Appendix D2 – Flood Response Plan

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Tweed Sand Plant, Altona Road, Cudgen

Flood Response Action Plan

Client: Hanson Construction Materials Pty Ltd
Project No: BE190043
Document No: BE190043-RP-FRAP-01

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Executive Summary

Burchills Engineering Solutions was engaged by Hanson Construction Materials Pty Ltd to prepare a Flood Response Action Plan (FRAP) to support a Development Application (DA) for the expansion of the existing Tweed Sand Plant located at Altona Road, Cudgen, properly described as Lot 156 on DP628026.

A FRAP is required as the site to address matters raised within the Biodiversity and Conservation Divisions *Recommended Environmental Assessment Requirements (EARs)* dated 9 December 2019 for the proposed Tweed Sand Plant Expansion. In particular, item 17 raises matters relating to the emergency management of the site during a flood event. Items 17 (h) – (k) of flood on site by the EAR are as follows:

h. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the NSW SES and Council;

i. Whether the proposal incorporates specific measures to manage risk to the life from flood. These matters are to be discussed with the NSW SES and Council;

j. Emergency management, evacuation and access, and contingency measures for the development considering the full range or flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the NSW SES;

k. Any impact the development may have on the social and economic costs to the community as a consequence of flooding.

The Flood Response Action Plan report has been prepared in accordance with the policy, provisions and clauses prescribed by the Tweed Shire Council's statutory framework. The strategy adopted in this report is for the early evacuation of the Tweed Sand Plant prior to the onset of flooding, mitigating the potential burden the proposed development upon emergency services personnel. Table i below summarizes the prescribed flood levels for the subject site and levels associated with the internal road network and site office.

Table i. Relevant Project Levels

100yr ARI Flood Level*	Designated Flood Level**	Probable Maximum Flood (PMF) Level	Habitable Floor level	Minimum road level
3.22	3.21	8.2		1.25

** 100yr ARI Flood Level derived from Burchills Engineering Solutions Flood & Stormwater Assessment (BE190043-RP-FSA-00)*

***Designated Flood Level derived from Tweed DCP Flood Mapping.*

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1. Introduction

1.1 Background

Burchills Engineering Solutions was engaged by Hanson Construction Materials Pty Ltd to prepare a Flood Response Action Plan (FRAP) to support a Development Application (DA) for the expansion of the existing Tweed Sand Plant located at Altona Road, Cudgen, properly described as Lot 156 on DP628026.

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j. Emergency management, evacuation and access, and contingency measures for the development considering the full range or flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the NSW SES;

k. Any impact the development may have on the social and economic costs to the community as a consequence of flooding.

A Flood Response Action Plan provides a means by which an applicant can assess and nominate the most applicable flood emergency response for a development (whether it be avoidance, evacuation, or shelter in place), and for Council officers to consider during assessment of the development application.

This FRAP report has been prepared in accordance with the provisions of the Tweed Local Environmental Plan 2014 (LEP) Tweed Development Control Plan (DCP) and associated flood risk management documents and policies.

1.2 Site Description

The subject site is located at Altona Road, Cudgen, within the Tweed Shire Council local government area. The current Tweed Sand Plant site consists of three lots which are properly described as Lot 22 on DP1192506, Lot 23 on DP1077509 and Lot 494 on DP720450 and occupies an area of approximately 46ha. The site is accessed via Altona Road which is off Crescent Rd and the Tweed Coast Road.

The existing development is to be expanded to include Lot 2 on DP1192506 and the new proposed Lot 1, being part of Lot 706 on DP1000580 which covers an additional area of 101ha, an additional 29ha of land within the previous Phase 5 area that was investigated but not approved for extraction

during the 2005 EIS, is also to be included in the development, covering a total of 176ha. Access to and from the redeveloped site is to be via the Pacific Motorway/Tweed Valley Way on-ramp, to the west of the site and adjacent to the existing Australian Bay Lobster Producers Pty Ltd (ABLP) facility, diverting all related vehicles (heavy and light) away from the current site access (Altona Road/Crescent Street/Tweed Coast Road).

Aside from the existing sand plant operation situated upon lots Lot 22 on DP1192506, Lot 23 on DP1077509 and Lot 494 on DP720450, the majority of the site area is currently utilised for agricultural purposes (sugar cane). The site has been extensively altered, with the majority of the subject sites native vegetation cover cleared to facilitate agricultural pursuits. Small pockets of native vegetation exist in the southern extents of Lot 706 DP1000580 in the proximity of residential dwellings adjacent to Cudgen Road.

Land uses surrounding the site are dominated agricultural pursuits and rural residential properties. To the north of the subject site is predominately used for agricultural purposes. Adjacent to the current site entrance off Altona Road is the Kingscliff Wastewater Treatment Plant. To the south and the east of the site, land uses are dominated by agricultural pursuits and rural residential properties. The western extents of the site are bound by the by the Pacific Motorway. Located between lots 2, 51, 706 and the Pacific Motorway is the Australian Bay Lobster Producers facility

The site is traversed by a number of farm drains which are tidally flushed and are connected to the Tweed River. Figure 1.1 below shows a locality plan of the subject site while Figure 1.2 shows an aerial photograph of the site.

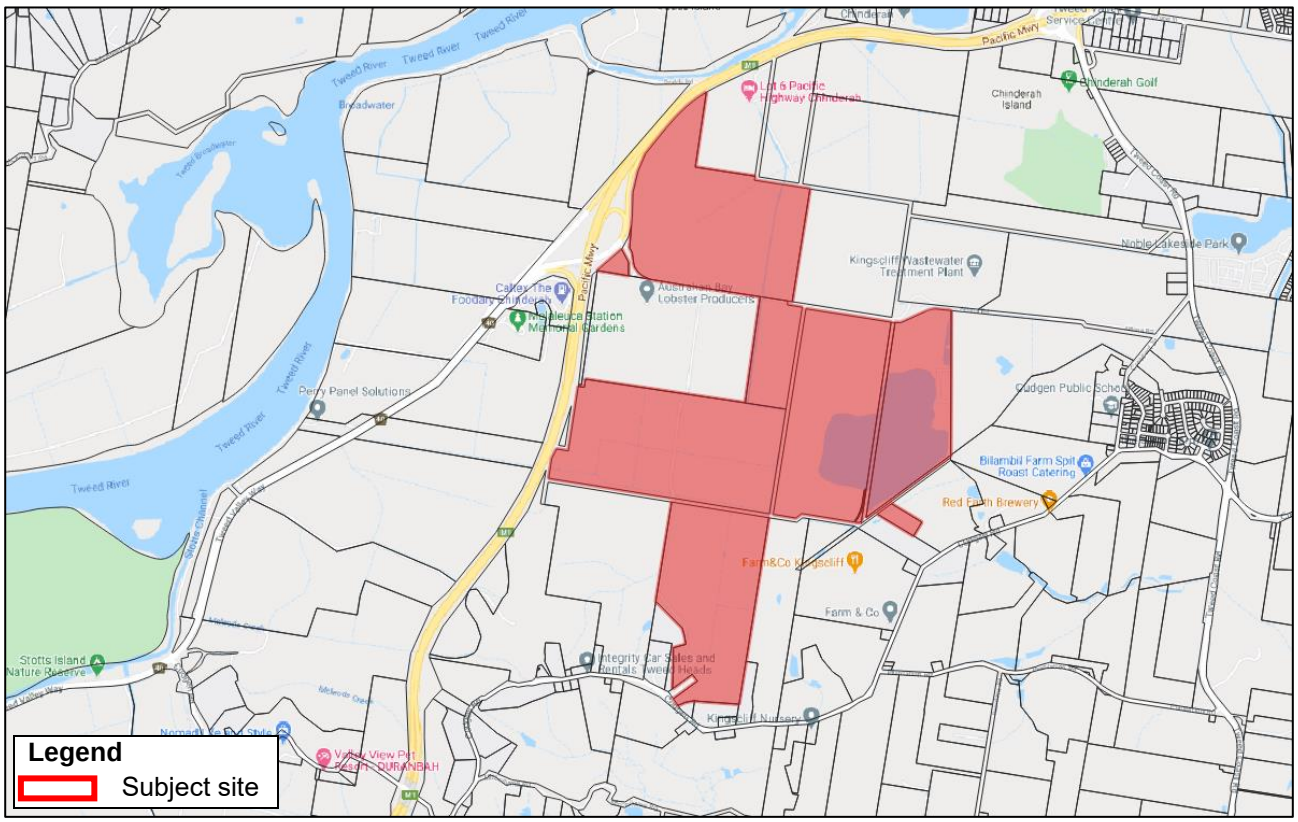

Figure 1.1 Locality Plan of the subject site (Courtesy: Google)

Figure 1.2 Aerial Photograph of the subject site (Courtesy: Google)

1.3 Description of Development

The expansion of the Tweed Sand Plant facility will increase annual production from 950,000 tonnes per annum (tpa), or 500,000 cubic metres (m3) per annum with annual extraction and sales rate would be market driven. The ultimate project life would be up to approximate 30 years, accessing an available resource of approximately 30-35 million tonne. The current site office, washplant and stockpile areas (located on centrally on Lot 22 on DP1082435) will be relocated to the northern end of Lot Plan 2DP1192506 as extraction proceeds.

All extraction will be via a dredge unit (i.e. wet excavation) and piped to an onshore washplant. The dredge and wash plant are to have a larger capacity and footprint compared to the current operation, albeit noise output, air emissions etc would likely be lower due to improvements in technology. The loading of the product will remain unchanged with product loaded into tucks via front-end loaders.

Figure 1.3 below provides an extract of the ultimate Tweed Sand Plant layout, showing the location of future buildings / wash plant and haul route.

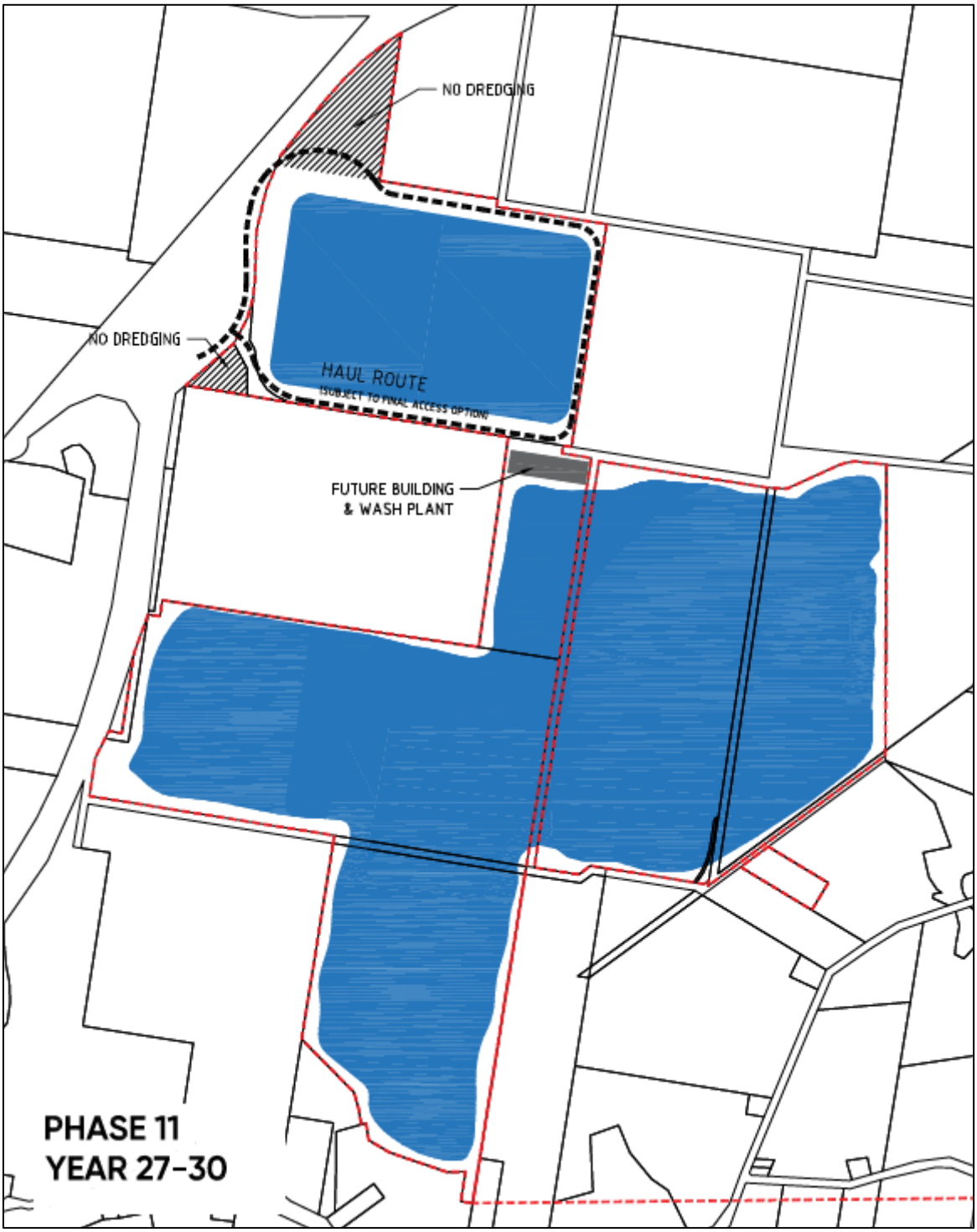

Figure 1.3 Proposed Ultimate Development Layout (Courtesy: Zone)

1.3.1 Site Operations

Operating hours would be as follows for the existing Tweed Sand Plant are as follows:

- Sand dredging & processing 24 hours/day, 7 days/week –
- Haulage 24 hours/day, 7 days/week –

- Maintenance 24 hours/day, 7 days/week.

The expanded Tweed Sand Plant facility shall maintain the existing hours of operation.

1.3.2 Persons at Risk

The flood risks described in this FRAP are equally applicable to any person attending the site including staff / visitors. Site personnel will remain at a similar number to present (currently three full-time employees), however the increase in extraction and sales rate would require an increase in truck drivers to transport the material. A 'ramp-up' phase may be adopted during the initial phase (first five years) of the expansion, depending upon market conditions and ongoing availability of suitable fine sand from alternate sources.

The peak population accounted for in this document was calculated as follows:

- 3 fulltime staff members; and
- 3 visitors (truck drivers).

It should be noted that the existing / proposed facility does not include caretaker (residential) facilities.

1.4 Surrounding Road Network

The subject site is currently serviced by Altona Rd via Crescent Street and the Tweed Coast Road with future stages of the facility to be accessed via the Pacific Highway and a newly constructed haulage road. Table 1.1 below provides a summary of road surface levels within the vicinity of the site.

Table 1.1 Road Network Surface Levels

Road Name	Surface Level (mAHD)
Altona Road	1.25 – 1.4m
Crescent Street	1.45m
Tweed Coast Road (Crescent St intersection)	1.7m
Pacific Motorway	1.9m – 2m
Proposed Haulage Road	1.75m

2. Legislative Requirements

The New South Wales Government has produced a raft of technical documents in order to manage the development of the states' flood liable land. The most important of these is the Government's Flood Prone Land Policy, which has the objective of:

> *"Reducing the impact of flooding and flood liability on individual owners and occupiers of flood prone property and to reduce private and public losses resulting from floods".*

Supporting the Flood Prone Land Policy is the Floodplain Development Manual. The manual was prepared in order to guide Council's in the development and implementation of local floodplain risk management plans. In accordance with the Flood Prone Land Policy and the Floodplain Development Manual, the Tweed Shire Council (TSC) has developed a number of Statutory Documents which incorporate the provisions of the flood policy and have been developed in accordance with the Floodplain Development Manual. Documents relating specifically to flooding and flood emergencies are as follows:

- Tweed Local Environmental Plan 2014 (LEP);
- Tweed Development Control Plan 2008 (DCP);
- Tweed Local Environmental Plan 2000 (LEP);
- Tweed Shire Council: Policy – Flood Risk Management;
- Tweed Byron Coastal Creeks Flood Study Byron Shire Council Climate Change Assessment;
- Tweed Shire Local Flood Plan

2.1 Tweed Local Environmental Plan 2014

The Tweed Local Environmental Plan 2014 (LEP) provides the Tweed Shire Council with a planning framework against which development can be assessed. The plan takes into consideration the future development of the Shire, accommodating forecast growth while balancing environmental, economic and social needs.

Section 7.3 (1) Flood Planning of the Tweed LEP stipulates that development occurring on low lying, flood affected land must:

a) Minimise the flood risk to life and property associated with the use of land;

b) Allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change; and

c) To avoid significant adverse impacts of flood behaviour and the environment.

Furthermore, Section 7.3(3) states that development consent must not be granted to development of land to which this clause applies unless the consent authority is satisfied that the development:

c) Incorporates appropriate measures to manage risk of life from flood.

2.2 Tweed Development Control Plan 2008

The Tweed Development Control Plan 08 effectively supports the provisions of the Tweed Local Environmental Plan. Section A3 – *Development of Flood Liable Land* of the Tweed DCP prescribes

specific design requirements for development occurring on flood affected lands within the Tweed Shire.

The proposed development is accessed via the Tweed Coast Rd, Crescent Rd and Altona Rd which are generally low lying and modelling indicates that during 100yr ARI events, the road corridors will be inundated to a depth of up to approximately 2m (refer Section 3.4).

The DCP identifies two possible strategies which can be adopted by Flood Response Action Plan's in response to flood emergencies, these being – Early Evacuation or Shelter in Place. Notes 3 and 4 of Section A3 of the DCP prescribe the specific requirements that are to be met for both options.

As the proposed development is not able to provide permanent flood free road access to an area above the prescribed PMF level, the preferred management strategy for the expanded facility is the closure and early evacuation of the site as discussed in detail in Section 4.2 of this report.

As previously stated, the existing and proposed expanded facility is situated on flood liable land and requires the production of a Flood Response Action Plan to safely manage site operations.

Note 5 of DCP section A3 identifies that as a minimum requirement the following details are to be provided:

- *Expected number of occupants*
- *Typical demographics of occupants (families with children, retirees etc)*
- *100 year ARI flood level and PMF level for the development site (obtainable from Council)*
- *Nominated Flood Risk Management Approach for the development (avoidance, evacuation, shelter in place. Note that rescue is not an appropriate response for any development type)*
- *For evacuation, provide detail of nearest evacuation centre (refer to SES Local Flood Plan), the intended mode of transport to the centre, and indicative ground/road levels at significant points along the nominated evacuation route.*
- *Any special requirements for evacuation centre to cater for evacuees (food, water, waste, medicines etc)*

The following sections of the report have been prepared in accordance with the requirements of the provisions included within the LEP and DCP.

2.3 Tweed Shire Flood Emergency Sub Plan

The Tweed Shire Local Flood Plan has been prepared by the Tweed Shire Council to identify preparedness measures, the conduct of response operation and the coordination of immediate recovery measures from flooding within the Tweed Shire Council area. The local flood plan identifies also identifies towns/areas at risk of flooding, the period they will be cut off or inundated for and evacuation sites.

The plan identifies that the Kingscliff / Cudgen locality is susceptible to flood and may be isolated (cut off) for a period of up to five (5) days. During flood events it is identified that the population is to evacuate temporarily to higher ground if necessary, seeking shelter at one of Councils nominated evacuation centres. The nominated evacuation centres are as follows:

- Kingscliff Public School Orient Street Kingscliff

- Kingscliff TAFE Campus Cudgen Rd Kingscliff
- Cudgen Public School Collier Street Cudgen

Further details regarding flood preparation, designated evacuation route and refuge areas are discussed in Section 4 of this report.

3. Flood Likelihood and Risk

3.1 Weather During Flood Events

The seasonality of flooding in the region is the result of two distinct weather patterns; ex-tropical cyclones and intense low pressure systems close to the coast.

In the early months of the year, tropical cyclones originating in the Coral Sea may move south and have been known to produce rains of duration and intensity high enough to cause a flood in the northern river catchments.

Another potential cause of flood events is the development of intense depressions close to the coast which usually form off either southern Queensland or northern NSW in a trough from the Coral Sea or from a shallow system.

Rain depressions can develop at any time of year, but are most likely when sea surface temperatures are high and the air is humid. Therefore, most flood events occur in the summer months and over the first half of the year.

Rainfall patterns are also dependant on weather patterns that occur throughout the year. Flooding is more prevalent in a La Nina year when rainfall is significantly greater than the average rainfall. Flooding may also occur due to storm tide driven by an extended low pressure system and an easterly or south easterly system in the Coral Sea.

3.2 Historical Flooding

The flooding of coastal towns in the Tweed LGA has occurred in the past as a result of two typical sources:

- Heavy rainfall over the catchments; and
- High tailwater levels in the ocean due to storm surge or exceptional tidal conditions.

Major Flood events in the area occurred over the following periods:

- February 1954;
- March 1974; and
- March 2017 (Ex Tropical Cyclone Debbie).

3.3 Flood Probability

Due to the nature of the development, the probability of a flood or major weather events occurring whilst operational is very high. The probabilities for various flood events are shown in Table 3.1.

It should also be noted that the Extreme Event which has been modelled is not the largest flood which could affect the site. The Probable Maximum Flood (PMF) would have somewhere between a 1 in 10,000 and 1 in 1,000,000 chance of occurring in any year but data is not available on the size of such an event for local creeks or storm surge.

Table 3.1 Flood Probability

Rainfall Average Recurrence Interval (ARI)	Average Exceedance Probability (AEP)
2 year	50%
20 year	5%
50 year	2%
100 year	1%
Extreme Event (500 year)	0.2%

3.4 Flooding on the Site

Interrogation of mapping contained within the Tweed DCP has identified the following:

- That the design flood level for the subject site identified within DCP mapping is approximately 3.2m AHD;
- The Probable Maximum Flood (PMF) level prescribed by DCP mapping is between 8.1m AHD and 8.2m AHD.

Detailed flood modelling reported in Flooding & Stormwater Report prepared by Burchills Engineering for the proposed development indicates that the 100 year ARI flood level is 3.22mAHD. It is important to note that modelling indicates that velocities experienced during 100yr ARI flood event in the area surrounding the vicinity are very low (0.1m/s). This is due to the site and its surrounds being a flood storage area.

Extracts of the Tweed Shire Development Control Plans Design Flood Level and PMF mapping are provided below in Figure 3.1 and Figure 3.2.

The flooding of the subject site will be influenced by a combination of rainfall in the upper and local Tweed River catchment causing regional flooding and storm surge events caused by cyclone systems off the coast. Modelling undertaken as part of the Flood & Stormwater Assessment (FSA) dated October 2020 prepared by Burchills Engineering Solutions details flooding experienced onsite.

Figure 3.3 below shows the hydrograph extracted from the model for a 100yr ARI regional event under the influence of a 20yr ARI storm surge. Road surface levels have been plotted on the modelled hydrograph to depict road trafficability / accessibility during the modelled flood event.

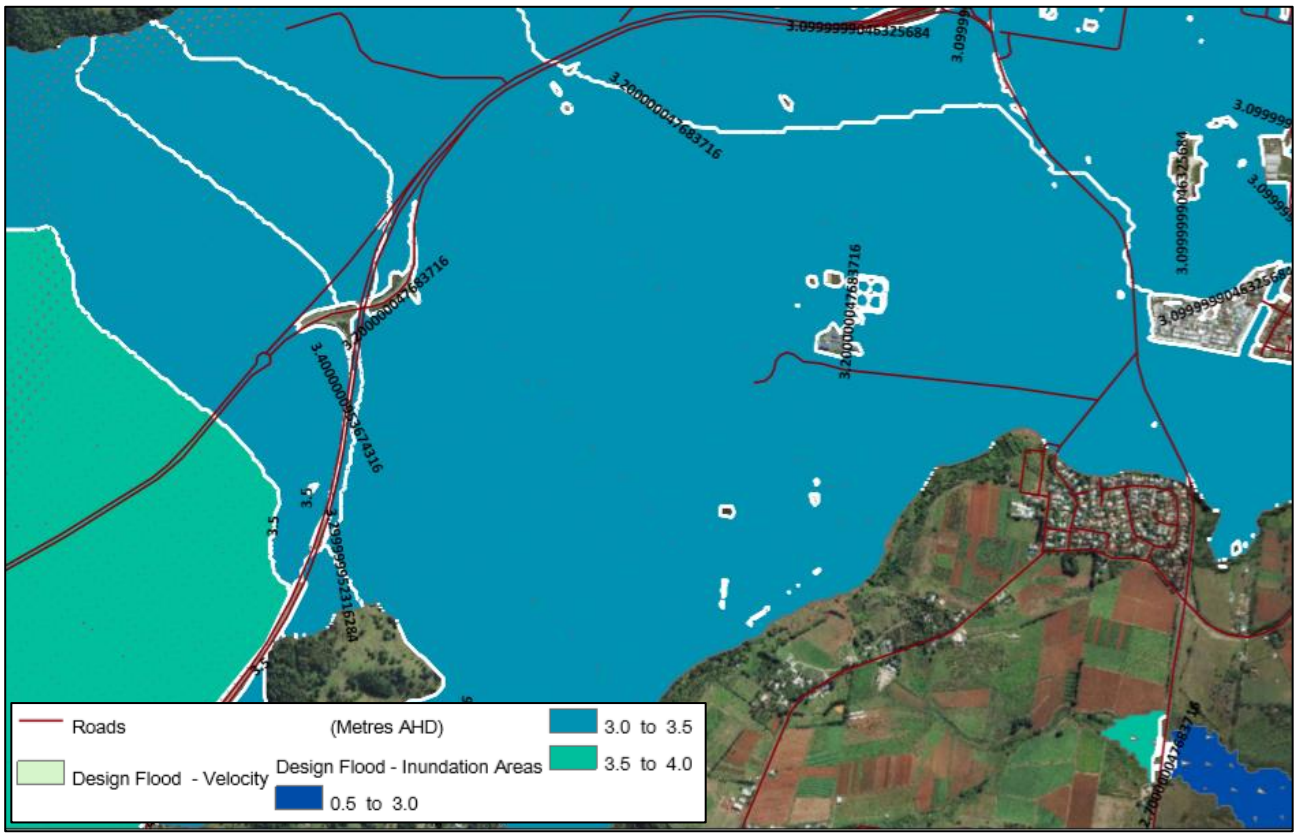

Figure 3.1 Tweed DCP Design Flood Level Maps (Courtesy: TSC)

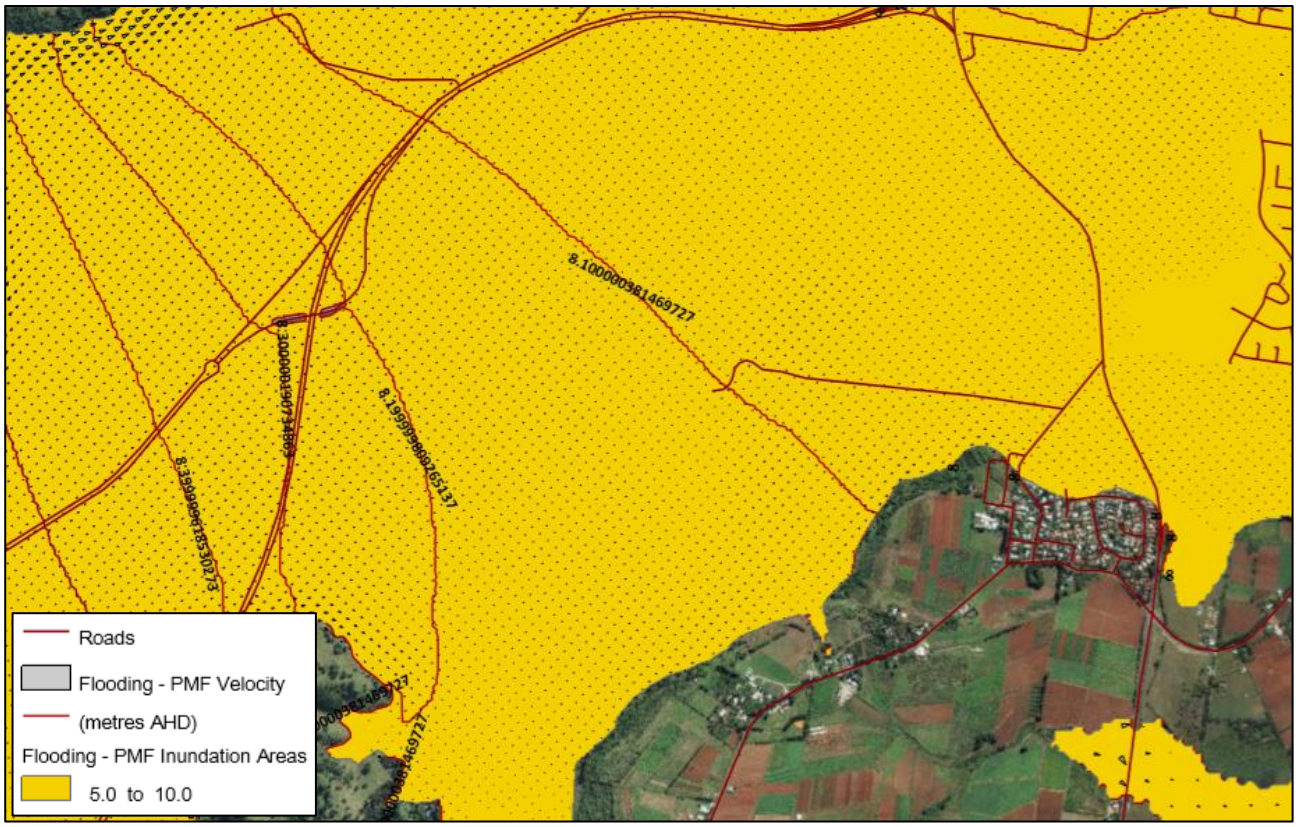

Figure 3.2 Tweed Probable Maximum Flood Level Map (Courtesy: TSC)

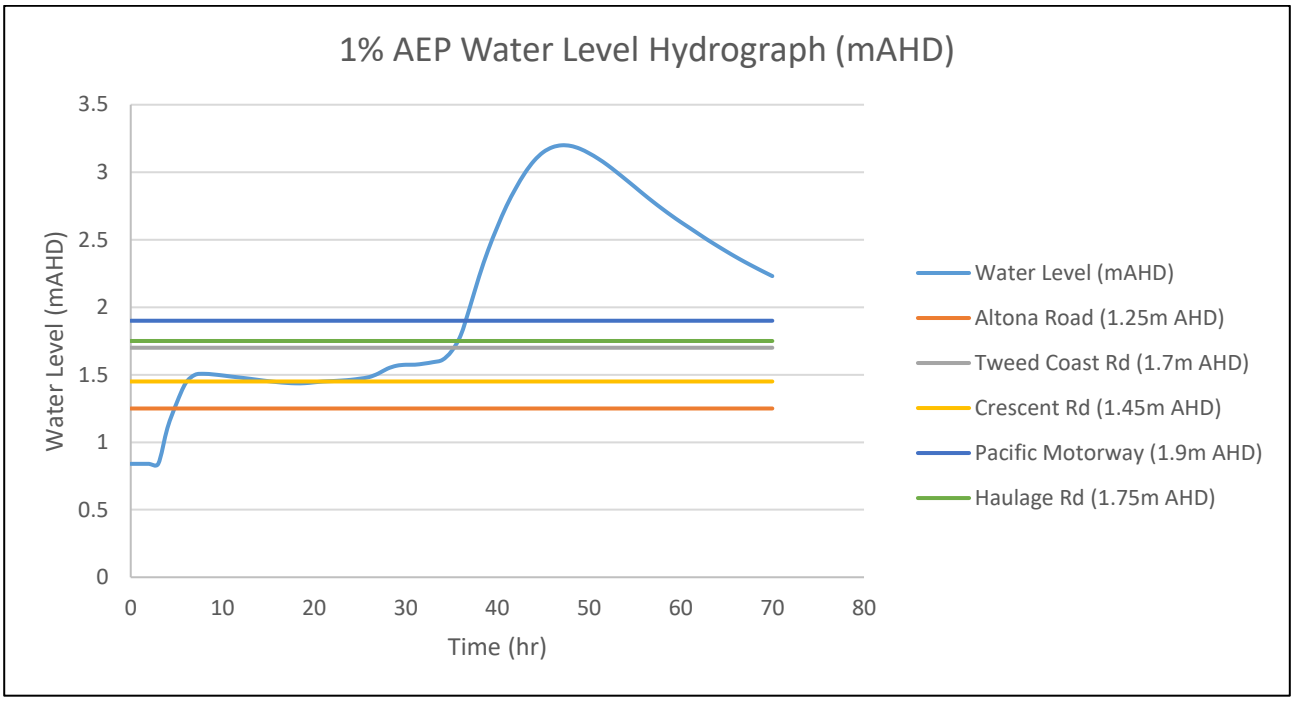

Figure 3.3 100 year ARI Event under normal tidal influence hydrograph (Courtesy: Burchills)

As shown in Figure 3.3, flooding in the local area reaches its maximum height (3.2m AHD) approximately 47 hours after the event commences. This event will inundate the surrounding road network and haulage road (including the Pacific Motorway) at a maximum depth of approximately 2m (Altona Road) for a period in excess of two days

The event hydrograph identifies the presence of two separate flood peaks, with approximately 39 hours between each peak level. The first flood peak reaches a maximum height of 1.5m AHD occurs 8 hours after the event has commenced and will inundate Altona Rd and Crescent Rd to a maximum depth of 300mm. The second flood peak reaches a maximum height of 3.2m AHD 47 hours after the event has commenced and will inundate the facility all site accesses / evacuation routes.

4. Flood Preparation and Response

4.1 Forecasts and Warnings

Monitoring the weather forecasts and warnings will be an integral step in managing the flood risk at the site. This will be critical to being able to evacuate the site before flooding commences. As the subdivision does not have any flood gauges on site to monitor, the responsible person will have to monitor the weather forecasts and warnings mentioned below. The responsible person is defined as the Site Manager or delegated Flood Warden.

Flood waters can be expected to rise at a rate of up to 220mm per hour in a major event (1% AEP event) as detailed within the Flood & Stormwater Assessment prepared by Burchills Engineering Solutions (reference BE190043-RP-FSA-00).

The Bureau of Meteorology (BoM) has forecast rainfall maps which can be used to estimate the amount of rain expected to fall over the next eight and four days, as well as the next 24 hours. This information is available at: www.bom.gov.au/jsp/watl/rainfall/pme.jsp.

New South Wales Weather Warnings are issued by the Bureau of Meteorology and can be found at the following link: http://www.bom.gov.au/nsw/warnings/

As a combination of fluvial flooding and storm surge dictate flooding at this site, the key warnings to look out for include:

- **When a moderate to severe Tweed River flood warning is issued by the BOM.**
- **A Category 3 cyclone alert is issued by BoM for area's south of Queensland's Sunshine Coast.**

To ensure that these warnings are noticed in a timely manner, the responsible person and any other nominated occupants will have their mobile phone numbers added to the NSW SES Tweed Shire Local Headquarters contact list for the issuing of SMS alerts for flood watches, flood warnings, and evacuation orders.

The Bureau of Meteorology also has rainfall and river gauges which show the amount of rainfall that has fallen in the previous 24 hour period and stream gauges which indicate water heights. These can be monitored at: www.bom.gov.au/australia/flood/.

The radar service on the BoM website also shows current rainfall location and intensities. The radar station to be used for the site would be the Brisbane (Mt Staplyton) radar at:

www.bom.gov.au/products/IDR663.loop.shtml#skip

Additionally, the SES FloodSafe website should be monitored. This site provides up to date weather warnings (Flood Warnings, Flood Bulletins, Evacuation Warnings and Evacuation Orders) for New South Wales. The SES FloodSafe website can be accessed at: http://www.floodsafe.com.au/ .

4.2 Emergency Response Philosophy

This FRAP recognises that protection of life is of critical and primary importance and the protection of property and motor vehicles is second. The Tweed Shire Council's LEP identifies that new developments which result in an increased population in flood affected areas should not represent an additional burden on Council's emergency response plan and State Emergency Services Staff.

As identified by the Tweed Development Control Plan there are generally two strategies available to development situated in the flood plain: evacuation of the subject site; or on-site refuge (where refuge is located above the PMF and meets the prescribed requirements of the DCP).

As identified by DCP Flood Mapping and the Flood and Stormwater Assessment prepared by Burchills Engineering Solutions, Altona Road and the surrounding road network is inundated during flood events to a height which is not conducive to evacuation.

The preferred strategy for all flood events is for the early evacuation of the operation seeking safe refuge offsite.

As mentioned previously, the flood scenario which will affect the site is regional flood events dominated by storm tides.

Regional flood events generally have long lead times and will allow for early evacuation measures to be put in place. Where heavy rain and flooding is forecast by the Bureau of Meteorology, the strategy employed shall be the cessation of site activities and the evacuation of the site prior to the onset of flooding.

Evacuation of the site shall be undertaken within 6 hours of the initial warnings being issued by the BoM or SES. Due to the long lead in time, the site manager and staff shall be able to halt activities and safely evacuate the site to a place of refuge prior to the rise of water levels in the surrounding catchment.

The closure and early evacuation of the site will also ensure that there is no additional burden placed upon emergency services as a result of the development.

4.3 Site Flood Warning System

The site flood warning system shall be dependent upon the monitoring of both BOM and SES websites and local radio stations. The flooding of the site shall be dependent upon heavy rainfall events occurring in the upper catchment of Tweed River and the intense storm events in the local catchment.

The trigger for the implementation of evacuation strategies shall be when the Bureau of Meteorology or Flood Warnings for Moderate to Severe flooding within the lower Tweed River Catchment or when the SES issue Flood Warnings / Evacuation orders.

The Tweed Shire Local Flood Plan identifies that warnings relating to severe weather and flooding will be issued by two responsible parties. These parties are:

- The Bureau of Meteorology; and

- The NSW SES Tweed Shire Local Headquarters.

Bureau of Meteorology

The Bureau of Meteorology (BOM) is responsible for the production of the following warnings:

- *Severe thunderstorm warnings:* These are issued direct to the media by BOM when severe thunderstorms are expected to produce damaging conditions which may result in flash flooding. These issues may be broadcast over the radio, on local television stations or through the BOM website (http://www.bom.gov.au/nsw/warnings/)

- *Warnings for Flash Flooding:* These warnings are issued direct to the media outlets by BOM and provide warning relating to possible flash flooding as a result of intense rainfall. These warnings are issued when a severe weather event is expected to affect communities within 6 to 24 hours.

- *Flood Watches:* Flood watches are issued by BOM to advise of potential flooding within a catchment area based on predicted or actual rainfall.

NSW SES Richmond Tweed Region

- *Flood Warnings*: Flood warnings are issued by the local SES Richmond Tweed Region Headquarters. These warnings will provide information relating to the estimated impacts of flooding and predicted heights.
- *NSW SES Flood Bulletins*: The local SES headquarters shall issue NSW SES Flood Bulletins which will describe information on the estimated impacts of flooding at the predicted heights. These bulletins will be circulated to media outlets and agencies.
- *NSW SES Evacuation Warnings and Evacuation Orders:* These are issued by the media on behalf of the NSW SES Local Incident Controller.

As early evacuation is the preferred strategy for this site, triggers will be necessary for determining timeframes for the cessation of site activities and the evacuation of the site.

4.4 Responsible Persons

The proposed development is an existing industrial operation. In this instance, the site manager shall be responsible for implementing the measures contained within the Flood Response Action Plan.

The Site Manager shall be responsible for the following flood emergency management measures:

- Ensure all members of staff are familiar with the FRAP;
- Maintain a register of all phone numbers (for SMS purposes) for all staff for emergency communication purposes;
- Appoint a flood warden from the staff population to co-ordinate on site activities in respect of the flood response strategy;
- Ensure all signage is in place / operation is shut barring entry to the site; and
- Maintain a register of staff and details as to where they will evacuate to in the event of a major regional flood event;

- Ensure that all employees and clients are aware of site conditions and the closure of the facility in the event of a flood (via email, text, phone call etc.).

In the instance that the Site Manager is absent during a flood event, the nominated Flood Warden be responsible for the implementation of the FRAP.

The flood warden is responsible for the following flood emergency management measures:

- Primarily assist the Site Manager in implementing the flood emergency procedures and providing support where required;
- Assist the Site Manager in maintaining the emergency communications register (for SMS purposes for all known regular residents and staff); and
- Ensure all signage is in place / operation is shut barring entry to the site following the closure of the facility.

Figure 4.1 depicts the hierarchy of people responsible for implementing the Flood Response Action Plan.

Figure 4.1 Emergency Response Hierarchy

4.5 Time Needed to Evacuate

It is estimated that the proposed development will have a maximum of 6 persons on site at the time of a flood warning being issued. There will be potentially 6 vehicles parked on the site (1 vehicle per employee).

An evacuation rate of about 150 cars per hour may be achieved, allowing the development to be completely evacuated in less than 5 minutes. This time is dependent on the evacuation being orderly and that all parties know what to do and where to go during a flood emergency.

In addition to the 5 minutes required for evacuation, another 1 hour will be required for the ceasing of all onsite activities and the erection of signage at the site entrance providing notification of the site's plants closure.

Staff will have a window of approximately 6 hours in which to leave from the commencement of the critical rainfall event until the inundation of the surrounding road network (Altona Rd / Crescent Rd, Tweed Coast Road) occurs.

4.6 Evacuation Route

Prior to the evacuation of the site, staff will be marshalled at the site office. This point has been nominated as it forms the focal point for site operations. Evacuation of the site should be undertaken as soon as practicable to ensure that staff are able to access a safe place of refuge prior to the surrounding road network becoming inundated.

Should staff not be able to reach their dwelling due to flooding, they will be able to seek shelter in a Council nominated evacuation centre. The nominated evacuation centres in the vicinity are as follows:

- Kingscliff Public School Orient Street Kingscliff
- Kingscliff TAFE Campus Cudgen Rd Kingscliff
- Cudgen Public School Collier Street Cudgen

Figure 4.2 below depicts the location of the Council nominated evacuation centres and evacuation route from the site.

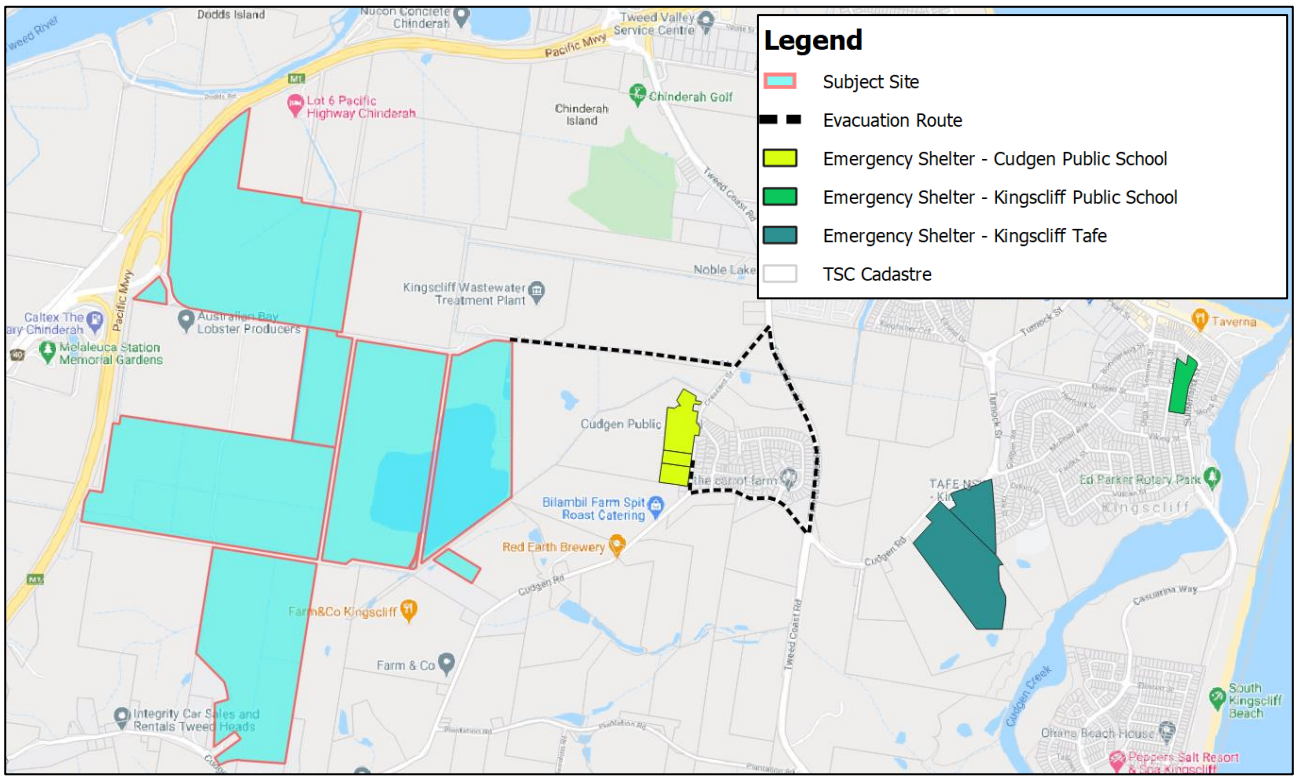

Figure 4.2 Emergency Evacuation Route to Cudgen Public School & Alternate Council Shelters

It should be noted that the evacuation route is not flood free, with Altona Road, Crescent Road and Tweed Coast Road becoming inundated to a depth of up to approximately 2m during the 100 year ARI flood event with a 20 year Storm surge flood event, making the evacuation route untenable for pedestrian and vehicular evacuation. As such, the early evacuation of the site is the preferred management strategy option during a flood emergency as refuge on site is not plausible.

4.7 Additional Risk Factors

Some factors that need to be considered when determining evacuation are:

- The management of staff / visitors;
- Reliable communication between the staff population
- Loss of electricity and some telecommunications in a flood;
- Possible traffic congestion on evacuation routes;
- What to do with staff who are stranded onsite / cut off by regional flooding.

These issues have been considered in this plan and will also be addressed in any of the developments additional emergency evacuation procedures.

5. Summary

The development site is identified as being flood prone by mapping contained within the Tweed Shire Council's DCP. The Flood Response Action Plan addresses the flood risks associated with the site and provides a strategy for the management of the facility during a flood event. This plan developed in accordance with the provisions of the Tweed Local Environmental Plan and Development Control Plan.

Hydraulic modelling has identified that the subject site and surrounding streets will be affected by a combination of fluvial flooding in Tweed River catchment and storm tide surges during extreme weather events and that the site and the surrounding road network are subject to hazardous flooding during major weather events.

Weather forecasts and flood warnings issued by the Bureau of Meteorology and the New South Wales State Emergency Service will determine when evacuation should occur. The monitoring of BoM forecasts and SES warnings by the site manager / flood warden will form a key component of the management strategy.

Using the information in this report and the identified risk factors, the site manager (in conjunction with facility owner) will devise a specific emergency management procedure manual which will outline roles and responsibilities, evacuation routes, and management actions to facilitate and manage the closure of the facility and the orderly evacuation of all operational staff.

The trigger for the implementation of evacuation strategies shall be when the Bureau of Meteorology or Flood Warnings for Moderate to Severe flooding within the lower Tweed River Catchment or when the SES issue Warnings and Evacuation orders.

The preferred response is for the cessation of all site activities and the immediate evacuation of staff off site to a safe place of shelter (home or Council emergency shelter). All staff shall be required to be offsite prior to the inundation of the surrounding road network by flood waters which can be expected to occur approximately 6 hours after the commencement of the 1% AEP event. The safe, early evacuation of the site will also ensure that no undue burdens are placed on emergency services as a result of the development.

The Site Manager shall ensure that the emergency response measures included within the Flood Response Action Plan are implemented in full.

To ensure that all measures detailed within this document are implemented in full, it is recommended that a condition of approval be implemented requiring the development of a concise Operational Flood Emergency Evacuation Plan for the Tweed Sand Plant facility.

6. References

1. Floodplain Development Manual - The management of flood liable land. New South Wales Government, April 2005
2. Flood Prone Land Policy. New South Wales Government
3. Tweed Byron Coastal Creeks Flood Study Byron Shire Council Climate Change Assessment, March 2010. BMT WBM
4. Burchills Engineering Solutions, September 2016. “Updated Flood Impact Assessment”
5. Tweed Shire Council Development Control Plan 2008, Section A3 – Development of Flood Liable Land
6. Tweed Shire Council Flood Risk Management Policy
7. Tweed Shire Council Local Environmental Plan 2014
8. Tweed Shire Flood Emergency Sub Plan

Appendix A – Design Drawings

PROJECT TITLE

HANSON TWEED SAND PLANT

PHASE 5-11

DRAWING TITLE

CONCEPT DEVELOPMENT PHASING

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	PASHING ARRANGEMENT CHANGES - REQ. PLANNER	25.01.2021	ZP	LN	LN	LN

ISSUE: PRELIMINARY	CLIENT: HANSON CONSTRUCTION MATERIALS PTY LTD
BASE PROVIDED BY: SIXMAPS DCDB	MANAGER: LANCE NEWLEY

ZONE PLANNING GROUP

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JOB / DRAWING NO: Z19163- 104

SHEET NO. SHEET 01 OF 01

Appendix B – Emergency Contacts List

Organisation	Role	Contact
Tweed Sand Plant	Site Manager	TBC
Tweed Sand Plant	Flood Warden	TBC
Tweed Sand Plant	Operational Staff	TBC
Tweed Sand Plant	Operational Staff	TBC
Tweed Sand Plant	Operational Staff	TBC
Tweed Sand Plant	Operational Staff	TBC
Emergency Services	Fire/ambulance/police	000
Ambulance Service Regional Office		
Tweed Shire Council	Disaster Management Co-ordinator	1300 292 872 1800 818 326 (After Hours)
State Emergency Service	SES Local Controller	132 500
Bureau of Meteorology	NSW Flood Warning	02 9296 1555
Tweed Shire Council	Flood Engineer	
Tweed Shire Council	Roads Engineer	
Tweed Hospital	Emergency medical treatment	(07) 5536 1133