries of the subject property (private lots). Design certification shall be submitted for approval to Council **prior to the issue of Construction Certificate** and construction certification shall be provided to Council **prior to the issue of Subdivision Certificate**.	Council's position noted.
25	The top of fill level within the developable area of the property is to be not less than RL 2.8 m AHD. Certification of the fill levels within the developable areas are to be provided by a suitably qualified and experienced surveyor with appropriate professional indemnity insurance to the requirements of the PCA **prior to the release of**	Some open drainage may be extended from the trunk drainage into the developable areas to suit individual developments making this compliance

	the Subdivision Certificate.	unachievable. Suggest rewording: 'Finished surfaces of development areas should be generally 2.5m or greater. Buildings to be 300mm above the 1% AEP flood level.
Utilities Conditions		
26	**Prior to approval of the Subdivision Certificate** written evidence must be submitted from the Hunter Water Corporation, Telstra Australia and Energy Australia that satisfactory arrangements have been made for the provision of their respective services to all lots in the proposed subdivision.	Council's position noted.
27	All utility structures other than conveyance conduits shall be constructed on land outside the road reserve and dedicated to its relevant authority ie: sewer pump stations, electrical substations and transformers and the like. Positions shall be shown on the construction plans **prior to the issue of Construction Certificate.** Details of the lots shall be included in the linen plan **prior to issue of the subdivision certificate**.	NEH recommend that the condition be amended as follows: All utility structures other than conveyance conduits shall be constructed on land outside the road reserve and where necessary appropriate easements be created or land dedicated to its relevant authority ie: sewer pump stations, electrical substations and transformers and the like. Positions shall be shown on the construction plans **prior to the issue of Construction Certificate.** Details of the lots shall be included in the linen plan **prior to issue of the subdivision certificate**.
Roads		
28	A Roads Act approval from Port Stephens Council is required for all necessary road, drainage and other works including maintenance required during the maintenance period **prior to any works occurring within Council road reserves.**	Council's position noted.

29	The applicant is to restore, replace or reconstruct any damage caused to road pavements, surfaces or street furniture on existing roads used for the construction of the subdivision.	Council's position noted.
	Haulage routes for the importing of fill over Council roads for the construction of the subdivision are to be as approved by the Manager Civil Assets Port Stephens Council **prior to the issue of a Construction Certificate.**	Not accepted. It is considered that the Construction Traffic Management Plan will appropriately address this matter.
30	Engineering plans for the following subdivision works within the private property must be designed by a suitably qualified professional, in accordance with Council's 'Infrastructure Design Specification – AUS Spec', and RMS Specifications **prior to the issue of a Construction Certificate:** a. Internal roads, drainage and pathways. **b.** Footpaths and shared paths **c.** Roadside furniture and safety devices including fencing, signage, guide posts, chevrons, directional arrows and guard rail in accordance with RTA and Australian Standards. d. Pedestrian facilities including footpaths, kerb ramps, pedestrian refuges, linkages from external and internal bus stops, lighting and the requirements for disabled access in accordance with Disability Discrimination Act requirements. e. Concrete access ways across the verge for all access points to public infrastructure comprising a minimum 4 metres full width reinforced concrete pavement (SL72 steel fabric, 150mm thick). f. Signage and line marking. - all regulatory signage and line marking plan must be approved by the Port Stephens Council Traffic Committee in accordance with the delegations from Roads and Maritime Services. g. Traffic control plans in accordance with the Roads and Traffic Authority – Traffic Control at Worksites Manual; h. Contractor's public liability insurances to a minimum value of $10 million dollars. i. All works shall be at no cost to Council The engineering plans and any associated reports for the above requirements **must form part of the Construction Certificate**.	It is noted that the RMS specifications are not current. Matters (a) – (d) and (f) – (i): Council's position noted. Matter (e) – PSC to delete.

31	Where roads cross boundaries of future stages, a temporary cul-de-sac head of the same radius as the permanent cul-de-sacs shall be designed and approved by Council **prior to the issue of Construction Certificate** and constructed **prior to the issue of the Subdivision Certificate**. The cul-de-sac is to include 2 coat bitumen seal, pipes and pits to drain surface water directly to Council's system along with appropriate rights of access and legal points of discharge for stormwater as necessary.	Council's position noted.
32	Bus Route Plan and design details for the entire subdivision is to be submitted to Port Stephens Council for approval **prior to the issue of a Construction Certificate**. The Bus Route Plan and design details shall be based upon the criteria of "no more than 5% of employees to the lots being further than 400mm walk to bus facilities". The applicant shall consult with Port Stephens Council and the relevant bus companies to determine routes which are acceptable. The plan, the design and construction of bus stops details to be submitted to Port Stephens Council for approval **prior to the issue of a Construction Certificate.**	PSC to delete.
33	All internal 4 way intersections shall be controlled by roundabouts, details shall be submitted to Council for approval **prior to the issue of Construction Certificate**.	Council's position noted.
34	All proposed roundabouts and cul-de-sacs shall be constructed from reinforced concrete, designs are to be prepared in accordance with Austroads Guides, RMS Concrete Roundabout Pavements: A Guide to their Design and Construction as well as Council's Infrastructure Specification. Details shall be submitted to Council for approval **prior to the issue of Construction Certificate.**	Council's position noted.
35	Roads approaching roundabouts shall be median separated and designed in manner that the entry geometry actively slows vehicles prior to engaging the roundabout proper in accordance with Austroads. Details shall be submitted to Council for approval **prior to the issue of Construction Certificate.**	Council's position noted.
36	All internal roads shall have cross sections that show a 2 way cross fall with the road's crown on the centreline with standard SA kerb on both sides, roads (1 way cross fall are not acceptable). Details shall be submitted to Council for approval **prior to the issue of Construction Certificate.**	Not accepted. The design criteria from Austroads for water film depths to avoid aquaplaning can be achieved at this site for this road width. Westrac Drive, previously

		accepted by Council in 2012 is one way crossfall and it is advantageous wherever drainage reserves lie adjacent. This reduces road ponding, stormwater piped drainage and drainage crossings.
37	Street lighting shall be designed and constructed in accordance with Australian Standards to the satisfaction of Port Stephens Council, design details shall be submitted to Port Stephens Council **prior to the issue of Construction Certificate.**	Amend condition to 'internal roads lit to PSC standards'.
38	Where roads cross trunk drainage channels, reinforced concrete box culverts with appropriate wing walls, embankment/erosion protection and safety barriers shall designed and certified by a suitably qualified Chartered Professional Structural or Civil Engineer, all materials specified in the design shall be sulphate resistant, details are to be submitted to Council for approval **prior to the issue of Construction Certificate**. Bridges of any kind are not acceptable.	Council's position noted.
39	Proposed Roads 1 and 2 function as internal collector roads, these shall have: • 2.5m parking lane • 1.0m safety strip • 1.5m cycle lane • 3.5m traffic lane for both sides of the centreline resulting in a 17m carriage way. All other proposed internal roads shall have: • 2.5m parking lane • 1.5m cycle lane • 3.5m traffic lane for both sides of the centreline resulting in a 15m carriage way. Details shall be submitted to Council for approval **prior to the issue of Construction Certificate**.	Not accepted. No parking on internal roads will occur – each future development w/ accommodate on site parking. We are proposing 15m wide road carriageway. PSC are reconsidering this draft condition.
40	Line marking of cycle lanes shall be in accordance with Austroads guides, where cycle lanes conflict with intersections the cycle lane surface shall be coloured green, works are to be complete. Details shall be submitted to Council for approval **prior to the issue**	Council's position noted.

	of Construction Certificate.	
41	All portions of roads that are not of reinforced concrete construction shall be Asphalt sealed 100mm thick minimum, where heavily bound base is to be used for pavement material the Asphalt thickness shall be minimum 175mm thick, details are to submitted to Council **prior to the issue of Construction Certificate.**	Not accepted. Current road pavement design is RMS compliant which far exceeds the Council standard. Westrac Drive is already constructed under MP 07_0086 is significantly higher pavement standard than Council would require in the same instance. The condition proposed by Council exceeds the standard acceptable to RMS. Fit for purpose, covered in item 42.
42	A Geotechnical Report for pavement design of the proposed roadworks prepared by a duly qualified and experienced Geotechnical Engineer shall be submitted for approval **prior to the issue of a Construction Certificate**.	Council's position noted.
Stormwater & Water Quality		
43	No rocks shall be provided within the open channel minor flowpath unless as rock check dams at spacing of no less than 30m minimum spacing. Any rock check dams shall have controlled weir. Details are to submitted to Council **prior to the issue of Construction Certificate.**	Council's position noted.
44	All road surface drainage throughout the proposed development shall be conveyed from the road surface via conventional pit and pipe system, roadside swales within the road reserve are unacceptable. Details are to submitted to Council **prior to the issue of Construction Certificate.**	Council's position noted.
45	All stormwater drainage pipes within the road reserve shall be minimum Class 4 steel reinforced concrete with rubber ring joints. Details are to submitted to Council **prior to the issue of Construction Certificate.**	Council's position noted.
46	Pits required for pipes of 600mm diameter or larger shall be cast in-situ steel reinforced concrete. No portion of any pit shall extend under or beyond the vertical extension of the lip of kerb. Details are to submitted to Council **prior to the issue of Construction**	Council's position noted.

	Certificate.	
47	**Prior to the issue of Practical Completion Certificate** a video condition analysis or CCTV analysis shall be undertaken on all drainage infrastructure for the proposed development and submitted to Port Stephens Council for approval. Where it is found that infrastructure or works are defective, non compliant or not to the satisfaction of Port Stephens Council the applicant shall reinstall, reconstruct or remediate the unacceptable item to the satisfaction of Port Stephens Council **prior to the issue of Practical Completion or Subdivision Certificate.**	Not accepted. Minimum standard of Class 4 pipe crossings has been accepted. This is consistent with RMS standards and a heavier class of pipe than Council's standard. Industry standard pavement construction methods apply over the piped drainage. No footage is required with RMS and based on the above, the CCTV request is not warranted.
48	All trunk drainage shall be fenced and sign posted to ensure public safety in the event of minor and major storm events, details are to submitted to Port Stephens Council for approval **prior to the issue of Construction Certificate**. All fencing and sign posting shall completed **prior to the issue of Subdivision Certificate.**	Not accepted. PSC have agreed to remove fencing requirement.
49	4 metre wide minimum 200mm thick all weather access track are required to provide maintenance access along drainage and water quality structures and devices including biofiltraton and open channels. Landscaping with trees and other vegetation shall not occur within the maintenance access areas or other adjoining areas that will impede maintenance.	It is considered that this draft condition should be modified. This condition will not always be appropriate for the development of the site. The condition should acknowledge that appropriate maintenance provisions shall be made available for the drainage channels.
50	Proposed filling should not impede or direct storm flows onto any adjoining properties. Suitable drainage should be provided to capture, transport and discharge storm flows into suitable receiving waters to ensure the filling does not create nuisance flooding of adjoining properties. Full details are to be provided and approved by the PCA prior to issue of a Construction Certificate.	Council's position noted.
51	All adjoining properties shall be protected from the impacts of increased flood levels as a result of the development through the construction and maintenance of appropriate bund walls. These walls are to be located within the development property and full details are to be provided to the PCA prior to issue of a Construction Certificate.	Council's position noted.

52	The Stormwater Drainage Report and Design by a suitably qualified and experienced Chartered Professional Engineer is to be submitted to Council for approval **prior to the issue of a Construction Certificate**. The report shall determine the: (1) extent of the 1% ARI event(s) affecting the proposed development including both localized and river flooding; (2) affects that the proposed development has on the lands and drainage systems within the upstream catchment developed to its full potential; (3) affects that the proposed development has on the lands and drainage systems within the downstream catchment; (4) sizing and volumes of water detention facilities within the development based on the principle of creating a "neutral or beneficial affect". Note: a beneficial affect may be required to ensure the long term protection and sustainability of the nearby RAMSAR and SEPP 14 Wetlands.	Council's position noted.
53	All soil within 1metre of the finished surface level of the drains is tested and treated for acid sulphate. All culverts are to be marine class pipes/culverts.	Not accepted – acid sulphate soils will be managed by the condition requiring an Acid Sulphate Soils Management Plan. The statement re: all culverts to be marine class pipes / culverts - Council's position is noted.
Stormwater Quality Improvement Devices		
54	Stormwater Quality Improvement Devices (SQID's) such as bio-swales, bio-retention systems and constructed wetlands are to be incorporated into the drainage design to treat minor events up to the 0.5 year ARI event. In this regard, provision is to be made for best practice Stormwater Quality Improvement Devices (SQIDs) as a treatment train(s) to collect sediment, hydrocarbons, nutrients, pathogens etc. The treatment train(s) is to be designed and constructed offline from the minor and major drainage system and the construction shall be conducted generally in accordance in with Water By Design's "Construction and Establishment Guidelines: Swales, Bio-retention Systems and Wetlands".	First paragraph of condition is not accepted – It is noted that the NSW Office of Water have already accepted the proposal. Second and third paragraphs - Council's position noted.

	The design shall be capable of retaining pollutants in accordance with the requirements of Council's Urban Stormwater and Rural Water Quality Management Plan, Australian Runoff Quality (ARQ) and ANZECC guidelines. Details shall be submitted (along with accompanying MUSIC model) to Port Stephens Council for approval with the engineering drawings **prior to the issue of a Construction Certificate**. In addition, a site specific "Operation and Maintenance Manual" is to be prepared for the system and submitted to Port Stephens Council for approval **prior to the issue of a Construction Certificate**.	
Roads Act Conditions		
55	All work required to be carried out within a public road reserve must be separately approved by Port Stephens Council, under Section 138 of the Roads Act 1993. Engineering plans for the required work within a public road must be prepared and designed by a suitably qualified professional, in accordance with Council's 'Infrastructure Design Specification – AUS Spec', and Section B of Development Control Plan 2007. These works and requirements include: a) Connection of roads and drainage to existing public assets including connection to earlier subdivision stages b) Traffic control plans in accordance with the Roads and Traffic Authority – Traffic Control at Worksites Manual; c) Payment of applicable fees and bonds in accordance with Council adopted fees and charges policy; and d) Contractor's public liability insurances to a minimum value of $10 million dollars. e) All works shall be at no cost to Council The engineering plans must be approved by Council **prior to the issue of a Construction Certificate** required under this consent.	Council's position noted.

56	Works associated with the approved plans and specifications located within the existing Road Reserve shall not commence until: a. a Roads Act Approval has been issued; and b. all conditions of the Roads Act Approval have been complied with to Council's satisfaction.	Council's position noted.
57	All civil engineering works associated with the Roads Act Approval shall be carried out to the satisfaction of Port Stephens Council (with a letter of practical completion issued) **prior to issue of the Subdivision Certificate or Occupation Certificate**. All works associated with the Roads Act Approval shall be at no cost to Council.	Council's position noted.
58	Works associated with the Roads Act Approval are subject to: 1. inspection by Council, 2. testing by a registered NATA Laboratory and 3. approval by Council at each construction stage as determined by Council.	Council's position noted.
59	Prior to any road opening work, a Road Opening Application and accompanying fee must be submitted to and approved by Port Stephens Council's Civil Assets Department.	Council's position noted.
Prior To Subdivision Certificate		
60	All stormwater and water quality structures shall be dedicated to Council (excluding the natural rehabilitated wetland in the lower portion of the site) as drainage reserve. Details shall be approved by Council **prior to issue of the Subdivision Certificate.**	Council's position noted.
61	**Prior to the issue of a Subdivision Certificate** a Works Maintenance Bond(s) shall be deposited with Port Stephens Council (or a Bank Guarantee) for a minimum period of twelve months from the issue of Subdivision Certificate of a sum equal to 5% of the contract values of the civil and landscaping works. Verification of the contract values by Council will be required to determine this bond value. Note: (1) Bond administration fees apply in accordance with Council's adopted fees and charges. (2) Rolling bonds will	Council's position noted.

	not be accepted.	
62	**Prior to the issue of a Subdivision Certificate** a Works Maintenance Bond(s) shall be deposited with Port Stephens Council (or a Bank Guarantee) for a minimum period of five years from the issue of subdivision certificate of a sum equal to 10% of the contract values of the water quality improvement devices and landscaping works. Verification of the contract values by Council will be required to determine this bond value. Note: (1) Bond administration fees apply in accordance with Council's adopted fees and charges. (2) Rolling bonds will not be accepted.	Not accepted. Considered unreasonable.
63	The developer is to provide the following plans, documentation and / or CAD files to Port Stephens Council: 1. Road construction plans in CAD and hard copy format **prior to commencement of road works;** 2. Works-as-executed drawings and CAD files of all engineering works **prior to the issue of any Subdivision Certificate**(s); and 3. CAD files which include all lot and road boundaries, lot numbers and easements, prior **to the issue of the Subdivision Certificate**. 4. Road and filling geotechnical testing and all other documentation in accordance with Council's infrastructure specification prior **to the issue of the Subdivision Certificate.** All CAD files shall be supplied in AutoCAD or compatible format in a known coordinate system (preferably GDA94 or MGA56).	Council's position noted.
64	Where new lots, new public and/or new private roads are created the street address numbers and road names(where relevant) shall be approved by Port Stephens Council in accordance with Council's Road Naming policy and application form. Road names shall be included on the final plan of subdivision. Details of proposed numbering shall be submitted to Council's GIS Services Team and approved **prior to application for Subdivision Certificate**.	Council's position noted.

65	The applicant shall restore, replace or reconstruct any sections of footpath, cycleway, kerb and guttering, road pavement, stormwater, or any other public infrastructure located within the Road Reserve that occur as a result of construction activities, as determined by Council's Development Engineers or Civil Assets Engineer. The applicant shall bear all associated costs with restoring the public infrastructure to satisfaction of the Certifying Authority. A **Subdivision Certificate shall not be issued** by the certifying authority until confirmation from the Roads Authority has confirmed that rectification works are to the satisfaction of the Roads authority.	Council's position noted.
66	A dilapidation report shall be provide and accepted by Port Stephens Council **prior to issue of a Construction Certificate,** for each stage of construction, for any public roads the Council has approved as haulage routines.	Council's position noted.
67	**Prior to the issue of Practical Completion Certificate and Subdivision Certificate** for each stage of construction a **"Works As Executed"** detail survey shall be submitted to Port Stephens Council for approval in accordance with Council's requirements, this shall include but not be limited to: • Confirmation of lot grading at a min 1% towards the road boundary • Confirmation of each box culvert crossing trunk drainage channels • Pit and Pipe drainage infrastructure • Line marking • Road Centreline • Top and Invert of kerb • Signs	Council's position noted except for point 1 re: 'confirmation of lot grading at a min 1% towards the road boundary'. This is not accepted based on previous commentary (see condition 22).
68	**Prior to the issue of Practical Completion** construction of each box culvert crossing trunk drainage channels shall be certified by a suitably qualified Structural or Civil Engineer and submitted to Port Stephens Council.	Council's position noted.

Construction Impacts		
69	*Whilst the consent authority is generally responsible for the consideration of Erosion and sedimentation conditions, the following has been provided for your consideration:* **Prior to the issue of Construction Certificate** a Soil & Water Management Plan, including all erosion, sedimentation and water quality components for use during and after construction in accordance with 'Managing Urban Stormwater - Soils & Construction', Department of Housing, 2004 Manual is to be prepared by a suitably qualified Chartered Professional Civil or Environmental Engineer submitted to Port Stephens Council for approval detailing temporary and permanent measures proposed to be installed. The plan is to include an analysis of : • Rainfall erosivity • Soil erodability • The erosion and sediment hazard and necessary environmental targets and limits to be met • The runoff coefficient • Soil contamination (if any) • Water tables • Ground water movements • Period of the year in which construction is expected to be undertaken • Sediment basin(s) and correct sizing, along with flocculation regimes • Diversion drain size capacity to determine the design and performance criteria for the preparation of site specific Erosion and Sediment Controls Plan(s). Control measures and treatment trains are to be thoroughly discussed for the site and its construction staging. The plan shall clearly illustrate and clearly define no go zones, timing and staging earthworks with regard to limiting exposure to rainfall events, stabilisation of erosion hazard. The plans must determine and recommend performance criteria and acceptable measures. In addition the Soil and Water Management Plan must clearly display acceptable discharge limits as per the following:	Council's position noted.

	• not exceed Total Suspended Solids of 50mg/L • not exceed Turbidity of 50 NTU • range within pH value of 6 to 8 • be < 80% and > 20% saturation dissolved oxygen • have no odour or visible petro-chemical sheen • have no visible litter or waste matter • not contain any other contaminant, chemical or biological condition which causes any measurable adverse affect Finally the plan must thoroughly discuss appropriate corrective and monitoring actions which are detailed for the strict purpose of construction, all details are to be submitted to Council for approval **prior to the issue of Construction Certificate.**	
70	All reasonable and practicable measures must be taken which are appropriate to ensure that the activities of all persons working on the site, including employees, agents and contractors, conform to the requirements of this consent and their general environmental duty as required under the POEO Act 1997.	Council's position noted.

Plan of:	PLAN VIEW	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	1 of 7
				Projection:	MGA Zone 56	Plan by:	CO
		Council:	Port Stephens	Origin:	PM 27766	Project Manager:	SD
				North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	B (6/02/2013)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-B
Our Ref:	37672

adw johnson

N

adw johnson

SANDBEDS

TOMAGO (FRESHWATER)

INDUSTRIAL SWITCHGEAR

CENTURION CIVIL

Graham Drive

313 Tomago Road (N.E.H.)

WesTrac Facility

EXISTING DRAIN

Existing Part 3A Approval 07-0086 & EPBC Approval 2007/3343

FUTURE LEVEE

TOMAGO WETLAND REHABILITATION (TWRP) STAGE 1 LEVEE (EXISTING)

EXISTING BOX CULVERT UNDER TOMAGO ROAD

Tomago Road

DRAINAGE

EXTENDED DRAINAGE

REFER TO SHEET 6

EXISTING FLOW SPLIT

EXISTING DRAIN

CONSERVATION LOT (22ha) TRANSFERRED TO NPWS

RING DRAIN

NPWS

EXISTING FLOOD GATES TO NORTH-SOUTH DRAIN

FULLERTON COVE

Tomago House

Tomago Church

CHANNEL 1

NEH DEVELOPMENT AREA

CHANNEL 2

CHANNEL 3

DISCHARGE CONTROL PIT

CHANNEL 4 2mAHD

BERM

RETAINED FRESHWATER WETLAND

LOT 1001 FLOODGATE

LOT 1001 D.P. 1127780

TOMAGO WETLAND REHABILITATION PROJECT AREA

RIVER LEVEE 1.7m AHD

DISCHARGE CONTROL PIT

STORAGE 29.3 ha. (2)

PERIMETER BERM 1.2mAHD

PERIMETER

RICE PADDY

BOUNDARY

900mm DIA. FLOODGATE -0.82m AHD

DISCHARGE TO RIVER

STAGE 1 (CURRENT) INUNDATION SALTMARSH AREA

Hunter River

STORAGE 10 ha. (1)

RETAINED SWAMP OAK FOREST

NORTH SOUTH DRAIN

PONDING AREA BETWEEN LEVEE & FILL & OVERFLOW AREA

525mm DIA. FLOODGATE -0.86m AHD

OVERFLOW WETLAND REHABILITATION AREA (FRESH WATER) 10ha. INVERT BASE 0.2m AHD

BACKWATER PONDING AREA

LOT 1002

RAMSAR

NPWS

EXISTING SMART GATES STAGE 1 (2006) TIDE/SALT WATER

FLOOD GATES INSTALLATION STAGE 2 WORKS (2012) TIDE/SALT WATER

RIVER LEVEE 1.4m AHD

A/1 SECTION ID / SHEET NO.

FILL EXTENTS

DEMOLISHED HOUSES

WETLAND AREAS

EXTERNAL CATCHMENTS

WATERCOURSES & STORAGES

0 100 200 300 400 600

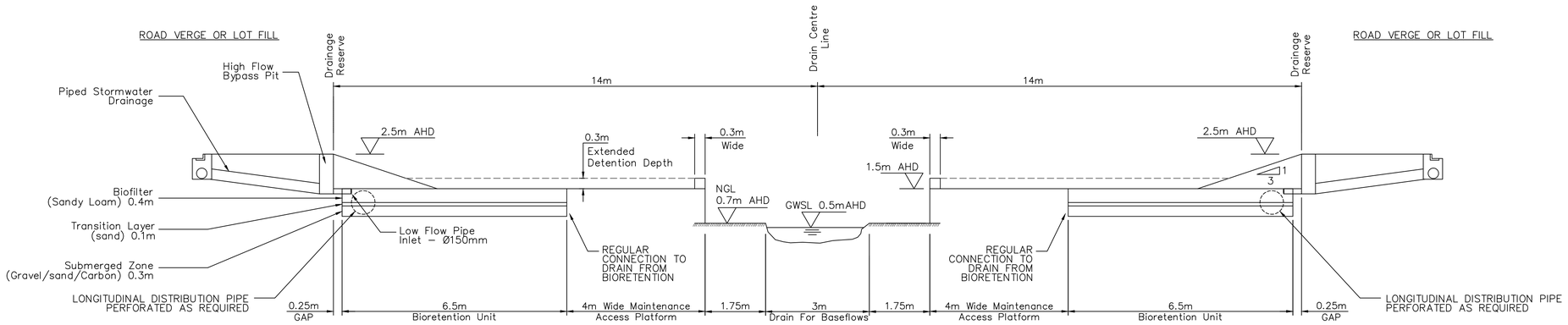
Bar Scale 1: 6000 (A1), 1: 12000 (A3)

Ver.	Date	Comment
B	6/02/2013	Additional Detail
A	27/11/2012	Issued for Approval

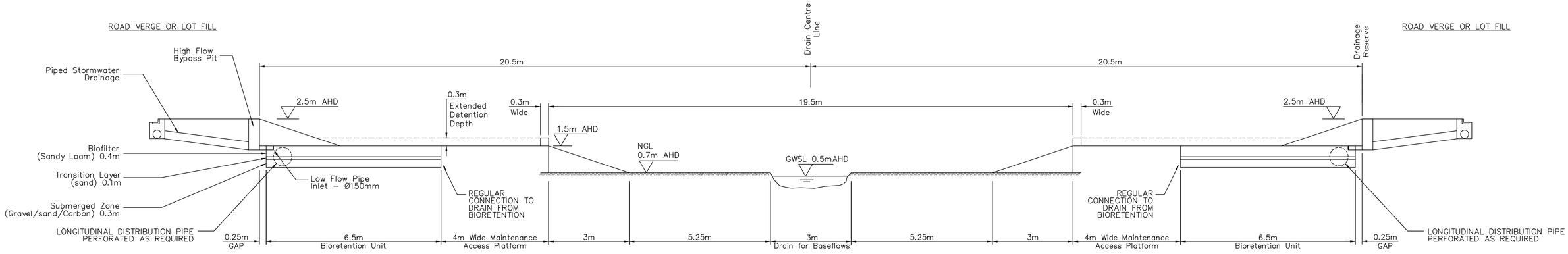
Plotted By: malc Plot Date: 07/02/13 - 08:39 Cad File: N:\37672 Northbank\Dwg\37672-DRAIN-CROSS-SECTION-001-B.dwg

Plan of:	CROSS SECTIONS - CHANNEL 1	Location:	Tomago Road, Tomago	Datum: AHD Origin: N/A Projection: MGA Zone 56 Origin: PM 27766 North Direction: Grid Contour Interval: N/A	Date: 27-Nov-2012 Sheet: 2 of 7 Plan by: CO Project Manager: SD Office: Hunter Plan Purpose: Report	Version: B (6/02/2013) Client: Northbank Enterprise Hub Pty Ltd Survey: N/A AutoCad: N:\...\37672-DRAIN-CROSS-SECTION-001-B Our Ref: 37672	
		Council:	Port Stephens				

adw johnson



SECTION A 1
TYPICAL
SCALE 1:75



SECTION B 1
TYPICAL
SCALE 1:75

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

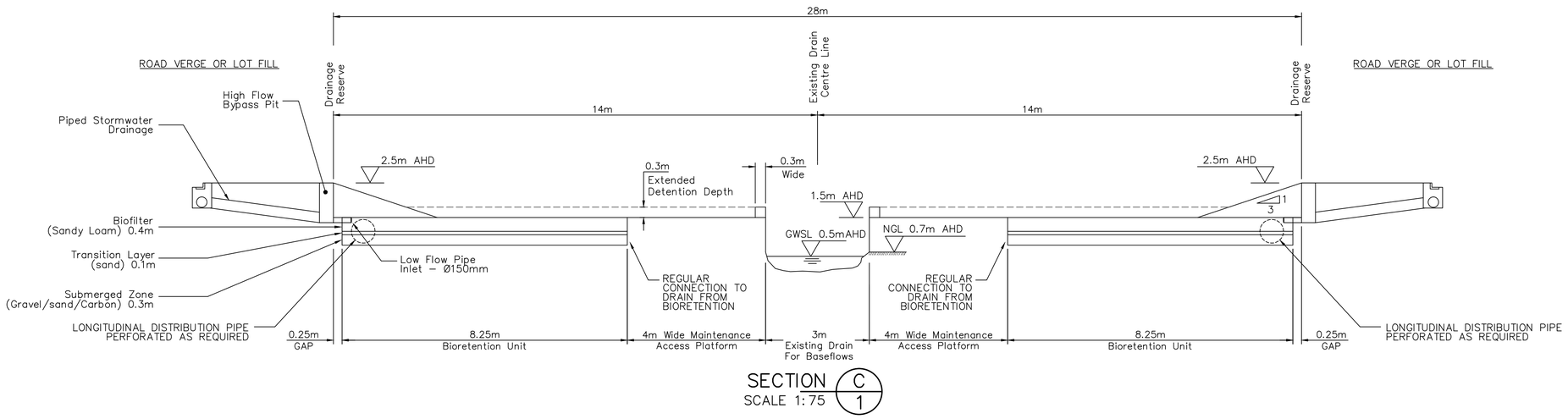
Ver.	Date	Comment
B	6/02/2013	Additional Detail
A	27/11/2012	Issued for Approval

adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

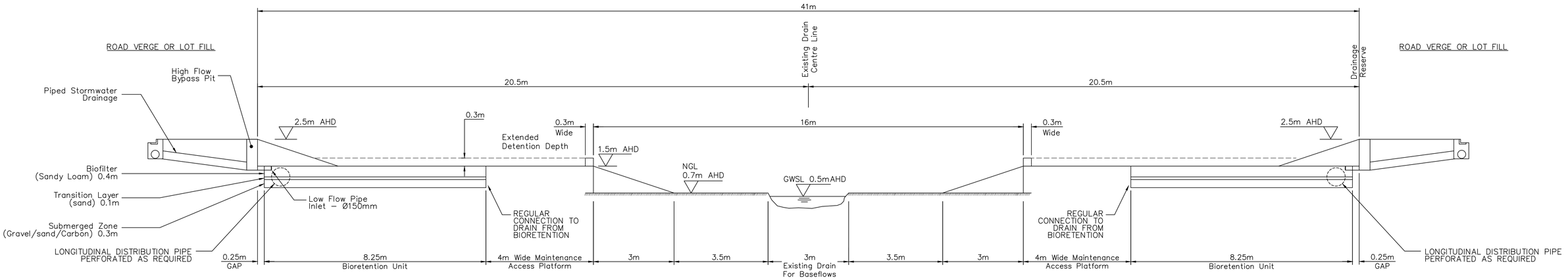
Plotted By: malc Plot Date: 07/02/13 - 08:40 Cad File: N:\37672 Northbank\Dwg\37672-DRAIN-CROSS-SECTION-001-B.dwg

Plan of:	CROSS SECTIONS - CHANNEL 2	Location:	Tomago Road, Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	3 of 7
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	B (6/02/2013)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-B
Our Ref:	37672



SECTION C/1
SCALE 1:75



SECTION D/1
SCALE 1:75

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

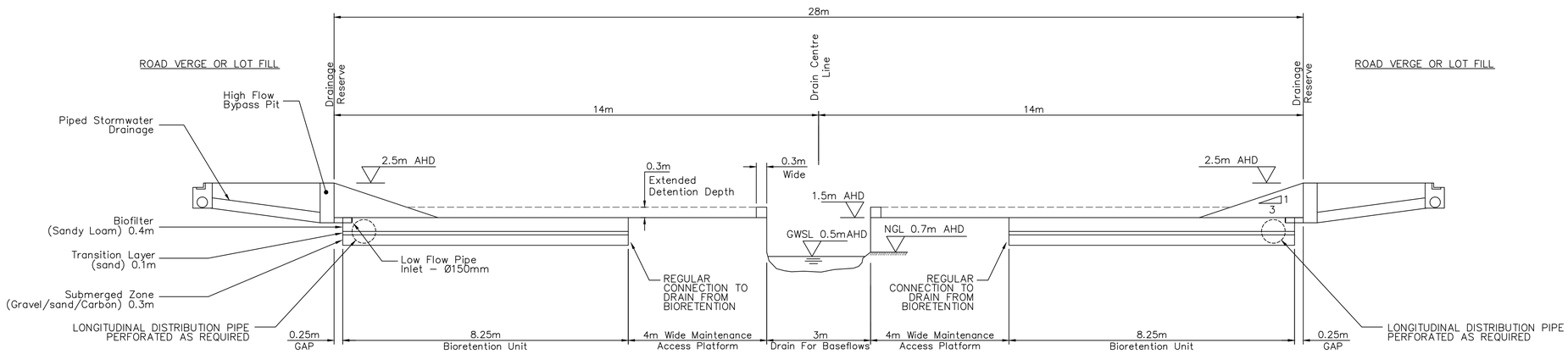
Ver.	Date	Comment
B	6/02/2013	Additional Detail
A	27/11/2012	Issued for Approval

Plotted By: malc Plot Date: 07/02/13 - 08:40 Cad File: N:\37672 Northbank\Dwg\37672-DRAIN-CROSS-SECTION-001-B.dwg

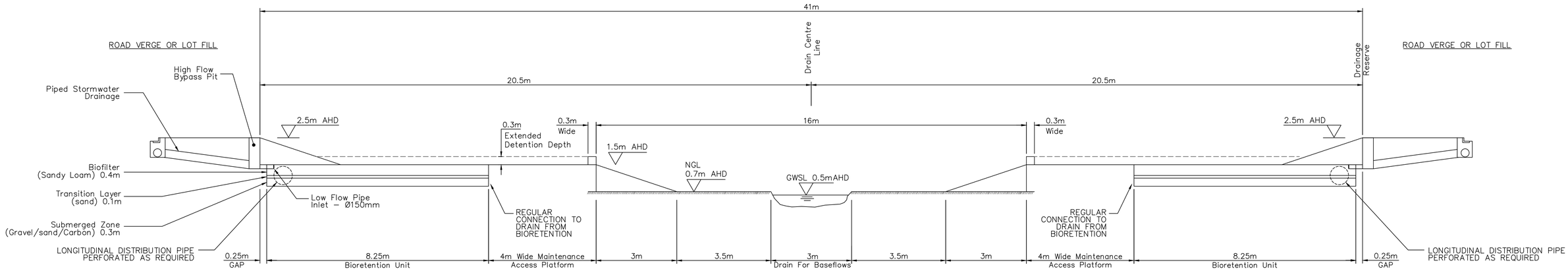
Plan of:	CROSS SECTIONS - CHANNEL 3	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	4 of 7
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	B (6/02/2013)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-B
Our Ref:	37672

adw johnson



SECTION E/1
SCALE 1:75



SECTION F/1
SCALE 1:75

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS

GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

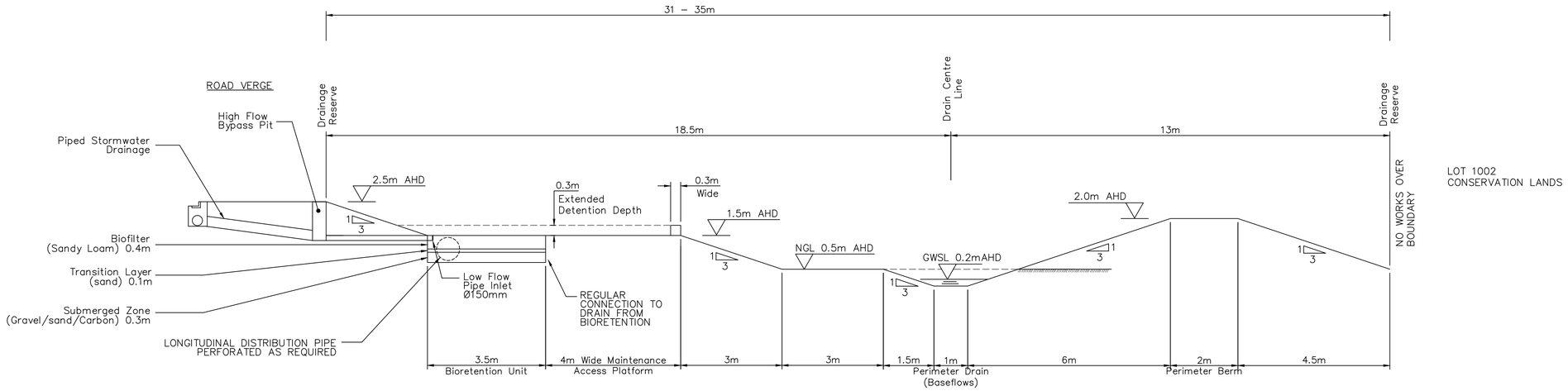
Ver.	Date	Comment
B	6/02/2013	Additional Detail
A	27/11/2012	Issued for Approval

Plotted By: malc Plot Date: 07/02/13 - 08:40 Cad File: N:\37672 Northbank\Dwg\37672-DRAIN-CROSS-SECTION-001-B.dwg

Plan of:	CROSS SECTIONS - CHANNEL 4	Location:	Tomago Road Tomago	Datum:	AHD	Date:	27-Nov-2012
				Origin:	N/A	Sheet:	5 of 7
				Projection:	MGA Zone 56	Plan by:	CO
				Origin:	PM 27766	Project Manager:	SD
		Council:	Port Stephens	North Direction:	Grid	Office:	Hunter
				Contour Interval:	N/A	Plan Purpose:	Report

Version:	B (6/02/2013)
Client:	Northbank Enterprise Hub Pty Ltd
Survey:	N/A
AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-B
Our Ref:	37672

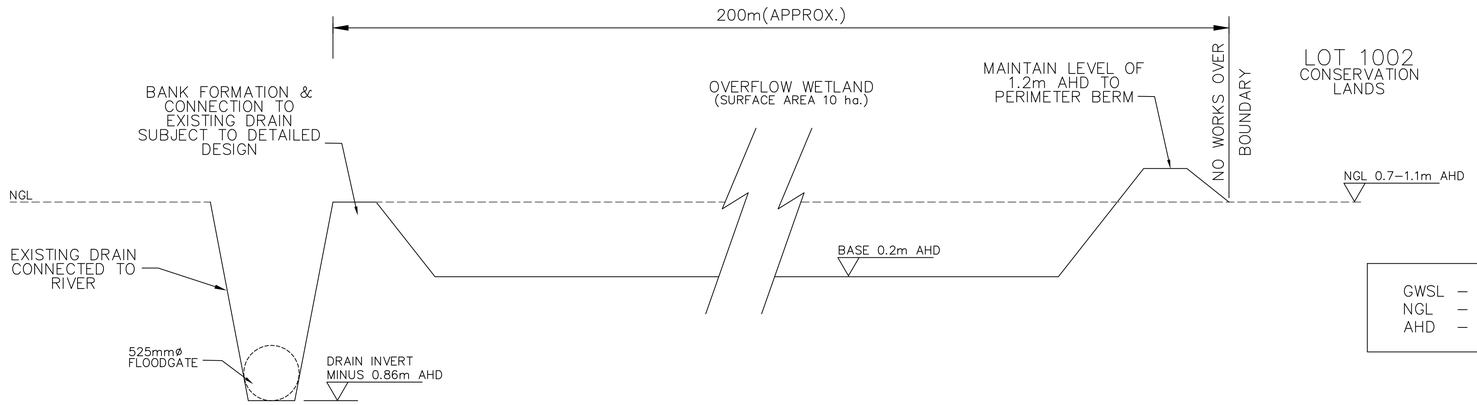
adw johnson



SECTION G
SCALE 1:75 1

NOTES:

1. ALL BATTERS 1V:3H U.N.O.
2. LEVELS SHOWN ARE INDICATIVE & WILL CHANGE RELATIVE OVER LENGTH FOR RISE IN NATURAL GROUND LEVEL
3. ACCESS TO CHANNEL MAINTENANCE ACCESS FROM ROAD/CULVERT CROSSINGS



SECTION H
SCALE N.T.S 1

GWSL – GROUND WATER SURFACE LEVEL
NGL – NATURAL GROUND LEVEL
AHD – AUSTRALIAN HEIGHT DATUM

Ver.	Date	Comment
B	6/02/2013	Additional Detail
A	27/11/2012	Issued for Approval

adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398

Plotted By: malc Plot Date: 07/02/13 - 08:40 Cad File: N:\37672 Northbank\Dwg\37672-DRAIN-CROSS-SECTION-001-B.dwg

Plan of: DETAIL

Location: Tomago Road
Tomago

Council: Port Stephens

Datum:	AHD	Date:	27-Nov-2012	Version:	B (6/02/2013)
Origin:	N/A	Sheet:	6 of 7	Client:	Northbank Enterprise Hub Pty Ltd
Projection:	MGA Zone 56	Plan by:	CO	Survey:	N/A
Origin:	PM 27766	Project Manager:	SD	AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-B
North Direction:	Grid	Office:	Hunter	Our Ref:	37672
Contour Interval:	0.1m	Plan Purpose:	Report		

adw johnson

N

adw johnson

BUILDING FLOOR LEVELS
APPROX. 3m AHD

TOP OF EMBANKMENT
APPROX. 2.5m AHD

MINOR FLOW FROM WEST

INCREASED DRAIN
STORAGE ADJACENT
(CURRENTLY NO DRAIN)

LOW LYING AREA
-1.5m AHD

SUSCEPTIBLE TO PONDING
DURING STORM EVENTS &
WATERLOGGING

IMPROVED
DRAINAGE
SOUTH

0 10 20 30 40 50 75 100

Bar Scale 1: 1000 (A1), 1: 2000 (A3)

Ver.	Date	Comment
B	6/02/2013	Additional Detail
A	27/11/2012	Issued for Approval

Plotted By: malc Plot Date: 07/02/13 - 08:40 Cad File: N:\37672 Northbank\Dwg\37672-DRAIN-CROSS-SECTION-001-B.dwg

Plan of: EXISTING CONTOURS & STORAGE AREAS

Location: Tomago Road
Tomago

Council: Port Stephens

Datum:	AHD	Date:	27-Nov-2012	Version:	B (6/02/2013)
Origin:	N/A	Sheet:	7 of 7	Client:	Northbank Enterprise Hub Pty Ltd
Projection:	MGA Zone 56	Plan by:	CO	Survey:	N/A
Origin:	PM 27766	Project Manager:	SD	AutoCad:	N:\...\37672-DRAIN-CROSS-SECTION-001-B
North Direction:	Grid	Office:	Hunter	Our Ref:	37672
Contour Interval:	0.5	Plan Purpose:	Report		

adw johnson

N

FILL

PONDING AREA BETWEEN LEVEE & FILL & OVERFLOW AREA AVERAGE NATURAL SURFACE LEVEL 0.8m AHD

LANDSCAPE STORAGE AREA 28.3 ha.

DISCHARGE CONTROL PIT E□TENT

E□TENT

PERIMETER BERM 1.2mAHD

LINKED TO PERIMETER BERM AT 1.2m AHD

E□ISTING DRAIN

RETAINED SWAMP OAK FOREST

900mm DIA. FLOODGATE -0.82m AHD

BACKWATER PONDING AREA

CREST EDGE TO 1.2m AHD

STORAGE AREA 10 ha.

" LANDSCAPE ARTIST IMPRESSION "

LEVEL AT BOUNDARY MAINTAINED AT 1.2m AHD

OVERFLOW WETLAND REHABILITATION AREA (FRESH WATER) 10ha. INVERT BASE 0.2m AHD

525mm DIA. FLOODGATE -0.86m AHD

RIVER LEVEE 1.4m AHD

Hunter River

Ver.	Date	Comment
B	6/02/2013	Additional Detail
A	27/11/2012	Issued □r Approval

adw johnson pty. ltd. unit 7, building 2, 335 hillsborough road, warners bay 2282 ph: (02) 49785100 fax: (02) 49785199 hunter@adwjohnson.com.au abn 62 129 445 398