



27 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 A – REGIONAL FLOODING RESPONSE'

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

1. INTRODUCTION

This report has been compiled to specifically address concerns raised by authorities in relation to floodway, flood hazard and potential impacts on regional flooding following development of Lot 1001 DP 1127780 at Tomago Road, Tomago.

1.1. BACKGROUND

A Regional Flooding Assessment for the Northbank Enterprise Hub Business Park has been completed by BMT WBM which included modelling of both the Hunter and Williams Rivers. BMT WBM have developed a comprehensive TUFLOW 2D flood model of the Hunter River landscape, completing analysis for significant projects such as the proposed RMS Hexham crossing and QR National/ARTC projects at the same location.

Authorities have raised concern in the assessment of the regional flood report in relation to:

- Floodway – fill platform, required to achieve flood immunity for development of Lot 1001, and its proximity to overbank flowpaths of the Hunter River during major events;
- Flood Hazard – namely in relation to the high hazard rating for existing flows over parts of Lot 1001; and
- Flood impact on upstream property.

A more detailed explanation and analysis of the modelling results is provided in this document to address these concerns.

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1.2. FLOODPLAIN DEVELOPMENT MANUAL

The standard used for this analysis is the Floodplain Development Manual (NSW Government, 2005). This standard provides general principles, identification methods and a process for floodplain risk management of flood behaviour and impacts.

Provisional Flood Hazard

Flood Hazard is a measure of the degree of difficulty that pedestrians, cars and vehicles will have in egressing flood areas, and the likely damage to property and infrastructure. The provisional flood hazard of floodwaters is defined by static energy – depth related and dynamic energy – flow velocity at the location.

Approximate relationships have been developed for categorising flood hazard as either high or low. At this site, flooding exceeds the depth of 1 metre and therefore triggers the categorisation of high hazard in its existing state. It should be noted however that WBM's model indicates that this categorisation is depth dominated and not velocity dominated, ie existing flood depths for the majority of Lot 1001 are typically 2.5m at an existing velocity of 0.5m/s. Some areas of lot 1001 closest to the river frontage are 1-1.5m/s.

Delineation of hazards to be high or low by definition, is velocity dominated, ie high velocity flows at shallow depths are considered higher hazard for potential damage and difficulty in egressing than low velocity floods of greater depth. This ratio is approximately 2:1 for delineation of high to low categories.

Therefore the provisional hazard classification of the land could be reduced by reducing the depth of floodwaters across the land by filling the land.

Hydraulic Categories

The three (3) hydraulic categories used throughout the manual flood regime include;

Floodways, which are areas that convey a significant portion of the flood flows. These areas, even if partially blocked, would cause a significant increase in flood levels.

Flood storage, which are the parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation.

Flood fringe, is the remaining area once the floodway and flood storage areas have been defined. Partial or complete blockage of these areas does not have a significant effect on the pattern of flood flows and/or levels.

Unfortunately there is no explicit quantitative criteria to defining the floodway, flood storage and flood fringe hydraulic categories.

2. PROPOSED DEVELOPMENT

The fill extents for the proposed development of Lot 1001, for flood immunity from the 1% AEP event, is shown on Sheet 1 (attached).

BMT WBM's work in relation to determining the appropriate fill extent on Lot 1001 was an iterative process. The following considerations were made:

1. Location of the historical flood runner, overbank flowpaths; and
2. Pre to post development flood hazards and categories for upstream.

In relation to Point 1, a range of aerial photos dating back to 1961 were analysed together with ground elevations over Lot 1001 and Lot 1002, adjacent and downstream of Lot 1001. As a result, the fill was setback from the historical flood runner in determining acceptable limits to fill extents on Lot 1001. Refer to Sheets 1 and 2.

In relation to Point 2, objectives of the fill extents were to:

- have no adverse impact during minor storm events; and
- have no adverse (ie increase) flood hazard impact on property immediately upstream of Lot 1001.

Fill extents were modelled and remodelled in an iterative process to determine an acceptable balance so as not to adversely affect flood hazard and improve same where possible. Modelling is cumulative including the fill of existing approved development lands under MP07_0086 project, north east of Lot 1001.

3. MODELLING RESULTS

The regional flood modelling by BMT WBM is conservatively estimated in that downstream tailwater levels are assumed to be 'high tide' for the Hunter River. Whilst this is most certainly possible, it is also possible that the flood peak in the Hunter River may coincide with a 'low tide', thereby significantly improving in bank flow capacities and reducing flood levels. The peak of the Hunter River takes in the order of 3 days to reach this location downstream of Hexham due to the high proportion of the Hunter River catchment being upstream of Singleton. The most recent flood peak of the Hunter River during June 2007 (the Pasha Bulka storm) reached 5% AEP levels in Maitland, however coincided with a low tide upon reaching Hexham and consequently remained in bank and had little or no impact on properties surrounding the Newcastle Port to Hexham flood reaches. The respective probabilities of the peak coinciding with either a low or high tide is beyond this scope and it is accepted as standard practice to adopt the high tide scenario in regional flood modelling.

Assessment was made for modelling results from a range of design storms from 10% AEP to 1% AEP storm events at both upstream and downstream properties, refer to figures 3-3 and 3-9 of BMT WBM report. The modelling results for properties to the east, downstream of Lot 1001 are shown in Table 1. The results for properties to the west, upstream of Lot 1001 are shown in Table 2. Adjacent property to the west of Lot 1001 is the description of five (5) industrial development properties between the public reserve/boat ramp of Tomago Road and Lot 1001, refer to Sheet 1.

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
10% AEP	No change	No change	No change	The fill extents have no changes to flood regime on any property in this event
5% AEP	Negligible Decrease	Negligible Decrease	—	No change
2% AEP	Minor Decrease up to 0.1m	Minor Decrease up to 0.2m/s	Decrease in hazard	Benefit to a number of existing properties
1% AEP	Decrease up to 0.2m*	Decrease up to 0.5m/s	Decrease in hazard	Benefit to an extensive number of existing properties

*Minor decrease of peak flood level over Fullerton Cove, Cabbage Tree Road and Nelson Bay Road properties east of lot 1001.

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
10% AEP	No change	No change	No change	The fill extents have no changes to flood regime on any adjacent property in this event
5% AEP	Negligible increase on 1 property	Negligible Decrease	No change	No change
2% AEP	Minor increase 0.02 to 0.05m	Minor decrease 0.02 to 0.2m/s	Minor decrease	Decrease in hazard
1% AEP	Increase up to 0.18m*	Decrease up to 0.5m/s	Decrease in hazard	Notable decrease in hazard

*Affectation on one property adjacent only to this level

From Table 1 for properties to the East of Lot 1001 and flood image Figures 3-3 – 3-9, it is clear that there is notable benefit to an extensive number of existing properties to the east of Lot 1001, post development. These properties are located along Cabbage Tree Road, Nelson Bay Road and Fullerton Cove Road. The benefit is decreased flood hazard, by reduction of both flood level (static energy) and velocity (dynamic energy).

From Table 2 for properties to the West of Lot 1001 and flood image Figures 3-3 - 3-9, the following points are predicted from the modelling:

- No change to flood regime over adjacent property up to the 10% AEP event.
- No net change to flood hazard during the 5% AEP event over adjacent property.
- There is negligible increase over adjacent property and slight peak flood level increase over one (1) adjacent property and decrease in peak hazard over two (2) nearest properties for the 2% AEP event.
- There is a peak flood level increase over adjacent properties however this increase is with a notable decrease in peak hazard over the adjacent properties during the 1% AEP event.

Regionally upstream of Lot 1001,

- There is predicted 0.02m-0.05m peak flood level increases across Hexham Swamp and Kooragang Island respectively during the 2% AEP event.
- There is predicted 0.02m-0.10m peak flood level increases across Hexham Swamp and Kooragang Island respectively during the 1% AEP event.
- Existing low lying residential and industrial property on the south side of the River (Old Maitland Road) with relatively small flood depth increases by comparison to large existing flood depths as noted by equatica (independent review for DoPI)

Lot 1002 assessment

To the south east and adjacent of Lot 1001 lies Lot 1002, identified conservation lands owned by Port Waratah Coal Services (PWCS). NEH's consultant ADW Johnson has liaised with PWCS on the wetland interface strategy for the management of vegetation and hydrology for regular minor events.

There are patches of increased peak velocity and peak flood level over the Lot 1002 conservation lands during the peak of the storm event. The velocities remain non-scouring limited to a peak of 1.1m/s. We note that with the salt marsh regeneration plans of PWCS and consequently removal of the trees within this area, peak flow velocities will increase. The velocity increase is over the historical flood runner, which will increase conveyance, and so on a cumulative basis, this will decrease upstream flood levels upon completion of these works.

With existing flood depths of approximately 2m, it is confirmed that based on the modelling results there is no adverse affectation of the conservation value of the PWCS land from regional flood impacts.

3.1. FURTHER ASSESSMENT

On Site Investigation

In relation to the increased peak flood levels on the adjacent industrial lands, further assessment has been undertaken. The 2D flood model is completed on a large regional scale and so further assessment of the on site details and practices was completed.

The following observations were made on site of the adjacent industrial properties:

- Large metal fencing along the river frontage;
- Containers and other sizeable equipment stored on site below 1% AEP peak flood level; and
- Large scrap metal stockpiles to 10m high on property.



Plate 1 - Large scrap metal stockpiles on adjacent industrial lot

It was concluded that there are currently on site practices which would significantly affect flood regime both on the industrial properties within the adjacent properties identified. Potentially the affectation of these on site practices affect both the adjacent industrial properties and may also impact on the flood regime toward Lot 1001. The regional model results remain a guide for the definition of these areas.

3.2 BACKGROUND DOCUMENTATION

An assessment of the existing and future potential flooding issues was undertaken in a report 'Lower Hunter Floodplain Management Study: Volume A – Assessment of Strategic Options for Community Consultation', October 1996 prepared by Patterson Britton and Partners Pty Limited. This report detailed the hydraulic and flood related impacts of a range of broad scale development options that were considered for floodplain for both Newcastle City Council and Port Stephens Council areas.

The modelling undertaken in this report predicted peak flood level increases of up to 120mm to existing areas upstream of Hexham during the 1% AEP event.

This modelling was for filling land adjacent to Tomago Road west of Fullerton Cove.

In the report it was concluded from the modelling that filling could be undertaken through this area along Tomago Road.

In the Volume B report of same, in particular to the industrial development for land located west of Fullerton Cove, it was concluded that:

- the minimum floor level be 300mm above the peak 5% AEP event;
- Access to higher ground be maintained to a level above the peak 2% AEP event; and
- Access routes for staff and transport to at least to the peak 2% AEP event level be provided.

It is unknown whether Port Stephens Council formally adopted these recommendations, however it was only recently that industrial development floor levels were to be a minimum level equivalent to the peak 2% AEP event with electrical located higher).

Given that Lot 1001 is now the actual development proposal for the land adjacent to Tomago Road, a comparison can be made of the previous and current modelling results. Peak flood levels during the 1% AEP event are dramatically lower than the previous modelling investigation of this report, 20mm vs 120mm upstream of Hexham. Under the current proposal there is no flood regime change at the previously recommended floor levels for industrial development. It is considered that the fill extent and current development strategy for Lot 1001 is an improved outcome by comparison to the potential flood impacts from proposed development.

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.

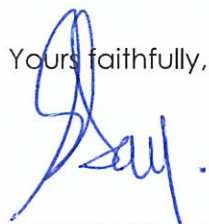
4. CONCLUSION

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,

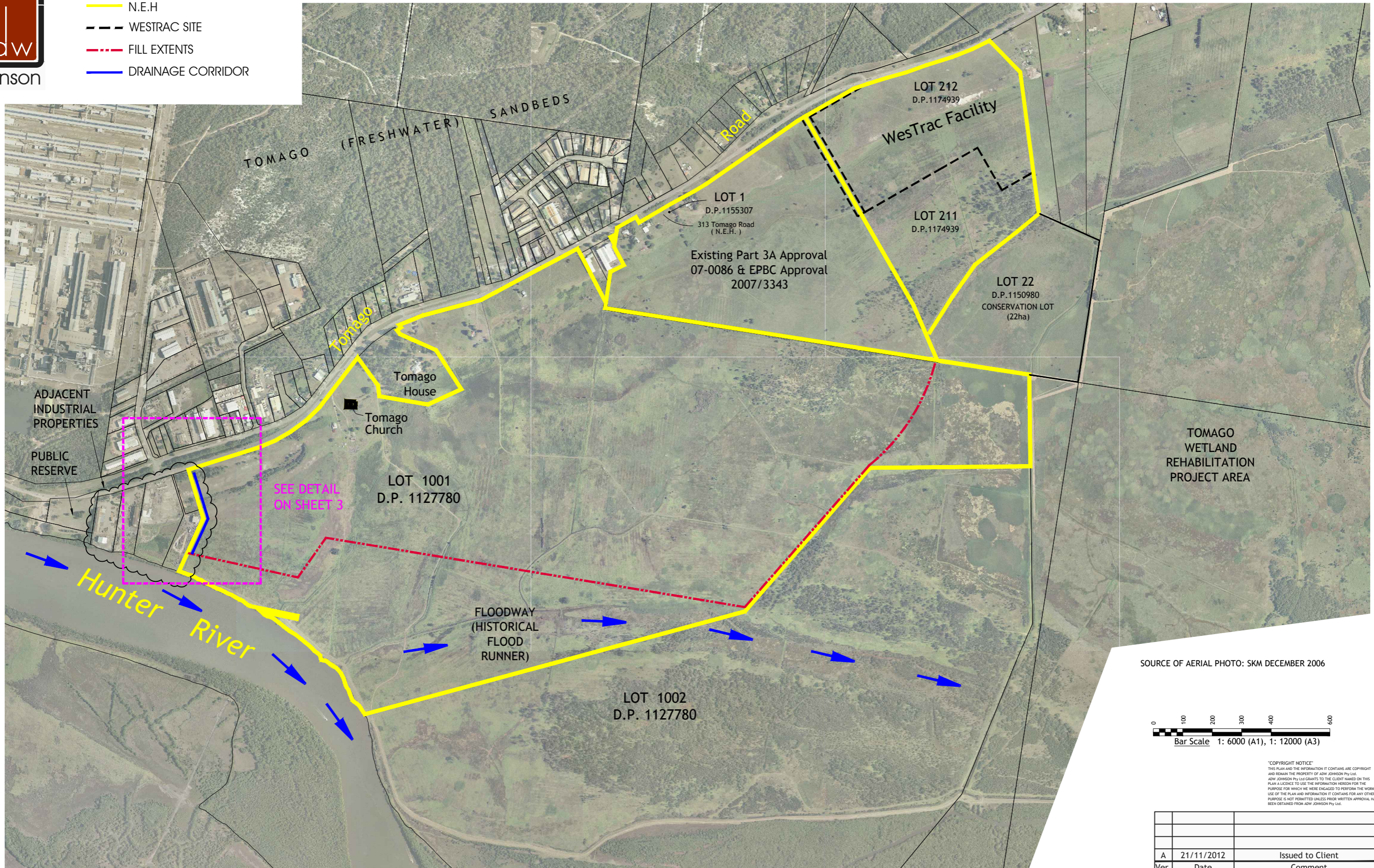
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SCOTT DAY BE (Env) MIEAust, CPENG NPER
ENVIRONMENTAL ENGINEER

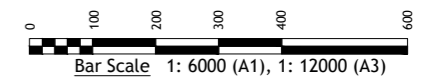
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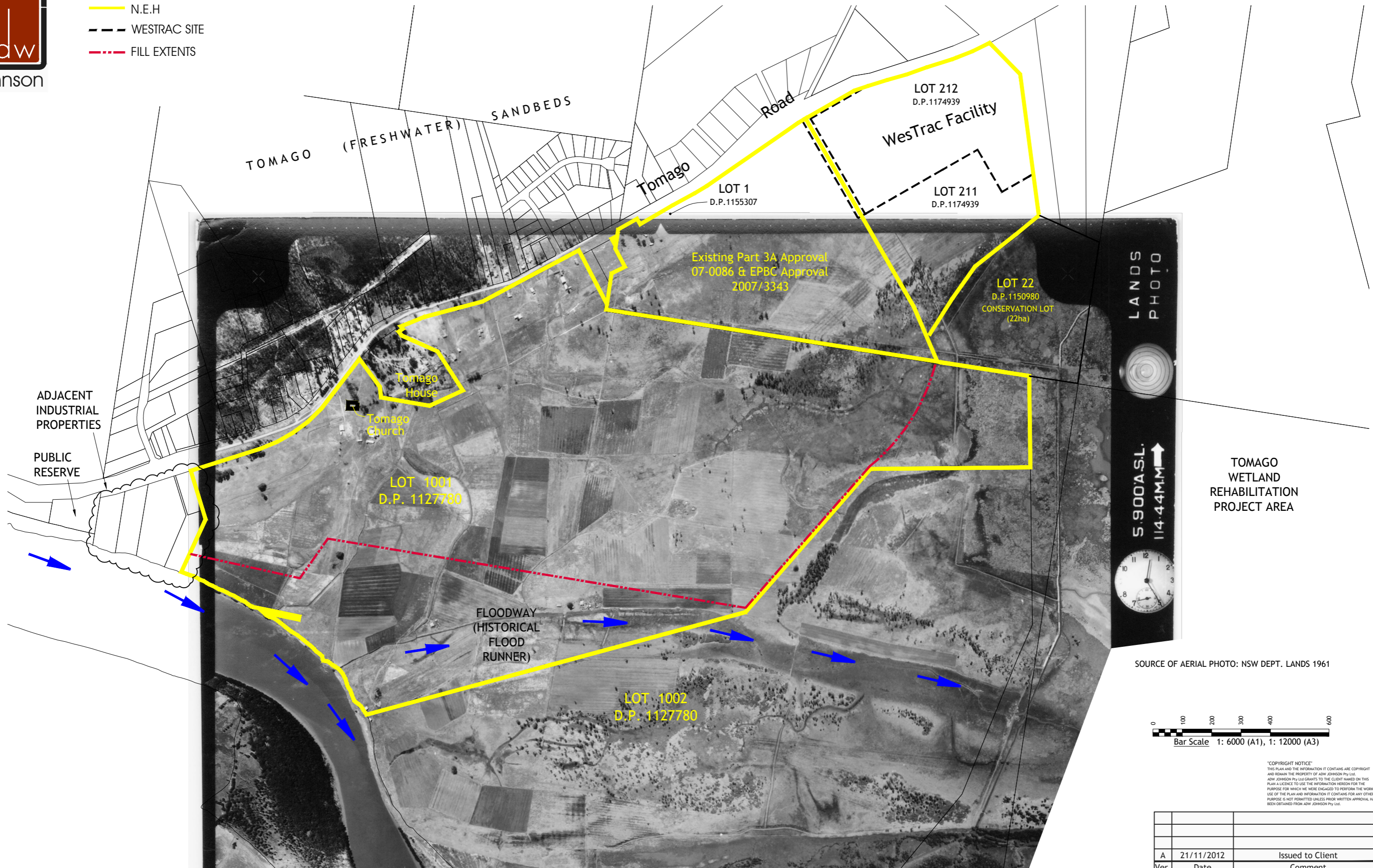
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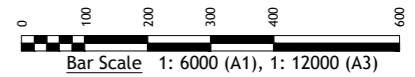
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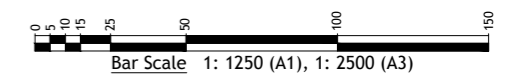
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