2nd August 2021

<u>For the attention:</u>
Liam Jukes
Senior Planner – Major Assessment
City Development Branch
Council of City of Gold Coast

Dear **Liam Jukes,**

<u>Objection submission COM/2019/81 -</u>

<u>Dewatering Issues and lack of 'Dewatering Management Plan'</u>

This development application is, I believe, by far the most prolific dewatering development on the Gold Coast in its entire history.

It would seem to me it is proposing to dump a potentially cataclysmic thirty litres of potentially contaminated leached ground water every single second (on average) from the surrounding ground water, for up to 1,418 metres radius of influence, into an *'Environmental significant - wetlands and waterways'* area of the adjacent freshwater lake within the Coomera River with untold effects on the local ecosystem.

It is also, I believe (at a proposed duration of one hundred plus years), the longest and biggest dewatering project ever conceived on the Gold Coast.

Please accept this objection as I believe it highlights that this development application fails to duly consider the dewatering issues associated with a proposed development of this colossal scale this close to the *'Environmental significant - wetlands and waterways'* area of the Coomera River.

Also, the City of Gold Coast Council's *'Guidelines for Dewatering Management Plan'* (Attachment A1) have not been followed for this development application despite the audacious scale of these monumental proposals and its seemingly unrelenting dewatering requirements.

It would seem that the required *'Dewatering Management Plan'* (DMP) has not been submitted with this development application. The failure to include it, as I believe is clearly required, means that areas such as *"Noise emanating from the plant such as pumps and diesel generators that is used in dewatering process can cause a noise nuisance to nearby noise sensitive places. During temporary dewatering activities in most cases the plant is required to be operated twenty four (24) hours per day, which can increase the intrusiveness of the noise particularly during later or early morning periods when the background noise levels are minimal"* are not covered in the development application (as shown in Attachment A2).

Dewatering Management Plan (DMP)

It is noted that in the City of Gold Coast *'Dewatering Management Plan'*, dated March 2018, it states: *"The DMP will be submitted with the development application"* (Attachment A3). This has not I believe been done and despite an over two years timeframe since the development application has been submitted and Council Planners consideration of it so far, I note no *'Dewatering Management Plan'* has been either submitted or requested by Council.

Given the extent of the Dewatering (believed to be 30 to 40 litres per second on a 24/7 basis with a claimed temporary duration of one hundred plus years) in to an *'Environmental significant - wetlands and waterways'* area of the Coomera River (as shown on the City Plan, reproduced in Attachment A4) the failure to submit the required DMP would seem an extraordinary and glaring oversight.

** Please note I refer to it as 'Temporary' as per the development application description: "Post closure, the groundwater flow regime will recover approximately back to its pre-development configuration" (Attachment A9).*

Despite the fact there will be a believed 30 litres of dewatering required per second (I believe based on a best case scenario whereas it might well be up to 40 litres as discussed below) that could be pumped into an *'Environmental significant - wetlands and waterways'* area of the Coomera River in an endless cycle as groundwater from the surrounding area (up to a 'Cone of Influence' or radius of 1,418 m as shown in Attachment A5) will leach into the pit via the walls and floor, be possibly contaminated by quarrying activity and will then require to be pumped out into the Coomera River (to prevent the pit from flooding), with unknown consequences on the local ecosystem.

And this is without any Stormwater contingency in these figures, purely leached groundwater from the subterranean quarrying method proposed.

It should also be realised from early stages onwards the existing sedimentation basins and containment pits, dams etc. (as shown in Attachment A11) are engulfed into the extractive footprint and appear to have no replacements planned (as shown in attachment A12) over and above the main sump in the foot of the quarry (as shown in Attachment A7). Therefore, there is nowhere to store the excess water to ensure its safe prior to pumping into the Coomera River.

Environmental Protection (Water) Policy 2009 - Coomera River environmental values and water quality objectives

It is noted that the dewatering locations from the quarry (as shown in Attachment A6) feed directly into an *'Environmental significant - wetlands and waterways'* area of the Coomera River as identified by the City of Gold Coast Council in their City Plan (reproduced in attachment A4).

This area is also covered by the Queensland *'Environmental Protection (Water) Policy 2009'*, *'Coomera River environmental values and water quality objectives'*.

From this document, section *'1'*, *'Introduction'*, I quote: *"This document is made pursuant to the provisions of the Environmental Protection (Water) Policy 2009 (the EPP [Water]), which is subordinate legislation under the Environmental Protection Act 1994. The EPP (Water) provides a framework for:*

• identifying environmental values for Queensland waters, and deciding the water quality objectives to protect or enhance those environmental values; and

• including the identified environmental values and water quality objectives under Schedule 1 of the EPP (Water).

This document contains environmental values and water quality objectives for waters in the Coomera River catchment, and is listed under schedule 1 of the EPP (Water).“ (Attachment A8).

Further, from section *‘1.1’*, *‘Waters to which this document applies’*:

“This document applies to fresh, estuarine and marine surface waters and ground waters draining the Coomera River catchment, as represented in the accompanying plan (WQ1462)1 . These waters fall within the broader South Coast basin (basin 146)[2] . Waters covered by this document include:

- *Coomera River;*
- *Coombabah Lake;*
- *Coombabah Creek;*
- *Saltwater Creek;*
- *Oaky Creek;*
- *other fresh and estuarine waters within the Coomera River catchment;*
- *tidal canals, constructed estuaries, marinas and boat harbours;*
- *southern Broadwater;*
- *wetlands; and*
- *ground waters.*

The geographical extent of waters addressed by this document is shown in the plan (WQ1462), and is broadly:

- *north to the boundary of the Coomera River catchment with the Pimpama River catchment;*
- *west to the boundary of the Coomera River catchment with the Albert River catchment;*
- *south to the boundary of the Coomera River catchment with the Nerang River catchment; and • east to include the tidal canals and constructed estuaries in the lower Coomera River and the adjacent Broadwater.”* (Attachment A8).

It thus, should be realised that the dewatering into the freshwater section of the Coomera River will also affect the wider area, namely:

- *Coomera River;*
- *Coombabah Lake;*
- *Coombabah Creek;*
- *Saltwater Creek;*
- *Oaky Creek;*
- *other fresh and estuarine waters within the Coomera River catchment;*
- *tidal canals, constructed estuaries, marinas and boat harbours;*
- *southern Broadwater;*
- *wetlands; and*
- *ground waters.*

However, this proposed development application, I believe, fails to address not only the local effect on the local ecosystem and local environment in the Coomera River adjacent to the quarry but also the wider implications of the effect their proposed dewatering could have on the wider area that is covered by the *‘Environmental Protection (Water) Policy 2009’.*

Is the Council considering the wider implications of this development application proposals on the environment values for Queensland waters and water quality objectives to protect or enhance those environmental values, including the identified environmental values and water quality objectives under Schedule 1 of the EPP (Water), as I believe they are required to do so? This is highly important because I do not believe the applicant has.

<u>The claimed extent of the required Dewatering</u>

Despite this being the biggest dewatering project I believe in the history of the Gold Coast and despite its one hundred plus years proposed mega duration it is, I believe, bordering on criminal the way this has been glossed over in the development application.

For instance, in *the 'Groundwater Impact Assessment', 'Section 7.2', 'Conceptual model during and after extraction'* it merely states: *"The quarry will require dewatering to remain dry"* and *"Any water flows to the quarry would be available for use on site and any excess likely discharged"* (Attachment A9).

<u>Is the City of Gold Coast Dewatering Management Guidelines applicable for this DA?</u>

In the development application it states: *"Regardless of the radius if influence and the inflows reporting to the quarry during operations, the groundwater levels in the vicinity of the quarry void are assessed to recover once quarry development ceases"* (Attachment A5). Thus, confirming this is a temporary situation that will cease after quarry development completes.

The Gold Coast Council's *'Dewatering Management Guidelines'* are applicable as it states: *"This document relates specifically to temporary dewatering activities"* (Attachment A2).

It should also be noted that the Gold Coast Council's *'Dewatering Management Guidelines'* also states: *"Permanent discharges occur from sites that have structures at or below the existing watertable … although this practice is being phased out"* (Attachment A2). Whilst, this proposed development application is clearly temporary, given it finite duration, however, it is clear that for long term projects excavating below the water table is no longer appropriate according to Council guidelines.

It is also noted that in *'Table 4'* (Page 10) of the *'Dewatering Management Guidelines'* (the *'Self assessable dewatering plan checklist'*) I note that if the site is *"greater than 800 square meters"* OR *"the dewatering depth is greater than one metre"* OR *"the site contain potential acid sulphate soil"* then *"a detailed DMP is required to be submitted to Council"* (Attachment A10). I believe all this apply to this development application. Therefore, the Dewatering Management Guidelines state (if any of the above apply): *"the following two certifications MUST be provided with any development application:*

1. *Provide certification Appendix A from a qualified scientist/engineer, specialising in dewatering that all the above requirements in Part A have been fulfilled and achieved. This certification is to be signed by a RPEQ.*
2. *Provide separate certification Appendix B that all geotechnical requirements have been addressed, including but not limited to slope stability, integrity, acid sulphate soils, cone of influence and drawdown effects."* (Attachment A10).

It would appear neither of this prerequisite requirements have been fully met by this development application.

It is also noted that: "*The applicant shall also provide a monthly monitoring report in relation to dewatering discharge and measures in how it has met the release criteria (Tables 1, 2 and 3). This report is to be submitted to Council for compliance and record keeping"* (Attachment A10). This is a highly interesting aspect of this development application because we are only too aware the Council has nothing to do with the running of the quarry whatsoever and passes all this responsibility to the DES. And, therefore, this clear and non-negotiable requirement is completely at odds with the Council's complete lack of any responsibility in this matter. Will the council approve a development application, with a clear requirement to provide monthly reports: *"to Council for compliance and record keeping"* when the Council on their own admission have nothing to do with the quarry or any aspect of its compliance whatsoever?

Clearly dewatering of a quarry into an *'Environmental significant - wetlands and waterways'* area of the Coomera River appears to cloud the lines of responsibility. Will this mean both the DES and the Council deny any liability in compliance monitoring?

I do not believe the Council can approve a development application that cannot be answerable to the council despite a clear requirement for the applicant to *"provide a monthly monitoring report in relation to dewatering discharge and measures in how it has met the release criteria (Tables 1, 2 and 3). This report is to be submitted to Council for compliance and record keeping"*!

Significant Sedimentation

I note the Gold Coast Council's *'Dewatering Management Guidelines'* states: *"Construction of basements or excavation below the existing groundwater level in coastal areas has the potential to create significant sedimentation, amenity issues and other water quality impacts on sensitive estuarine and fresh water receiving environments. The problem arises from the dewatering operations associated"* and *"where the natural surface levels are below five metres Australian height datum (AHD). These areas are likely to contain actual or potential acid sulphate soils"* and *"The dewatering required …. often results in … low pH (acidic) groundwater)"* (Attachment A2).

The significant problems with the sedimentation in this particular development application is discussed later.

However, it should be noted that the environment protection agency lists sediment as the most common pollutant in rivers, streams and lakes and reservoirs. And sediment degrades the quality of the water in the following ways:

- *Water polluted with sediment becomes cloudy preventing animals from seeing food*
- *Murky waters prevents natural vegetation from growing in water*
- *Sediment in stream beds disrupts the natural food chain by destroying the habitat where the smallest stream organisms live and causing massive declines in fish population*
- *Sediment can clog fish gills, reducing resistance to disease, lowering growth rates, and affecting fish egg and larvae development*
- *Nutrients transported by sediment can activate blue-green algae that release toxins and can make swimmers sick*
- *Sediment deposits in rivers can alter the flow of water and reduce water depth, which makes navigation and recreational use more difficult.* (Attachment K1)

Toxic metals

The Gold Coast Council's *'Dewatering Management Guidelines'* also states: "The solubility of many metals is pH sensitive and in particular the solubility of iron and aluminium increases significantly at lower pH. Because of this property, acidic groundwater often contains high concentrations of soluble metals, which are virtually colourless while in a dissolved, soluble state. While present in a soluble form at low pH, these metals are also extremely toxic to many forms of aquatic life" (Attachment A2).

Due to the acid sulphate soils in and around the Oxenford quarry, as shown in attachment D2, this could be a major problem with the proposed development application.

Saltwater Intrusion

The Gold Coast Council's *'Dewatering Management Guidelines'* also states: *"Dewatering that may lower the watertable near a coastal or estuarine environment should be assessed for potential saltwater intrusion of the aquifer. The operator should control dewatering to ensure there is no significant change in water quality or change in the natural watertable or flow regime of surface water"* (Attachment A2).

With the Coomera River saltwater section (Saltwater from weir onwards) within a mere 500 metres of the proposed extractive footprint, the mixing of freshwater and saltwater through the lowering of the water table for a radius far beyond this (at up to 1,418 m, as stated in the submitted *'Groundwater Impact Assessment'*, Attachment A5) cannot, I believe, be ruled out and could have severe implications for the local ecosystem and the quality of the freshwater in the freshwater section of the Coomera River (adjacent to the quarry) which is an area of '*Local Environmental Significance - Wetlands and Waterways'* (as shown in attachment A4) by the possible *"saltwater intrusion of the aquifer"'* which could see a *"significant change in water quality"* and a *"change in the natural watertable"* as this contaminated leached water will be discharged into the *'Environmentally significant'* freshwater section of the Coomera River via the dewatering discharge outlets from the quarry as shown in attachment A6.

The effect of acidic groundwater discharged into Estuarine or Marine receiving waters

The Gold Coast Council's *'Dewatering Management Guidelines'* also states: *"If the extracted acidic groundwater is discharged untreated to estuarine or marine receiving waters a range of possible impacts is likely to occur, including direct mortality or injury to aquatic life, reduction in the pH buffering capacity of estuaries, damage to infrastructure, and loss of visual amenity from visual plumes and staining"* (Attachment A2).

It is noted that the existing *'Sediment Basin C8'* and *'Polishing Dam C2'*, *'Dam C5'* and *'Water Reuse Pond'* (as shown in attachment A11) will ALL be fully engulfed in the proposed extractive footprint by Stage 6 (as shown in attachment A12).

Without the required sedimentation pits or containments pits there is, I believe, a constant and very real possibility of dumping polluted and/or contaminated water into the Coomera River as the subterranean quarry pit will be forever receiving leached ground water, via the pit walls and floor, but as there is no containment or sedimentation basin or settlement pit to ensure water quality prior to release (only the main sump that is forever receiving the leached groundwater and/or stormwater).

This, I believe, could have a devastating effect on the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem and the wider areas beyond.

<u>Assessment of the Impact on local vegetation, springs, wetlands and groundwater bores</u>

The Gold Coast Council's *'Dewatering Management Guidelines'* also states: *"An assessment of the impact on local vegetation, springs, wetlands and groundwater bores used by others in the vicinity of the project should be made prior to dewatering. Where assessment indicates potential reduction in watertable or quality of groundwater, the operator should either design the dewatering system to overcome this threat or provide an acceptable alternative water supply to affected parties"* (Attachment A2).

I do not believe this development application has provided an adequate: *"assessment of the impact on local vegetation, springs, wetlands and groundwater bores used by others in the vicinity of the project"*. The radius of influence of up to 1,418 metres in all directions around the proposed quarry footprint I do not believe has been given due consideration as to the effect of lowering the water table throughout this area, the possibility of saltwater inclusion, the effects on the Coomera River, the effects on the local residents and the local ecosystem, the effect on the upstream Wave Park and the Aqua Park, etc.

The requirements of this aspect of the *'Dewatering Management Guidelines'* has, in my opinion, been pretty much ignored at the detriment to the local environment, the local ecosystem and the local residents and land owners.

<u>Monetary Costs to the Local Council</u>

The Gold Coast Council's *'Dewatering Management Guidelines'* also states: *"The monetary costs incurred to local authorities investigating or cleaning up when responding to the one of the abovementioned incidents can also be substantial"* (Attachment A2).

It is noted the monitoring authority, the DES, in its Environment Authority EA0002207 theoretically monitors the quality of the water, it does not pay compensation or clean up fees. Is the Council willing to take on this burden of responsibility on investigating or cleaning up the many incidents that can happen that are associated with this level of dewatering in an environmentally sensitive area? Or are they merely going to ignore problems associated with the extractive industries in the area as they do presently?

<u>Odours and Poisonous Gas</u>

The Gold Coast Council's *'Dewatering Management Guidelines'* also states: *"Odour problems that emanate from dewatering activities can negatively impact on residents surrounding the site. If the groundwater is contaminated, gases such as hydrogen sulphide and hydrocarbon can be released during the dewatering process. These gases when released can cause severe odours that can be offensive to nearby residents"* (Attachment A2).

Notwithstanding the clear dangers (e.g. the 'Bogle-Chandler' case discussed below) of hazardous gases, the personal amenity of local residents can clearly be affected.

Are Council willing to subject local residents to the possibility of hazardous gases and/or odour problems by permitting the proposed incredulous rate of dewatering into a public freshwater lake, used for fishing, swimming, kayaking, etc. that is an area of *'Environmental significant - wetlands and waterways'*?

Water table Height

In the Groundwater Impact Assessment Conceptual Cross section the freshwater lake within the Coomera River is, I believe, shown incorrectly at an elevation of 0m AHD (reproduced in attachment G1). If you compare this on Google Maps you find it is nominally sitting at +2m above the AHD (Attachment G2).

What more importantly this shows is at this point, shown in the submitted cross section (Attachment G1), that the freshwater lake of the Coomera River, adjacent to the quarry, is sitting at 2m above the sea water part of the Coomera River downstream from the weir (approximately 500 metres from proposed extractive footprint) which is at 0m AHD.

Therefore, at the freshwater lake of the Coomera River's, the equilibrium of the water table is such that it sits 2m above the seawater part of the Coomera River. Slightly upstream is the Wake park and Aqua park sitting at approximately 6m above. Whilst further upstream the Coomera River flowing down to this area is sitting at approximately 12 metres (these depths are shown in attachment G2).

This is the current water table equilibrium for the area. How will the massive and extensive proposed subterranean quarrying activity at 110 meters below the Coomera River affect this equilibrium?

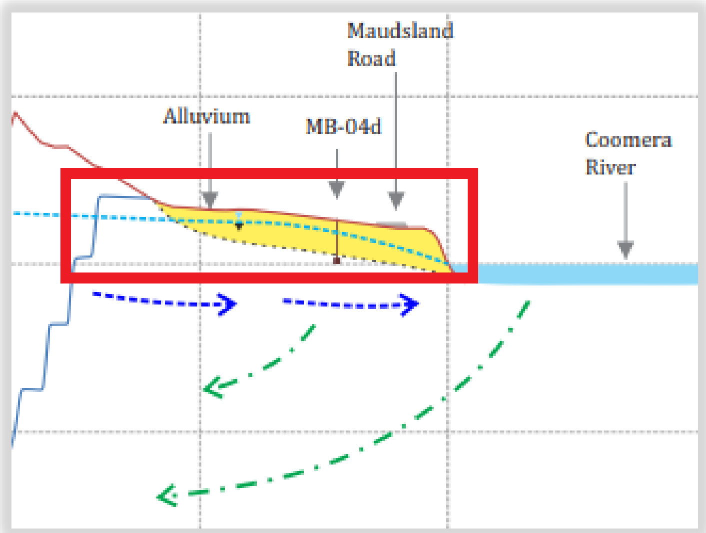
It is interesting to note the submitted Groundwater Impact Assessment showing the *'Conceptual Cross section during operations'* (reproduced in attachment G3) carefully manages to show *"Existing groundwater flows in fresh bedrock"* as apparently travelling upwards to the Coomera River (blue arrowed lines)! This *'Conceptual Cross section during operations'* unfortunately does not show the quarry depth beyond 25 metres (despite a proposed 110 metres). It also only shows a small area between the quarry footprint and the Coomera River and how the existing water table will be way above the quarry depth and the Coomera River at this point. I find it hard to believe that given the proposed depth of the quarry that the water table can be maintained at this level. I also note only a fraction of the cross section (the western end) is reproduced in order, I believe, to attempt to trivialise the true extent and scale of the proposed operation.

I do not believe this *'Conceptual Cross section during operations'* (attachment G3) shows the true extent of the effect this will have on the groundwater in the area. In fact, if you compare the area labelled *'Alluvium'* (between the Quarry and the Coomera River) from the current situation (Attachment G1) to the during operation I believe inconsistencies emerge as listed below.

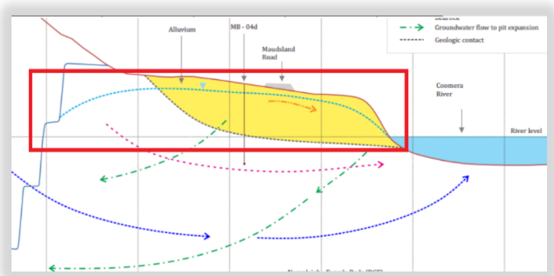
Please note the area marked as *'Alluvium'* in the *'Conceptual Cross section during operations'* (attachment G3) is somewhat concerning as this would indicate: "*A deposit of clay, silt, and sand left by flowing floodwater in a river valley or delta, typically producing fertile soil"* Is this development application seriously suggesting this area is not part of the Neranleigh Fernvale Beds? And, the Tamborine-Oxenford Road and the John Muntz Bridge are built on an area of *'Alluvium'* and not solid Rock? If this was the case, why does this not get washed away by stormwater? I would question the accuracy of these diagrams.

Is this development application seriously claiming that when the quarry pit is beyond 25 metres deep (which is unfortunately the maximum shown in their submitted diagram) that the water table will be maintained at virtually the exact same level, traversing through the alluvium, prior to subterranean quarrying as per these comparisons:

Current Water Table (from *'Conceptual Cross section'* current operations, attachment G1):



Current Water Table (from the *'Conceptual Cross section during operations'*, attachment G3):



These extracts, from the submitted Groundwater Impact Assessment, shows that the author expects the reader to believe the water table at the proposed quarry footprint intersection drops only 6 metres approx despite the massive drop caused by the subterranean quarrying. Common sense would dictate that the water table will be at the lowest point i.e. The bottom of the pit, be it 110 metres down or say 50 metres down by Stage 6 or whatever. Clearly the water table will not magically remain at this level as shown. A more accurate picture I believe is more aptly shown by the New South Wales Office of Water depiction where the water table drops to reflect the lowest point of the quarry (reproduced in attachment G5).

I note a mere five pages later, the *'Groundwater Impact Assessment'* shows the radius of influence to be up to 1,418 m (as reproduced in attachment A5) i.e. The water table will drop for a radius of up to 1,418 m. Yet here we have submitted diagrams purporting it will be virtually unchanged at the precipice of the quarry footprint which is completely at odds with common sense and the NSW Office of Water depiction (attachment G5).

I hope the City of Gold Coast Council Planners will investigate the true extent of the radius of influence and how it will affect the local environment the local ecosystems and local residents as these diagrams are, I believe, attempting to trivialise the true extent of the effect this development application will have on the local area.

With a claimed radius of influence of up to 1,418 m (Attachment A5), I believe, the Coomera River will have difficulty retaining its current level when the water table below it is lowered so drastically within just 120 metres approx of the bank of the Coomera River. The River is only believed to be a few metres deep at this point, the lowering of the water table so drastically could, I believe, effectively empty the Coomera River, especially in long hot dry spells. It may sadly be actually reliant on the dewatering process, and its potentially contaminated water, to maintain it at an acceptable level. The effects on the local ecosystem and local environment do not bear thinking about. Also the effects on the Wake Park and Aqua Park upstream will, I believe, be seriously adversely affected by these Nucrush development application proposals.

Radius of Influence

The development application states the *'Radius if influence'* will be up to 1,418 metres (Attachment A5). Unfortunately however none of the submitted Cross-Section diagrams appear to demonstrate this.

For instance the '*Conceptual Cross Section at A-A'* is shown in attachment L1 shows the *'Existing water table'*, prior to subterranean quarrying, however, negligently in my opinion, fails to show the *'Conceptual water table'* as would seem highly important.

** Please note the cross section location is shown in attachment L2.*

I have expanded upon the 'Conceptual Cross Section A-A' to demonstrate the *'Radius if Influence'* at 1,418 metres as shown in attachment L3.

This clearly shows homes on both sides of the quarry could be affected by the lowering of the water table in the area.

It also shows how the scale of the quarry will dwarf the Coomera River at this point and will, I believe, cause the Coomera River to leach into the underlying rock once the existing water table is no longer in equilibrium with the Coomera River level as it is currently.

I find it hard to believe the Coomera River will be able to maintain its current water level given the existing water table will be lowered considerably and will probably be in the region of 75 metres below the River at this point.

The development application's *'Groundwater Impact Assessment'* claims: *"the Coomera River will act as a flow boundary that will limit the western extent of the radius of influence"* (Attachment A5). However, I believe it is clear to see from my conceptual diagram (Attachment L3), that with the water table sitting at an estimated 75 metres below the Coomera River that this claim cannot be true given the tiny insignificant size of the Coomera River at this point compared to the adjacent colossal scale of the subterranean quarry pit that is proposed.

I believe this is reiterated by the applicants statement: *"Development of the quarry will result in changes to the groundwater flow direction"* (Attachment A9). This is an important point. This will have an undeniable significant impact on the Coomera River where instead of the groundwater flowing into the Coomera River as currently happens, and provides the equilibrium for the area, the groundwater will now be flowing out of the Coomera River in a perpetual cycle of trying to establish a new water table level as it diminishes ever further below it. Ironically, it might only be the dewatering from the quarry of the leached (now maybe contaminated) groundwater from all around that stops the Coomera River from completely drying up in this area. I believe the current level of the Coomera River could be extremely hard to maintain in the future given the development application extreme proposals and the effect on the existing water table. The cumulative effects on the environmentally significant ecosystems all around really do not bear thinking about.

I hope Council Planners will consider the affect this *'Radius of Influence'* will have on the whole of the surrounding area and the effect this could have on the local environment, the local ecosystem and the thousands of local residents and businesses' (including the catastrophic effect this could have on the Wake Park and Aqua Park) that are surrounding the quarry.

Ultimate Site Conditions

It is noted in the Stormwater Management Plan that prior to an anticipated rainfall event the following process should be adopted:

"Check water quality and levels in the Quarry Pit:

If water quality meets the maximum release limit of 50mg/L and pH release limit of between 6.0-8.5 as identified in Table1 adjacent and there is less that 119.7 ML of storage available in the Quarry Pit (40.5ML of which is within the sump), undertake releases of water from the waterbody. Releases only to be undertaken if an increase in stored water resulting from a rainfall event will hinder quarrying activities"

If stormwater exceeds maximum release limit shown in Table 1, either wait until sediment settles or use a coagulant or flocculants to treat stormwater prior to discharge. The use of coagulant or flocculants to treat stormwater in a sediment pond design must not cause environmental harm to receiving waters" (Attachment B1).

However, this does not allow for the ingress into the pit through walls and floors and appears to be unconcerned about this aspect despite being "Ultimate Site Conditions". This ingress into the quarry (believed to result in 30 to 40 litres of dewatering required per second) will have to be dewatered continually to stop quarry flooding. There is no sediment basin or containment pit therefore what happens if the water in the quarry pit exceeds the maximum of 50mg/L and/or the pH level is incorrect and there is less than 119.7 ML of storage? The water has to be released or the quarry will flood yet there is apparently nowhere to permit settlement. You cannot apply *'coagulant or flocculants'* to the sump as it will be continually filling with leached groundwater (And maybe stormwater also). There is no backup system, it appears the water will have to be dewatered into the Coomera River despite the effects this could have on the local ecosystem.

There are similar problems with" 'Protocol for During a Rainfall Event (Attachment B1) and 'Protocol for after a Rainfall Event' (Attachment B1).

It would seem there is inadequate storage on-site once the sediment basins and containment pits are engulfed in the extractive footprint and this combined with more and more leached water to be handled as the pit gets bigger and bigger would seem to be a recipe for disaster (as shown in Attachment A7).

Dewatering Management Guidelines 4.2.2 - Acid Sulphate soils (ASS)

The Gold Coast Council's *'Dewatering Management Guidelines',* Section 4.2.2', 'Acid sulphate soils (ASS)' section is reproduced in attachment D1.

This states: *"The occurrence of ASS in coastal areas is a common phenomenon. ASS contains iron sulphides, mostly pyrites and when they are exposed to the air they can generate large amounts of sulphuric acid. When iron sulphides have been exposed to oxygen, they become very acidic, that is with a pH less than or equal to four and can contaminate groundwater.*

In the past, large scale drainage of coastal flood plains for flood mitigation, urban expansion and agriculture has exposed significant areas of ASS. This disturbance has generated acidic water, through the generation of sulphuric acid, together with elevated concentrations of typically aluminium, iron and arsenic. The discharge of acidic 'slugs' of water into streams, rivers or estuaries have resulted in major fish kills in rivers along the Queensland coast." (Attachment D1).

Obviously in this particular case, given this is thought to be the biggest ever proposed dewatering project on the Gold Coast, that is proposing dewatering on a colossal scale into the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem then the Acid sulphate should be a serious consideration.

It is known that this is an acid sulphate region (as shown in the City Plan reproduced in attachment D2).

This is reinforced in the Main section of the development application where it says: *"The occurrence of acid sulphate soils has been addressed within the Groundwater Impact Assessment prepared by Australasian Groundwater and Environmental Consultants Pty Ltd."* in the (Attachment D3).

In the *'Groundwater Impact Assessment'* referred to, there is very little mention of the acid sulphates and how it effects the local area.   However, *'Section 6.2.6'*, confirms that sulphide minerals and sulphide-bearing carbonaceous rocks are found within this region and goes on to state: *"Weathering of sulphide minerals when exposed to moisture and oxygen has potential to result in acidic groundwater quality. Sulphide-bearing minerals exposed to oxygen can potentially lead to acid mine drainage and acid sulphate soils."* (Attachment D4).

Finally, in the *'Summary and Conclusions'* section it states: *"The understanding is the water level in the quarry void will recover back to an elevation that is consistent with the Coomera River post closure. Additionally, the water level recovery within the proposed development will saturate the exposed pit walls thereby limiting the potential for acid generation"* (Attachment D5).

This, relatively small coverage of the acid sulphates in the Groundwater Impact Assessment, confirms to me that this proposed development will *'result in acidic groundwater'* as predicted.

It is extremely concerning that the applicant is eventually relying on *"the water level recovery within the proposed development will saturate the exposed pit walls thereby limiting the potential for acid generation"*. What about the intervening one hundred plus years where the groundwater will be acidic and due to the lack of sedimentation pits and/or containment pits it will have to be, it would seem, pumped into the Coomera River even if levels are incorrect to avoid flooding the pit as there appears to be no other means of controlling the output?

Bogle-Chandler case

I believe the highly concerning case of Dr Bogle and Mrs Chandler should be considered. Their deaths are believed to be as a result of hydrogen sulphide poisoning whilst relaxing on a Sydney river bank. It would seem they were overcome by hydrogen sulphide gas from the adjacent river (Attachment D6).

It is compelling reading that years before this *"the local council received scores of letters from residents complaining of the smell of "rotten eggs" coming from the river, causing nausea and breathing difficulties. There was also a series of massive fish kills. With the residents facing permanent evacuation, the Maritime Services Board conducted a year-long study of the river. It found that the bottom muds were saturated to a depth of 50 centimetres with hydrogen sulphide and that the very rapid releases of hydrogen sulphide gas could occur from a section of the river impounded by the weir. The source was identified as a factory that had pumped its waste into the river since the 1890's. The worst affected location was within a quarter-mile of the weir, exactly where Bogle and Chandler died"* (Attachment D6).

Given this is a known acid sulphates affected area (Attachment D2) and subterranean quarrying activity will disturb the acid sulphates (Attachment D4), the stark parallels to this proposed development and the *'Bogle-Chandler'* case are unnerving.

Summary

The Coomera River Environmental Protection (Water) Policy 2009, for the Coomera River at the quarry's proposed discharge locations are a 'Suspended Solids' Limit of '<8 mg/L' (as shown in attachment C1). Whereas, the DES Environmental Authority 'EA0002207' is incredulously authorising a 'Maximum release limit' of '50 mg/L' (Attachment C2) which is over six times the limit of the receiving water. This combined with the knowledge that 30 to 40 Litres per second (946 to 1260 Million litres per annum) is believed to be required to be dewatered to avoid the quarry flooding (as described in my *'Water Quality problems and omissions re Stormwater Plan'* objection dated, 30th June 2021). This equates to (if I have got my maths correct) 1.5 grams (30 litres times 50 mg) of 'Suspended Solids' can be apparently legally dumped into the Coomera River every single second. Or 90 grams per minute, 5.4 Kg per hour, 130 Kg per day.

This amounts to a staggering total of between 47 to 63 tonnes per annum of 'Suspended Solids' can be legally dumped into the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem by Nucrush under their obscene Environmental Authority 'EA0002207' issued by DES, for this development application. I really cannot believe the DES comprehended the scale of what they were actually authorising at the time. However, if this development application were to be approved by Council, this would be fully legitimise these actions.

Are Council Planners willing to risk a similar long-term build-up, as per the *'Bogle-Chandler'* case, happening here on the Coomera River?

Are Council Planners willing to let this development application pollute the Coomera River and its local ecosystem for the next one hundred plus years with untold and ill-considered effects these proposals could have?

Could the case of *'Bogle-Chandler'* become a reality here on the Gold Coast also? Certainly the lack of dewatering Management Plan and, in my opinion, ill-conceived and environmentally unsound, dewatering methods, could see this as a definite possibility.

Dewatering Management Guidelines 4.2.3 - Geotechnical Issues

The Gold Coast Council's *'Dewatering Management Guidelines',* Section 4.2.3', 'Geotechnical Issues' section is reproduced in attachment D7.

This states: *"The DMP should also include an assessment of the potential geotechnical and hydrological impacts of groundwater extraction. It should demonstrate that nearby structures and infrastructure will remain stable during and after dewatering. Consideration of groundwater recharge should be given. This may require groundwater modelling. Details of dewatering volume, rate, duration, equipment and procedures must be included in the DMP"* (Attachment D7). These clear and detailed requirements I believe have not been submitted as part of the development application and therefore I do not believe the Council Planners can adequately access the impact of the proposals in the development application without this essential information.

It then goes on to state: *"A geotechnical investigation shall be undertaken to determine the groundwater level and the absorption rate for all sites. The lowest value obtained from the geotechnical investigation shall be used in the absorption calculations"* (Attachment D7). However, it should be noted that the figures adopted in their *'Stormwater Management Plan'* are based on, I believe, a best case scenario as highlighted in Section C.5.1: *"To present a water balance model considered to represent the site (in lieu of comprehensive information), certain assumptions have been applied. These are outlined below: … As suggested in the Groundwater Impact Assessment - Oxenford Quarry Extractive Boundary Realignment Project (G1913)(AGE 2018) and supported by G1913A: Oxenford Quarry Response (AGE 2019): "The inflow predictions show that the inflows are dominated by groundwater entering through the pit floor. The inflows predicted by the low bedrock conductivity scenario (total of 4 L/s or 130 ML/yr) are considered more likely to be representative of the magnitude of inflows to be observed during operations"* and *"Based off this statement, the groundwater inflow as anticipated at being 4 L/s (345.6m^3/d) for the quarry Pit Sump C3 for the ultimate site conditions"* (Attachment D8).

Based on the *'low bedrock conductivity'* assumption above, a 'best case scenario' of 130 ML/yr inflow into the pit was, it seems, assumed. If it were found to be a *'high bedrock conductivity'* then up to 432 ML/yr would flow into the pit as per their Analytical results table (Table 7.2) of their Groundwater Impact Assessment shows (reproduced in Attachment D9). Thus, there would be an additional 302 ML/yr inflow into the quarry pit which would have to be pumped into the Coomera River (which I believe equates to roughly an extra 10 litres per hour) as the quarry has it would seem no use for this additional ground water. Therefore, I believe, the outflow would increase to an estimated 40 litres per second on a 24/7 basis (approx).

I believe it is culpable to use a best case scenario within the *'Stormwater Management Plan'* that should clearly be based on a worst case unless proof was available negating this worst case scenario.

There appears to be no proof submitted. However, the mere fact *'high bedrock conductivity'* is presented as an option within their *'Stormwater Management Plan'* shows, I believe, this would have been more appropriate case to base calculations on. Especially when considering the possible devastating effect this DA could have on the local ecosystem and the local environment when discharging high volumes of potentially highly contaminated water into the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem.

The Gold Coast Council's *'Dewatering Management Guidelines',* Section 4.2.3', 'Geotechnical Issues' section goes on to say: *"The geotechnical investigation shall report the meteorological details of the test day, the general site condition and the level of the watertable applicable at the site"* and *"The report must identify and address the overall potential adverse effects of dewatering on the stability and integrity of any adjacent property or structure. The report shall assess the radius of influence of the draw-down cone on potential settlements and lateral movements of any adjacent structures, properties or services"* (Attachment D7). Although the radius of influence is evaluated in the *'Groundwater Impact Assessment'* (at up to 1,418 metres) it does not, despite encompassing thousands of homes, an environmentally significant river, many, many significant and sensitive structures, report on the: "*influence of the draw-down cone on potential settlements and lateral movements of any adjacent structures, properties or services".*

The Gold Coast Council's *'Dewatering Management Guidelines',* Section 4.2.3', 'Geotechnical Issues' section goes on to say: *"A minimum of two boreholes per site is required. One of the boreholes shall be within the proposed absorption area and others in various locations throughout the site. For developments where the gross site area (GSA) is greater than or equal to 1000 square metres, an additional borehole is required for every 400 square metres or part thereof over 1000 square metres. For example, a site with GSA of 1450 square metres, four boreholes are required. Copies of the borehole logs are to be attached to the report. Unless groundwater is encountered, borehole depth shall be a minimum of four metres from the existing ground level"* (Attachment D7). There appears to be kjust three bores used in the development application: *'MB-01', 'MB-03' and 'MB-04D' despite a requirement: "For developments where the gross site area (GSA) is greater than or equal to 1000 square metres, an additional borehole is required for every 400 square metres or part thereof over 1000 square metres."* Clearly, this development application falls far short of the required target.

Also, it should be noted these boreholes had a sample depth of only *'8'*, *'9'* and *'28'* metres below ground level (mbgl), as shown in Attachment D10, despite a target proposed depth of 110 mbgl. How can the results be adequately assessed when the boreholes are just a mere 13 percent of the target depth? How can the development application assume a best case scenario of *'low bedrock conductivity'* when the bedrock conductivity it would seem has not been adequately investigated?

<u>Development Application Stormwater Management Plan Model assumptions</u>

It should be noted that the *'Model Assumptions'* , in *'Section C.5.1'*, adopted in their *'Stormwater Management Plan'* are based on: *"To present a water balance model considered to represent the site (in lieu of comprehensive information), certain assumptions have been applied."* (Attachment D8).

Why is it that: *"in lieu of comprehensive information … certain assumptions have been applied."* ? With a development application of this immense scale and potential impact on the local environment, the local ecosystem and the local residents and for the next one hundred plus years, why has the *"comprehensive information"* not be obtained and therefore they would not need to rely on: *"certain assumptions have been applied."* ?

I believe their seemingly unfounded assumptions have enabled them to select a best case scenario, not the worst case as is surely required for a development application's *'Stormwater Management Plan'*. i.e Their assumptions are based on the *'low bedrock conductivity'* case, giving a best case scenario of 130 ML/yr inflow into the pit, whereas if it were a *'high bedrock conductivity'* then up to 432 ML/yr would flow into the pit (as shown in their Analytical results table (Table 7.2) of their Groundwater Impact Assessment shows, reproduced in Attachment D9).

Thus, it would seem, they are assuming less than a third of the worst case inflows into the quarry pit that could be expected. And, their *'Stormwater Management Plan'* is based on this apparent best case assumption which I belief nullifies their presented analysis.

Dewatering Management Guidelines 4.2.4 - Noise and vibration issues

The Gold Coast Council's *'Dewatering Management Guidelines', Section 4.2.4', 'Noise and vibration issues'* section is reproduced in attachment D11.

This states: *"The DMP should detail the type and location of equipment to be used and the duration of use. Potential noise/vibration issues and potential sensitive receivers should be identified within the DMP. It must detail any mitigation measures and how they will prevent any noise issues"* (Attachment D11). I do not believe these important details have been divulged anywhere within the development application. With the proposed reduction in buffers, down to 150 metres from homes in the north) and in every lateral direction these are important issues that have been omitted.

It then goes on to state: "Treatment methods for the reduction of noise emitted from the mechanical plant involved in the dewatering process include, but are not limited to methods such as:

• installation of a fully acoustically attenuated enclosure around noise generating equipment, (for example, pumps and generators)

• the use of sound attenuating material such as hay bales to surround the plant

• installation and maintenance of mufflers and suitable exhaust systems for all noise generating plant and equipment

• operation of particularly noisy equipment within restricted time periods 7am – 6pm

• restriction of operating hours of the offending plant All noise emitted from the dewatering process is to comply with the provisions of the Environmental Protection Act 1994." (Attachment D11).

I do not believe any of these important aspects have been adequately covered anywhere in the development application.

However, the requirement of: *"operation of particularly noisy equipment within restricted time periods 7am – 6pm"* is particularly important given the believed magnitude of dewatering required. Is the applicant proposing dewatering on a 24/7 basis? Can they meet their environmental noise levels as specified in EA0002207? These highly important and concerning aspects of the development application appear to be missing.

Dewatering Management Guidelines 4.2.5 Odour Issues

The Gold Coast Council's *'Dewatering Management Guidelines', Section 4.2.5', 'Odour issues'* section is reproduced in attachment D12.

This states: *"The presence of potential odour-causing gas hydrogen sulphide (H_2S) should be detailed in the DMP. The DMP should identify potential mitigation measures and demonstrate they will be effective. The proposed treatment methods for the dewatering process are required to be included within the DMP. The proximity of the residents should be considered when undertaking dewatering activities"* (Attachment D12).

Again, I do not believe these important details, despite the serious implications for residents, have been considered anywhere within the development application.

Dewatering Management Guidelines 4.3 Operational and monitoring requirements

The Gold Coast Council's *'Dewatering Management Guidelines', Section 4.3', 'Operational and monitoring requirements'* section is reproduced in attachment D13.

This states: *"To avoid any environmental harm where water contains significant suspended solids and other harmful chemical and toxicants, the proponent should install and operate a settling basin/balance tank with a capacity to contain a minimum of two hours prior to release to the environment, depending on sediment characteristics. This is necessary to remove flocculating matters and also allow aeration and dissolved iron to precipitate and settle. It may be also necessary to apply chemical dosing such as lime to raise pH, metal salt to enhance removal of toxicants.*

Where it is not possible due to lack of space, the proponent must explore mobile tanks or other forms of solids reduction such as filtration or chemical coagulation" (Attachment D13).

I believe there is a significant risk of potential environmental harm given the amount of dewatering required. Therefore, as stated: *"the proponent should install and operate a settling basin/balance tank with a capacity to contain a minimum of two hours prior to release to the environment, depending on sediment characteristics"* would seem a minimum requirement.

The lack of sedimentation basin and/or containment pits of adequate size in the later stages of development I believe is of great concern (Attachment A7).

The statement: *"It may be also necessary to apply chemical dosing such as lime to raise pH, metal salt to enhance removal of toxicants."* (Attachment D13) is also highly concerning given the high rate of proposed discharge into an environmentally significant area of the Coomera River. How will this affect the local ecosystem? It seems the development application has not divulged this information.

The Gold Coast Council's *'Dewatering Management Guidelines', Section 4.3', 'Operational and monitoring requirements'* goes on to state: *"It is important that during construction and operational phases of a project, **the existing groundwater regime is maintained as close as possible to the pre-development condition**. In this regard, consideration should be given to the level and flow attributes of the groundwater regime, through appropriate monitoring. In general a minimum monthly for static water levels via piezometers in the surrounding watertable is required to assess draw-down effects."*.

Given the clear plans to destroy the existing groundwater regime and lower the water table for a radius of influence of up to 1,418 metres, down to a depth of 110 mbgl, I do not see how the following statement can be successfully achieved: ***"It is important that during construction and operational***

phases of a project the existing groundwater regime is maintained as close as possible to the pre-development condition".

Dewatering Management Guidelines 4.4 Dewatering Contingency Plan

The Gold Coast Council's *'Dewatering Management Guidelines', Section 4.4', 'Dewatering Contingency Plan'* section is reproduced in attachment D14.

This states: *"A key feature of the DMP is that it will identify risks at the planning stage before construction begins. Where problems are unlikely and are not accounted for in the general dewatering procedures, contingency plans must be prepared. Triggers that activate the contingency plans should also be detailed within the DMP. Contingency plans within the DMP are binding through conditions of approval. The DMP should identify management actions for scenarios including but not limited to the following:*

- *noise complaints*
- *odour complaints*
- *complaints about appearance of wastewater discharge*
- *unexpected contaminants found during monitoring*
- *failure of treatment methods*
- *failure of pumping systems*
- *groundwater seepage into construction area*
- *heavy rainfall*
- *impacts on the stability of adjacent structures*
- *release of any toxicant materials outside the trigger values in Tables 1, 2 and 3 Examples of contingency actions may include:*
- *consulting a professional*
- *stopping operations*
- *changing methods or equipment*
- *additional monitoring*

Contingency plans with a higher level of detail and foresight prove more useful if the situation arises." (Attachment D14).

I do not believe the required highly important and relevant Contingency plan for the dewatering has been submitted in any way shape or form.

Sediment Build-up

It was noted above that the quarry, under their issued Environmental Authority can dump up to *'50mg/Litre'* of *'Suspended Solids'* into the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem (as shown in attachment C2). This is over six times the limit (*'<8 mg/Litre'*) permitted under the Environmental Protection Policy for this part of the Coomera River (as shown in Attachment C1).

Therefore, I believe, this amounts to a staggering total of between 47 to 63 tonnes per annum of *'Suspended Solids'* can be legally dumped into the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem by Nucrush under Environmental Authority 'EA0002207', as issued by DES.

This is, I believe, equivalent to between two and three loaded trucks of 'Suspended Solids' (dust, grit, or whatever) can be legally dumped into the Coomera River every single year. Which equates to an incredulous two to three hundred fully loaded trucks of 'Suspended Solids' (dust, grit, or whatever) can be legally dumped into the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem over the proposed duration without DES batting an eyelid!

How will this level of legalised dumping into the Coomera River affect the local ecosystem?

I believe the sediment build-up can be clearly seen on historical images of the area just downstream of the John Muntz Bridge and the Southern Discharge point.

I appreciate some of this sediment build up maybe attributed to either the Bullrin Extractive Industry upstream and/or the Holcim Concrete Production Plant. However, the accumulated effect of this extractive and industrial activity, in this confined area, appears to be dumping a high level of sediment into the *'Environmental significant - wetlands and waterways'* area of the Coomera River.

In February 2004 it can be seen there was no noticeable sediment build up downstream of the Southern discharge point (Attachment J1).

In June 2008 it can be seen there was a little sediment build up downstream of the Southern discharge point (Attachment J2).

In June 2011 it can be seen there was more sediment build up downstream of the Southern discharge point (Attachment J3).

In January 2014 it can be seen there was significant sediment build up downstream of the Southern discharge point (Attachment J4).

In July 2020 it can be seen there was significant sediment build up downstream of the Southern discharge point, however in a different position to six years ago (Attachment J5).

From these historical images I believe it is clear to see that there is a lot of sediment collecting on the floor of the Coomera River in the area and it is continually moving with river flow and stormwater effects.

It can also be seen that downstream, beyond the weir, in the saltwater section of the Coomera River the same pattern can be witnessed in June 2008 (attachment J6) and Aug 2017 (Attachment J7) where the shifting sediment is being carried downstream.

I shudder to consider the long term (or indeed the short term) effect of this much sediment being dumped into the *'Environmental significant - wetlands and waterways'* freshwater part of the Coomera River and its effect on the local ecosystem and the local environment.

If you look carefully at the City Plan Interactive Map at the southerly discharge location into the Coomera River (adjacent, but just upstream of the John Muntz Bridge, reproduced in Attachment J8) I believe it is possible to see a sediment trail leading from the discharge chute, under the John Muntz Bridge at an approximately angle 45% under the John Muntz Bridge which is the same angle the discharge chute enters the Coomera River. To me it appears sediment is exiting from this discharge location and the sediment is building up under the John Muntz Bridge and in the downstream areas leading from it.

John Muntz Bridge

It should also be realised that reducing the water level under the John Muntz Bridge, due to sediment build up, will result in a Stormwater event causing the water to rise a lot quicker than it would with a deeper river bed, and with a lot more pressure, which will undoubtedly add stress to the John Muntz Bridge structure. Is this why the John Muntz Bridge has failed three times, I think, in the last ten years?

Clearly the sediment build-up, and the effects on the local ecosystem and the surrounding structures, should be part of this development application and should, I believe, be within the *'Dewater Management Plan'* had it been submitted. Unfortunately, it would seem, this highly important aspect is completely missing from the DA..

How deep is it below the John Muntz Bridge? How much of this is sediment build-up? What is the design criteria for the Bridge and the volume of water below it? How much faster will the Coomera River rise up to engulf the John Muntz Bridge in a stormwater event for differing levels of sediment built up under it? How is the proposed development application dewatering into this discharge point going to affect the level of sediment in this area?

All these are highly relevant and pertinent questions that, I believe, should be being addressed before any development approval can be considered and should have been duly considered as part of the development application.

I believe that to permit sediment to enter into the Coomera River at this location, upstream and within metres of the John Muntz Bridge, is tantamount to reducing the lifespan of the John Muntz Bridge.

Why permit dumping into the *'Environmentally significant'* Coomera River?

In the original approval. I believe, the quarry was not supposed to dewater into the Coomera River but was supposed to use all the water internally. Why has it now been permitted to now dump into the Coomera River? Especially since we are now understanding the negative and devastating effects this could have on the local ecosystem.

How has this approval been given to dump into the Coomera River? I note the Southerly discharge location (as shown in Attachment A6) has to pass under the Maudsland Road and through '34 Maudsland Road' (Lot 3 on SP304578), which is land that I believe is not owned by Nucrush. Have they got the appropriate approval to do this? Why is this important information not part of the development application?

If this land owner of '34 Maudsland Road' chooses to develop this area in the future how will this affect the dewatering process for Nucrush? What contingency plans are in place if this location gets blocked? Will it flood the road and/or the immediate area?

I note there are no 'Easements' relating to Nucrush use of '34 Maudsland Road'. Can the City of Gold Coast Council Planners confirm if the use of a man-made drainage channel (located majorly within '34 Maudsland Road') from the *'Polishing Dam C2'* down to the foundations of the John Muntz Bridge is legal use of this area? It would seem completely at odds with the structural integrity of the bridge given the sediment discharge that will occur.

Also, the northerly discharge location passes under the Tamborine Oxenford Road. What approval has been given to permit this to happen? What contingency plans are in place if this location gets blocked? Will it flood the road and/or the immediate area?

Where are the required 'Easements' to permit the use of this two discharge points?

This is all highly important and relevant information that I believe should be part of their 'Dewatering Management Plan' but has been omitted.

I believe the Council Planners should very carefully consider the implications of approving a development application with the clear detrimental effects this will have in the local ecosystem and environment just from the planned dewatering activities.

Quaternary alluvium

The *'Groundwater Impact Assessment'* claims: *"The proposed quarry design does not intersect and Quaternary Alluvium associated with the Coomera River (Figure 7.5)"* (attachment A9).

However, I do not believe this is correct, the referenced *'Figure 7.5'* ('*Projected pit shell location relative to mapped alluvial extent'*), reproduced in attachment E1, I believe shows the *'Quaternary Alluvium'* as the yellow outline. In the submitted 'Visualisation Stage 5' it can be seen the extractive footprint engulfs the majority of this area despite the *'Quaternary Alluvium'* land zoning of this area (reproduced in attachment E2).

Dewatering release criteria

The Gold Coast Council's *'Dewatering Management Guidelines'* dewatering release criteria is reproduced in attachment H1.

It is reassuring to see a number of water quality checks are required by the Council's *'Dewatering Management Guidelines'*. However, these are not reflected in the Environmental Authority EA0002207 and therefore will not be appropriately monitored by DES as they are only interested in what is stated in the Environmental Authority (as reproduced in Attachment C2).

Clearly the Environmental Authority, re contaminants entering the Coomera River are far inferior to the Council Guidelines as they only legislate for *'Suspended Solids'* (*'50mg/L'* which is six times the Environmental Protection Limit of this receiving water as shown in attachment C1) and *'pH'* levels that are again far more lenient than the receiving waters Environmental Protection Limit (as shown in attachment C1).

The Council, once any initial approval has been given, will deny any responsibility for anything to do with the quarry as they currently do. Hence the clear requirements of the Councils: *"On-site dewatering water quality release criteria"* will unfortunately be ignored if this development application is approved at the peril of the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem and its clear Environmental Protection requirements (as shown in attachment C1).

Are the Council Planner's willing to endorse such blatant ignoring of the Council's requirements for dewatering water quality that will enter an *'Environmental significant - wetlands and waterways'* area under their watch?

Dewatering - Treatment of Groundwater

The Gold Coast Council's *'Dewatering Management Guidelines',* Section 4.2.1', 'Treatment of groundwater' section is reproduced in attachment H2.

This states the development application (by means of the DMP): *"must address methods for the treatment of groundwater that is to be discharged to the stormwater system includes, but are not limited to the following:*

- *treatment of the groundwater - off-site removal of groundwater from the site to a treatment facility for treatment and disposal*
- *physical treatment - filtration of the groundwater to remove suspended solids/reduce turbidity on-site before disposal into the stormwater system*
- *chemical treatment (for example, flocculation) - addition of lime to the groundwater in order to form a precipitate of the waste content of the water - this process should be used as last resort because it can cause other solid/sludge disposal implications/costs*

Often the dewatering will require treatment prior to discharge. A qualified company/professional should be consulted and supervise water treatment procedures. The DMP must detail proposed treatment processes and operating protocols, in addition to justify these decisions. It must indicate where the treatment is being carried out in relation to the pump and other equipment and the point of discharge. Erosion prevention methods should also be detailed including pump protection at inlet and outlet" (Attachment H2).

It is noted that in the submitted *'Groundwater Impact Assessment'* (the closest thing they have submitted to a DMP) there is unbelievably no mention of any processes whatsoever to ensure the quality of the water displaced by the dewatering process.

Whilst in the submitted *'Stormwater Management Plan'*, for an *'Anticipated Rainfall event'* in the ultimate site conditions: *"If stormwater exceeds maximum release limit shown in Table 1, either wait until sediment settles or use a coagulant or flocculants to treat stormwater prior to discharge. The use of coagulant or flocculants to treat stormwater in a sediment pond design must not cause environmental harm to receiving waters"* (Attachment B1).

Given that in the ultimate site conditions, as it is referred to, without the required sediment pond (as shown in attachment A7) where is the sediment going to be allowed to settle? However the use of a *"coagulant or flocculants"* as the only specified alternative is also highly concerning given the possible impact this can have on the local ecosystem.

Coagulant process

"What is coagulation? The coagulation process involves adding iron or aluminium salts, such as aluminium sulphate, ferric sulphate, ferric chloride or polymers, to the water. These chemicals are called coagulants, and have a positive charge. The positive charge of the coagulant neutralises the negative charge of dissolved and suspended particles in the water" and *"When this reaction occurs, the particles bind together, or coagulate (this process is sometimes called flocculation). The largest particles, or floc, are heavy and settle to the bottom of the water supply. This settling process is called sedimentation."* (Attachment H3).

Flocculation process

It is noted the flocculation process typically requires that: *"water from the reservoir passes through the first compartment into which flocculants are added. The water then moves to the sedimentation tank where the flocculation process occurs and suspended particles settle at the bottom of the tank."* (Attachment H4). As there appears to be no suitable reservoirs and sedimentation pits it does not appear the *"flocculants"* route, as claimed, is appropriate in this environment when there is only a pit sump available (as shown in attachment A7).

Summary

It should be remembered the Stormwater Management Plan claims: "*If stormwater exceeds maximum release limit shown in Table 1, either* ***wait until sediment settles*** *or* ***use a coagulant or flocculants*** *to treat stormwater prior to discharge"* (Attachment B1). As *"coagulant"* and *"flocculants"* both require a period of settlement time in sedimentation pits it is clearly not an alternative option as inferred.

Also, as *"coagulant"* and *"flocculants"* both require additional additives to be added to the contaminated water I find this very concerning for the *'Environmental significant - wetlands and waterways'* area of the Coomera River's local ecosystem.

I believe that it is abundantly clear that when reading the requirements of the Council's *'Dewatering Management Guidelines',* Section 4.2.1', 'Treatment of groundwater' section (reproduced in attachment H2) that the *'Treatment of Groundwater'*, as part of the dewatering process, has not been adequately considered by this development application.

<u>Legislative Requirements</u>

It is noted in the Gold Coast Council's *'Dewatering Management Guidelines'* that: "*Person/s conducting dewatering activities shall do so in accordance with the requirements of the Environmental Protection Act 1994 and Environmental Protection Regulation 2008. Parts of State Planning Policy, Planning and Managing Development Involving Acid Sulphate Soils, is also applicable"* AND "Person/s conducting dewatering activities shall take all reasonable and practicable measures to:

- ensure all groundwater that is discharged from a site into receiving waters is adequately treated and disposed of so as not to create environmental nuisance or harm
- ensure all contaminated groundwater that is to be treated off-site is done so in accordance with all relevant legislation
- prevent the emission of nuisance odours associated with the dewatering process
- ensure there is no scouring or erosion at the point of discharge into the receiving waters
- manage and resolve any complaints generated by the activity
- ensure all plant and equipment associated with the dewatering process is to be adequately acoustically attenuated to comply with the Environmental Protection Act 1994" (Attachment I1)

I do not believe the submitted development application appropriately addresses the legislative requirements for dewatering activities as clearly outlined by its failure to submit a Dewatering Management Plan (DMP) as clearly was required.

<u>Water Quality Protection Guidelines for Mining and Mineral Processing - Mine Dewatering</u>

The *'Water Quality Protection Guidelines for Mining and Mineral Processing - Mine Dewatering'* document produced by the Western Australian government is, I believe, particular relevant.

It states in their *'Introduction'*: *"Dewatering is a commonly used method of coping with groundwater seepage, mine excavations intersecting aquifers or excessive rainfall on mining operations. Dewatering can affect the natural biota and significantly alter the state of the receiving waterbody. Discharge water containing high solids load or a high concentration of contaminants, or differing substantially in nature from the receiving waterbody, can affect regional water quality. A change in the volume of water in a receiving waterbody may also impact on its normal ecosystem function. This may lead to a number of detrimental environmental effects including deoxygenation of water, toxicity to biota and reduced light penetration. It may also impact on downstream uses such as agricultural pursuits and farmstead and industrial water supplies. If discharge of water can be avoided or if it can be used on site, environmental impact may be minimised. The use of discharge water on site also minimises demands on other resources"* (Attachment M1).

It also states in the *'Regulatory requirements'* section: *"There are provisions under the Environmental Protection Act 1986 (the EP Act) that control discharge of water from mine sites. Under the Environmental Protection Regulations 1987 (as amended) a proponent must gain prior approval from the Department of Environmental Protection (DEP) before discharging minewater, where the total annual volume is 50 000 tonnes or more. For quantities less than this, advice should be sought from the Department of Minerals and Energy (DME). The DEP and DME may seek advice from the Commission if it considers discharge water may impact on water resources"* (Attachment M2).

It is noted, that this development application proposes dewatering at a believed 30 to 40 litres per second (giving between 946 to 1260 Million litres per annum). Given that one litre of water has a mass of almost exactly one kilogram (and 1,000 litres has a mass of about 1,000kg or one tonne), this means, I think, that an annual volume of between 946 and 1260 thousand tonnes of dewatering will enter the Coomera River. This is monumentally above the threshold required for approval of the *'Department of Environmental Protection (DEP)'.*

It also states in the *'Regulatory requirements'* section: *"An abstraction (water allocation) licence is also required under Part III of the Rights in Water and Irrigation Act 1914 (RIWI Act) in declared* *groundwater areas (which cover most of the State)"* (Attachment M2). Is this a requirement that should be considered for this development application?

It also states in the *'Assessment of Impacts'* section: *"a. The impact of dewatering must be assessed as part of the mine project feasibility study and within proposal applications to the DEP and DME. The proponents/operators need to understand the environment they are working in and to evaluate potential impacts of dewatering discharge. The proponent or operator is required to ensure that appropriate measures are taken to prevent pollution or degradation of the receiving waterbody.*

b. To determine the potential impact of dewatering, the proponent/operator is required to provide:

• a hydrogeological and hydrological assessment of the project area to estimate quantity and quality of water to be discharged;

• verification that the quality of discharge water will comply with the receiving water criteria set out in Table 1;

• duration and frequency of the discharge;

• seasonal variability of the receiving water quality;

• assessment of the viability of treating or recycling the wastewater;

• a water audit, which should be carried out by or endorsed by a suitably trained auditor;

• baseline assessment of the existing environment (e.g. fauna, water quality) that will receive the discharge;

• a strategy for monitoring and managing any impacts during the life and after the closure of the project." (Attachment M3). It would seem highly appropriate to include these measures for this development application too.

It also states: *"c. Discharge water should not be allowed to:*

• enter poorly defined channels, as water may leave the channel and inundate vegetation;

• enter any surface water (e.g. ephemeral stream, creek or river), or groundwater where the physical, chemical or biological nature of the discharge will affect the beneficial use of the receiving waterbody;

• cause or contribute to soil erosion;

• have a detrimental impact on flora and fauna downstream of the discharge point. Further advice on the protection of flora and fauna should be sought from the Department of Conservation and Land Management (CALM).

d. Dewatering that may lower the watertable near a coastal or estuarine environment should be assessed for potential saltwater intrusion of the aquifer.

e. The operator should control dewatering to ensure there is no significant change in water quality or change in the natural watertable or flow regime of surface water.

f. An assessment of the impact on local vegetation, springs, wetlands and groundwater bores used by others in the vicinity of the project should be made prior to dewatering. Where assessment indicates potential reduction in watertable or quality of groundwater, the operator should either design the *dewatering system to overcome this threat or provide an acceptable alternative water supply to affected parties.*

g. Evaluation criteria to assess the impacts of dewatering will be developed in consultation with the mining industry." (Attachment M3). Again, it would seem highly appropriate to include all these measures for this development application too.

It would seem all the measures in this document should be considered for this development application as they are all highly relevant in this particular case too. And, with so much at stake, ignoring any of these important criteria could be devastating for the local ecosystem, the local environment, the local community or indeed the wider community.

<u>What effects will dewatering have on the underground mantle?</u>

Typically when undertaking a significant dewatering process, such as this development application proposes, ground structure can deteriorate through voids and results in land slippage over a wide area. The emergence of sink holes is another example of what can happen.

If there is a period of low precipitation and the water table is pulled down to such a prolonged level for such a prolonged time how will this affect the local soil substrate and vegetation that holds land in place? How will this affect the Coomera River and its local ecosystem?

I trust undocumented problems such as this that are notably missing from the development application will be duly considered by the Council Planners before untold environmental problems unfold in the area.

<u>The Case of the future of one of the Gold Coast's most popular lakes</u>

A very recent article in the *'Gold Coast Bulletin'*, titled: *"Revealed: The stunning verdict on the future of one of the Gold Coast's most popular lakes"*, by Paul Weston, dated 2nd August 2021, concerning Lake Hugh Muntz in Mermaid Waters, is I believe highly relevant to this proposed development application.

It states (referring to the council report): *"Over the past 40 years, stormwater run-off into the lake has deposited a thick layer of nutrient-rich sediment across the lake floor. This layer has gradually turned anoxic - lacking oxygen - resulting in varying oxygen levels of the water column,"* and *"Over time an increase in the salinity of groundwater entering the lake caused by the growth in canal estates, has also contributed to the changes in water quality within the lake. This has contributed to a change in the lake's ecosystem from a freshwater environment to a brackish water environment. "* and *"Residents on the Save Lake Hugh Muntz Facebook page are continuing to post photographs of the lake's poor water quality, including shots of dead eels"* (reproduced in Attachment N1).

"Latest research reveals there is no easy solution to improving water quality at Lake Hugh Muntz in Mermaid Waters, leaving the council to consider multiple future options … The latest report by council officers concludes:

- *No single remedial works option has the capability to prevent future algal blooms in Lake Hugh Muntz.*

- *No combination of remedial work options will maintain a water-quality standard that facilitates a permanent swimmable lake"* (reproduced in Attachment N1).

Although I appreciate on the face of it this is a completely different case. The results are worryingly relevant.

It would seem a sediment build-up across the lake floor has resulted in an anoxic environment (a significant drop in oxygen levels) within the lake. This is, I believe, a very real concern with these development application too due to its immense dewatering proposals and the sediment content permitted by the Environmental Authority to be released which, I believe, amounts to a staggering total of between 47 and 63 tonnes per annum of *'Suspended Solids'* has been authorised by the Environmental Authority EA0002207 to be discharged into the *'Environmental significant - wetlands and waterways'* area of the adjacent freshwater lake within the Coomera River (at a rate of up to *'50 mg/Litre'* despite an *'Environmental Protection'* objective (as outlined in the *'Coomera River environmental values and water quality objectives'* - Attachment C1) of less than *'8 mg/Litre'* i.e. over six times the Environmental Protection water quality objective.

Also, Lake Hugh Muntz has turned into a brackish environment due to the saltwater intrusion. This is obviously a very real risk with this development applications proposals too (as discussed in the 'Saltwater Intrusion' section above). As the groundwater effect of lowering the water table for up to 1,418 metres will encompass the saltwater section of the Coomera River (beyond the weir) it is a very real possibility that the freshwater and salt water will intermix and be dewatered into the *'Environmental significant - wetlands and waterways'* area of the adjacent freshwater lake within the Coomera River causing untold damage to the Local Ecosystem.

Is the Gold Coast Council content to approve a development application that can have these appalling effects, as witnessed in 'Lake Hugh Muntz', on the *'Environmental significant - wetlands and waterways'* area of the freshwater lake within the Coomera River?

Are the Gold Coast Council content to risking making this area and environmental disaster area, with the current recreational activities e.g. fishing, kayaking and swimming in this lake endangered?

Are the Gold Coast Council Content to pick up the bill that maybe required in trying to undo any environmental disasters (as per the 'Lake Hugh Muntz' case) that could be caused by the proposed 'Extractive Industry' in the area for the next one hundred plus years?

Or, will the Gold Coast Council simply say it is down to the Department of the Environment and Science to deal with (as the Council continually do currently with anything remotely quarry related). Whilst the DES will simply say it is perfectly legal as it is less than *'50mg/Litre'* of *'Suspended Solids'* on the particular day that DES warned Nucrush in advance that they would be monitoring it (as happens with the Blast monitoring)?

Conclusion

Is the Council Planning department aware that the required Dewatering Management Plan has not been submitted despite this development application being, I believe, the greatest dewatering proposal and for the longest duration in the entire history of the Gold Coast?

Are the Council Planners, bearing in mind the lack of sedimentation basins and containment pits, content that the development application has adequately explained how it will ensure water purity is maintained during dewatering into the *'Environmental significant - wetlands and waterways'* area of the freshwater lake within the Coomera River?

Are the Council Planners content to let this amount of possibly contaminated water (or any contaminated water) enter into the *'Environmental significant - wetlands and waterways'* area of the freshwater lake within the Coomera River system bearing in mind in the Current approval all water was to be used internally with no dumping into the local river?

I believe the successful dewatering of acceptable levels of pollution within the dewatering process cannot be maintained give the scale of the extractive footprint proposed and the amount of groundwater that will be leached on a 24/7 basis. This combined with a lack of storage vessels to ensure sedimentation levels can be maintained is, I believe, a disaster waiting to happen for the unsuspecting Coomera River (Especially considering the acceptable water quality in the Coomera River is less than *'8 mg/Litre'* of 'Suspended Solids' (as per the Environmental Protection Policy 2009 for the Coomera River water quality objectives, reproduced in Attachment C1) whereas the development application is proposing dumping up to *'50 mg/Litre'* into the Coomera River (Attachment C2)

I hope the Gold Coast Council Planners are aware of the disaster that could befall the local ecosystem within the *'Environmental significant - wetlands and waterways'* of the Coomera River if this development application is approved.

I also hope the Gold Coast Council Planners are conscious of the very high monetary costs, as outlined in the Gold Coast Council's *'Dewatering Management Plan'*: *"The monetary costs incurred to local authorities investigating or cleaning up when responding to the one of the above mentioned incidents can be substantial"* (Attachment A2), that they could be committing the Gold Coast Council to if this all goes horribly wrong as I believe, given the facts above, is highly likely.

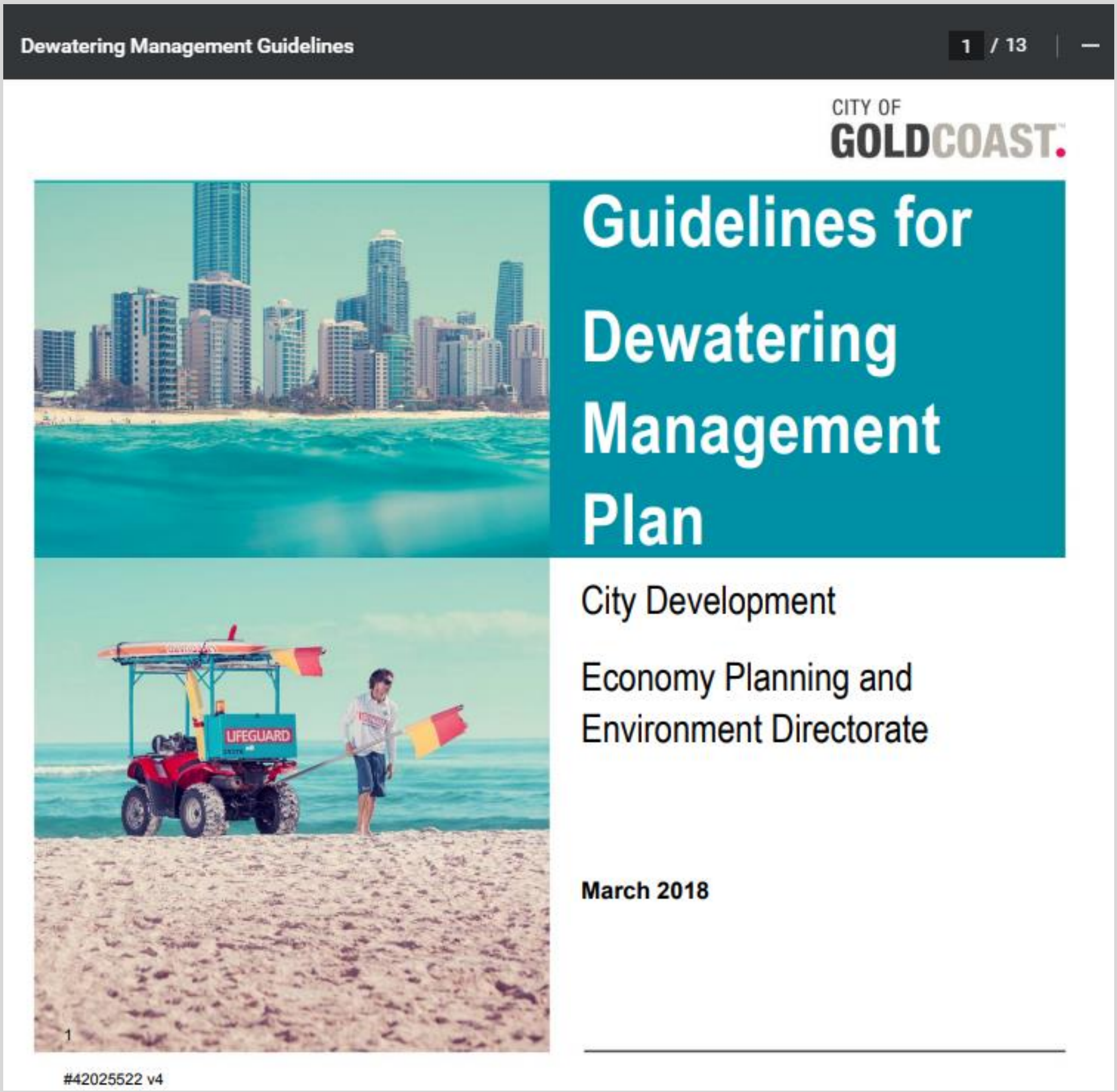
Thank you in anticipation,

Kind regards

Tony Potter

* Disclaimer. Please note my findings are believed correct and are to the best of my ability. However, there may be errors and assumptions I have made that are incorrect. I do not believe this to be the case, but, realise with the vast amounted of submitted data from the applicant, errors and assumptions on my part may occur. Hopefully this is not the case, but please accept my apologises if this is so. Thank you.

Attachment A1 - City of Gold Coast Dewatering Management Plan



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Guidelines for Dewatering Management Plan

City Development

Economy Planning and Environment Directorate

March 2018

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#42025522 v4

Attachment A2 - City of Gold Coast Dewatering Management Plan - Introduction

1. INTRODUCTION

Dewatering is defined by the process of removal of water from a site that accumulates in earthwork excavations or underneath structures at or below the existing watertable. Dewatering activities are either permanent or temporary. Permanent discharges occur from sites that have structures at or below the existing watertable, (for example, underground car parks below buildings), although this practice is being phased out. Temporary discharges occur from construction sites that have water entering the earthwork excavation. A temporary discharge usually occurs for the duration of the construction phase. This document relates specifically to temporary dewatering activities.

Construction of basements or excavation below the existing groundwater level in coastal areas has the potential to create significant sedimentation, amenity issues and other water quality impacts on sensitive estuarine and fresh water receiving environments. The problem arises from the dewatering operations associated with the basement construction. The majority of high-rise developments that incorporate basements are also located in coastal areas where the natural surface levels are below five metres Australian height datum (AHD). These areas are likely to contain actual or potential acid sulphate soils. The dewatering required for the construction of these basements therefore often results in the extraction, through the use of groundwater spears, of low pH (acidic) groundwater.

The solubility of many metals is pH sensitive and in particular the solubility of iron and aluminium increases significantly at lower pH. Because of this property, acidic groundwater often contains high concentrations of soluble metals, which are virtually colourless while in a dissolved, soluble state. While present in a soluble form at low pH, these metals are also extremely toxic to many forms of aquatic life.

Dewatering that may lower the watertable near a coastal or estuarine environment should be assessed for potential saltwater intrusion of the aquifer. The operator should control dewatering to ensure there is no significant change in water quality or change in the natural watertable or flow regime of surface water.

If the extracted acidic groundwater is discharged untreated to estuarine or marine receiving waters a range of possible impacts is likely to occur, including direct mortality or injury to aquatic life, reduction in the pH buffering capacity of estuaries, damage to infrastructure, and loss of visual amenity from visual plumes and staining.

An assessment of the impact on local vegetation, springs, wetlands and groundwater bores used by others in the vicinity of the project should be made prior to dewatering. Where assessment indicates potential reduction in watertable or quality of groundwater, the operator should either design the dewatering system to overcome this threat or provide an acceptable alternative water supply to affected parties.

The monetary costs incurred to local authorities investigating or cleaning up when responding to the one of the abovementioned incidents can also be substantial.

Odour problems that emanate from dewatering activities can negatively impact on residents surrounding the site. If the groundwater is contaminated, gases such as hydrogen sulphide and hydrocarbon can be released during the dewatering process. These gases when released can cause severe odours that can be offensive to nearby residents.

Noise emanating from the plant such as pumps and diesel generators that is used in the dewatering process, can cause a noise nuisance to nearby noise sensitive places. During temporary dewatering activities in most cases the plant is required to be operated twenty four (24) hours per day, which can increase the intrusiveness of the noise particularly during later or early morning periods when the background noise levels are minimal.

Attachment A3 - City of Gold Coast Dewatering Management Plan - Preperation

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Dewatering management plan guidelines

4. PREPARATION OF DEWATERING MANAGEMENT PLAN (DMP)

The DMP will be submitted with the development application and must include details of who is carrying out the dewatering activities, who the developer is, and who the owner is. It will also state clearly where to address complaints or issues that may arise during dewatering activities.

For Council of the City of Gold Coast's assessment and approval, the applicant must provide the following information in the DMP.

1. Purpose of dewatering (that is, an explanation of why dewatering is necessary).
2. Dewatering technique (that is, wellpoint, deep well, open hole, etc.).
3. Anticipated dewatering flow rate and total dewatering duration.
4. Controls (that is, settling tank, turbidity curtain, etc.) and method of effluent discharge.
5. Measures and techniques to manage noise, vibration and odour issues.
6. Measures and techniques to manage geotechnical stability issues.
7. Contingency plan in case of any emergency situation.
8. If dewatering conducted in a contaminated area, engineering specifications for dewatering effluent treatment (that is, air-stripper, carbon filtration, etc.) and details for an analytical monitoring program to ensure that effluent will meet *water quality release standards* described in *Tables 1 and 2.*
9. A monitoring program to ensure that effluent will comply with applicable *water quality release standards* described in *Tables 1 and 2.*
10. Baseline assessment of the existing environment (for example, fauna and water quality) that will receive the discharge.
11. A strategy for monitoring and managing any impacts during the life and after the closure of the project.
12. The point of discharge to the stormwater system and to any waterway or water body.

Further, the proponent/operator may also be required to provide the following additional information in the DMP for any complicated site:

- a hydro geological and hydrological assessment of the project area to estimate quantity and quality of water to be discharged
- verification that the quality of discharge water will comply with the receiving water duration and frequency of the discharge
- seasonal variability of the receiving water quality
- assessment of the viability of treating or recycling the wastewater

Attachment A4 - City Plan - 'Environmental significance - wetlands and waterways'

Attachment A5 - Groundwater Impact Assessment - Radius of Influence

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7.4 Radius of influence

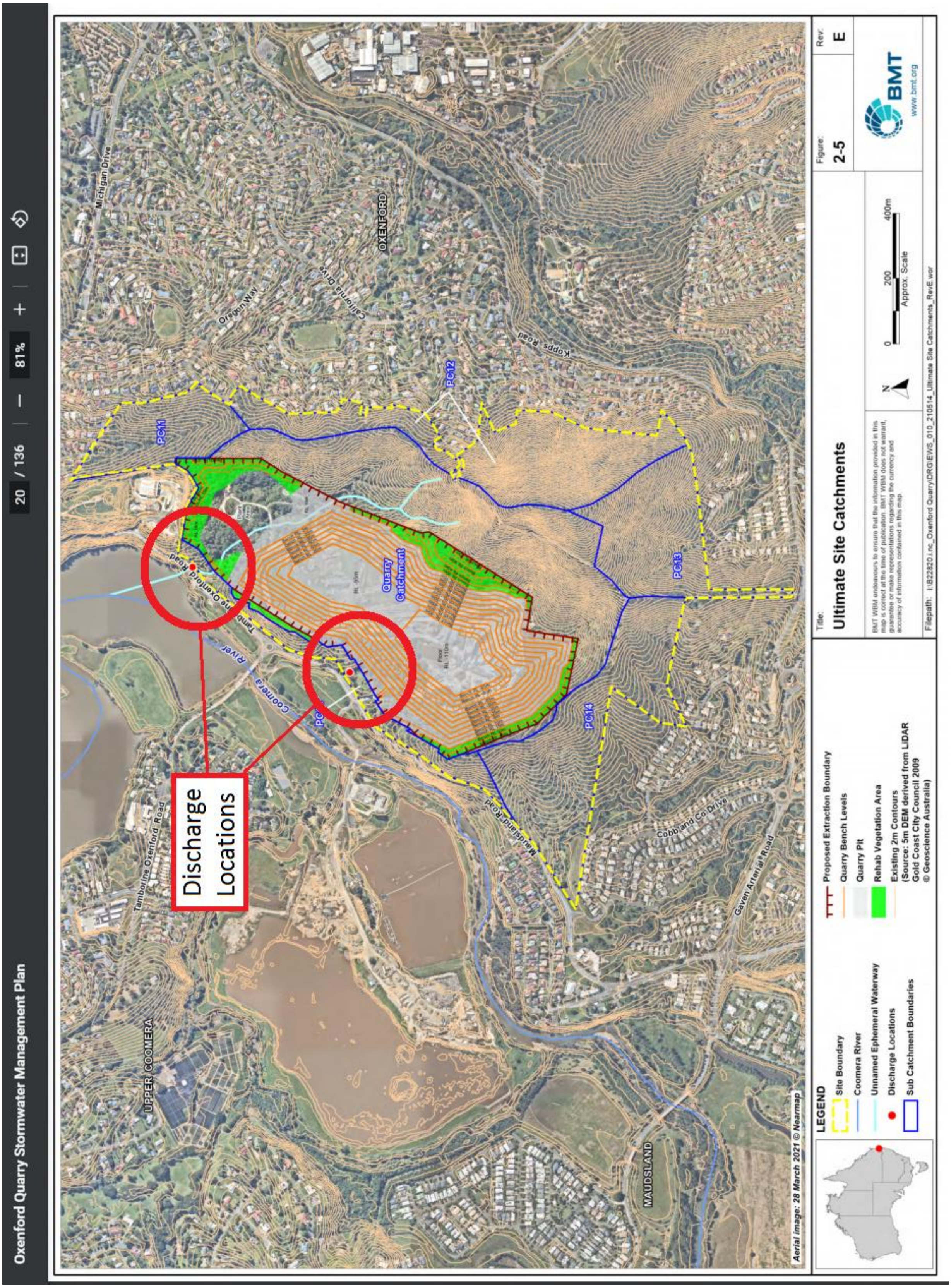
The actual radius of influence of the pit will be dependent upon the hydraulic parameters of the groundwater system (hydraulic conductivity and storage parameters) of which only hydraulic conductivity is considered in this equation, as it is a steady-state approximation only. Furthermore, the Marinelli and Niccoli (2000) analysis does not include any no flow boundaries, such as catchment boundaries, rivers, or geological structures, which can limit the radius of influence. The greatest magnitude of drawdown will occur closest to the quarry and will diminish with distance from the quarry walls.

The radius of influence based on low permeability bedrock in the pit wall is estimated to be 700 m (Table 7.2). The Coomera River and the Water Polishing Pond off Oxenford-Tamborine Rd are both located within this radius of influence and may therefore provide a source of water for quarry inflows. If there is hydraulic connectivity between the Coomera River, the associated alluvium and the Neranleigh-Fernvale Beds, the Coomera River will act as a flow boundary that will limit the western extent of the radius of influence.

The radius of influence assuming high permeability bedrock and high permeability pit floor is estimated to be 1,418 m (Table 7.2). This scenario extends the radius of influence to include private water bore (RN 124033), a more extensive portion of the Coomera River and approximately 400 m of riparian wetland located upstream of the Gold Coast wave park. Providing there is hydraulic connectivity between the Coomera River, the associated alluvium and the Neranleigh-Fernvale Beds, the Coomera River will act as a flow boundary limiting the western extent of the radius of influence. The riparian wetland located upstream of the Gold Coast wave park is fed by surface water from the Coomera River originating upstream of the Oxenford Quarry. The low permeability scenario indicates quarrying operations will not impact surface water flow supplying these riparian wetlands, so they are highly unlikely to be impacted by the proposed development. Whilst groundwater level decline at the one private active water-supply bore (RN 124033) is located within the potential radius of influence, this is likely to be negligible.

Regardless of the radius of influence and the inflows reporting to the quarry during operations, the groundwater levels in the vicinity of the quarry void are assessed to recover once quarry development ceases and the quarry void is allowed to fill. The elevation at which the quarry void water level stabilises will be governed by the surface water balance of the post-closure landscape and the elevation of a spill point within the final pit void.

Attachment A6 - Dewatering discharge Locations



Attachment A7 - Ultimate Site Conditions Map (from Stormwater Management Plan)

Oxenford Quarry Stormwater Management Plan

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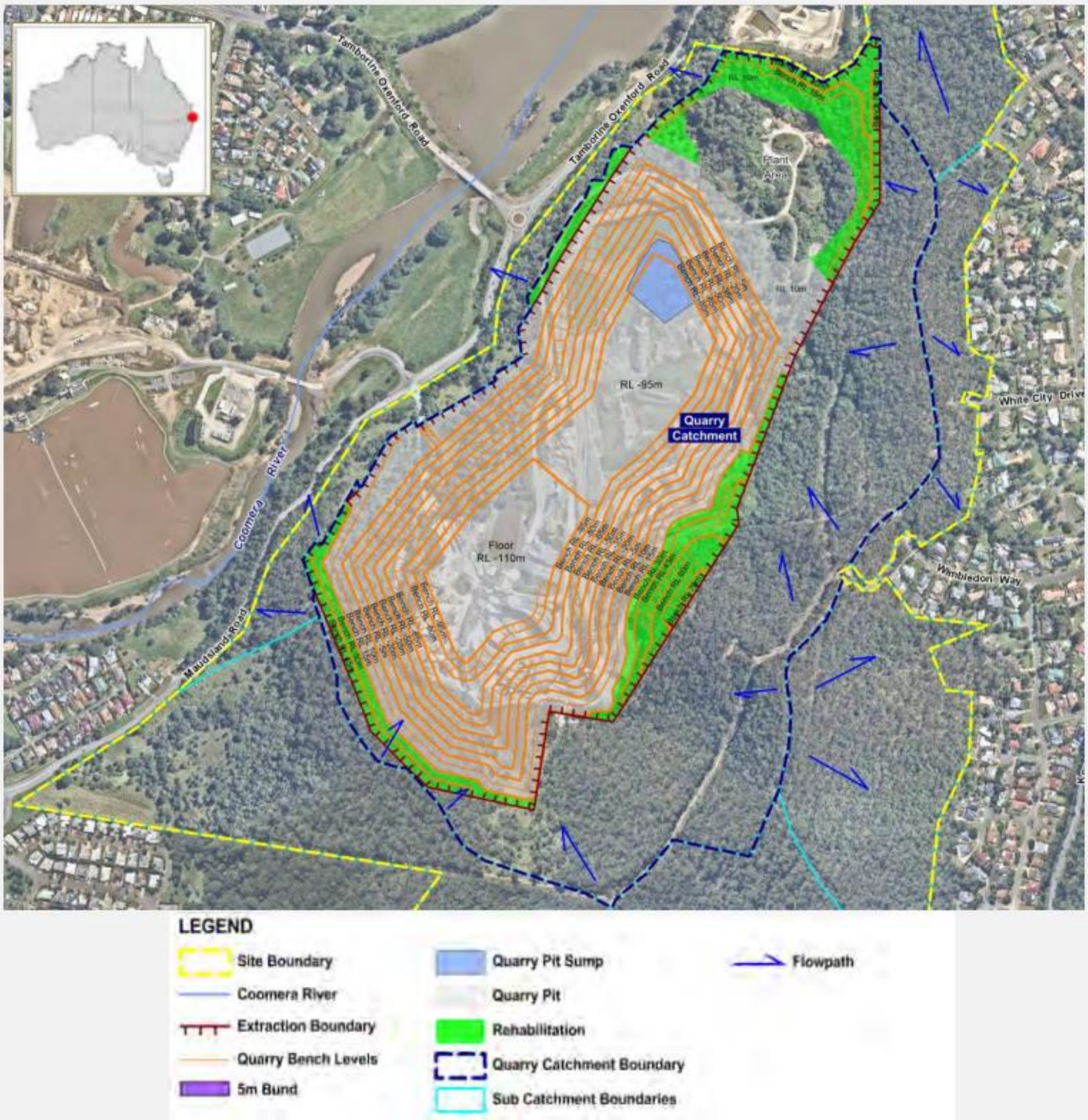
Ultimate Site Conditions - Nucrush Oxenford Quarry Daily Stormwater Management Plan

Figure 1: Map showing Ultimate Case Stormwater Management Strategy



Attachment A8 - Environmental Protection (Water Policy 2009 - Coomera River environmental values and water quality objectives)

1 Introduction

This document is made pursuant to the provisions of the *Environmental Protection (Water) Policy 2009* (the EPP [Water]), which is subordinate legislation under the *Environmental Protection Act 1994*. The EPP (Water) provides a framework for:

- identifying environmental values for Queensland waters, and deciding the water quality objectives to protect or enhance those environmental values; and
- including the identified environmental values and water quality objectives under Schedule 1 of the EPP (Water).

This document contains environmental values and water quality objectives for waters in the Coomera River catchment, and is listed under schedule 1 of the EPP (Water).

1.1 Waters to which this document applies

This document applies to fresh, estuarine and marine surface waters and ground waters draining the Coomera River catchment, as represented in the accompanying plan (WQ1462)[1]. These waters fall within the broader South Coast basin (basin 146)[2]. Waters covered by this document include:

- Coomera River;
- Coombabah Lake;
- Coombabah Creek;
- Saltwater Creek;
- Oaky Creek;
- other fresh and estuarine waters within the Coomera River catchment;
- tidal canals, constructed estuaries, marinas and boat harbours;
- southern Broadwater;
- wetlands; and
- ground waters.

The geographical extent of waters addressed by this document is shown in the plan (WQ1462), and is broadly:

- north to the boundary of the Coomera River catchment with the Pimpama River catchment;
- west to the boundary of the Coomera River catchment with the Albert River catchment;
- south to the boundary of the Coomera River catchment with the Nerang River catchment; and
- east to include the tidal canals and constructed estuaries in the lower Coomera River and the adjacent Broadwater.

Attachment A9 - Conceptual model during and after extraction, Section 7.2

7.2 Conceptual model during and after extraction

A conceptual groundwater-flow model was developed to examine the groundwater flow during and following extraction by constructing two detailed cross sections. These sections run from the Coomera River, across Oxenford-Tamborine Rd, to the edge of the proposed quarry pit. The conceptual model considers a fully excavated and dewatered quarry, and a quarry post operations and post dewatering (Figure 7.3 and Figure 7.4).

The quarry extension will extend the pit depth to -95 mAHD, inverting the current topographic relationship between the quarry and the Coomera River. The conceptual models presented in Figure 7.1 and Figure 7.2 show groundwater moving from the site and discharging to the Coomera River. At full excavation, and when the pit is fully dewatered, the hydraulic gradient will shift from east-to-west (currently towards the Coomera River), to west-to-east (towards the quarry) (Figure 7.3 and Figure 7.4). Groundwater flow within the shallow Quaternary alluvium may also change from draining towards the Coomera River, to partially draining towards the quarry. The degree to which the water is captured is a function of the hydraulic gradient between the Coomera River and the dewatered quarry and the secondary porosity and hydraulic conductivity in the Neranleigh-Fernvale Beds between the Coomera River and the quarry. The proposed quarry design does not intersect any Quaternary alluvium associated with the Coomera River (Figure 7.5).

The quarry will require dewatering to remain dry. Any water that flows to the quarry would be available for use on site and any excess likely discharged. The conceptual flow diagrams depicted in Figure 7.3 and Figure 7.4 show that the pit will capture groundwater flow from the eastern and southern portion of the project site. The future excavation will capture groundwater all the way to the current divide running along the topographic high.

Extending the quarry eastwards towards the ridge crest along the topographic high will influence the volume of water discharged on-site and available for discharge downgradient from the site. This will due principally to a decrease in the gradient between the groundwater in the Neranleigh-Fernvale Beds along the more elevated eastern portion of the site relative to the elevation of the current receptor, that is the Coomera River. This change (decline) in gradient will decrease the volume of water that will flow to the Coomera River.

This decline in gradient will however be temporary. Removal of the secondary porosity bedrock for the project will minimise and cease groundwater flowing from the shallow bedrock. Groundwater flow will shift to the deeper, less permeable bedrock as the secondary porosity bedrock is removed. The deeper, less permeable bedrock is more likely to yield lower groundwater discharge rates. Development of the quarry will result in changes to the groundwater flow direction.

Figure 7.3 and Figure 7.4 illustrates the groundwater flow conditions following completion of quarrying and dewatering activities. The post-quarrying conceptual model shows that the water level in the quarry void will likely stabilise to approximately the same elevation as the current Coomera River (that is ~0 mAHD). However, the elevation at which the quarry void water level stabilises will be governed by the surface water balance of the post-closure landscape and the elevation of a spill point within the final pit void. The groundwater table within the alluvium will likely recover back to a level that is comparable to current conditions (Figure 7.3 and Figure 7.4). Post-closure, the groundwater flow regime will recover approximately back to its pre-development configuration, with the quarry pit only capturing a small portion of the groundwater flow that would have otherwise discharged to the Coomera River under current conditions.

Attachment A10 - Council: 'Dewatering Management Guidelines', Table 4, Self-Assessable dewatering plan checklist

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Dewatering management plan guidelines

Table 4 – Self assessable dewatering plan checklist

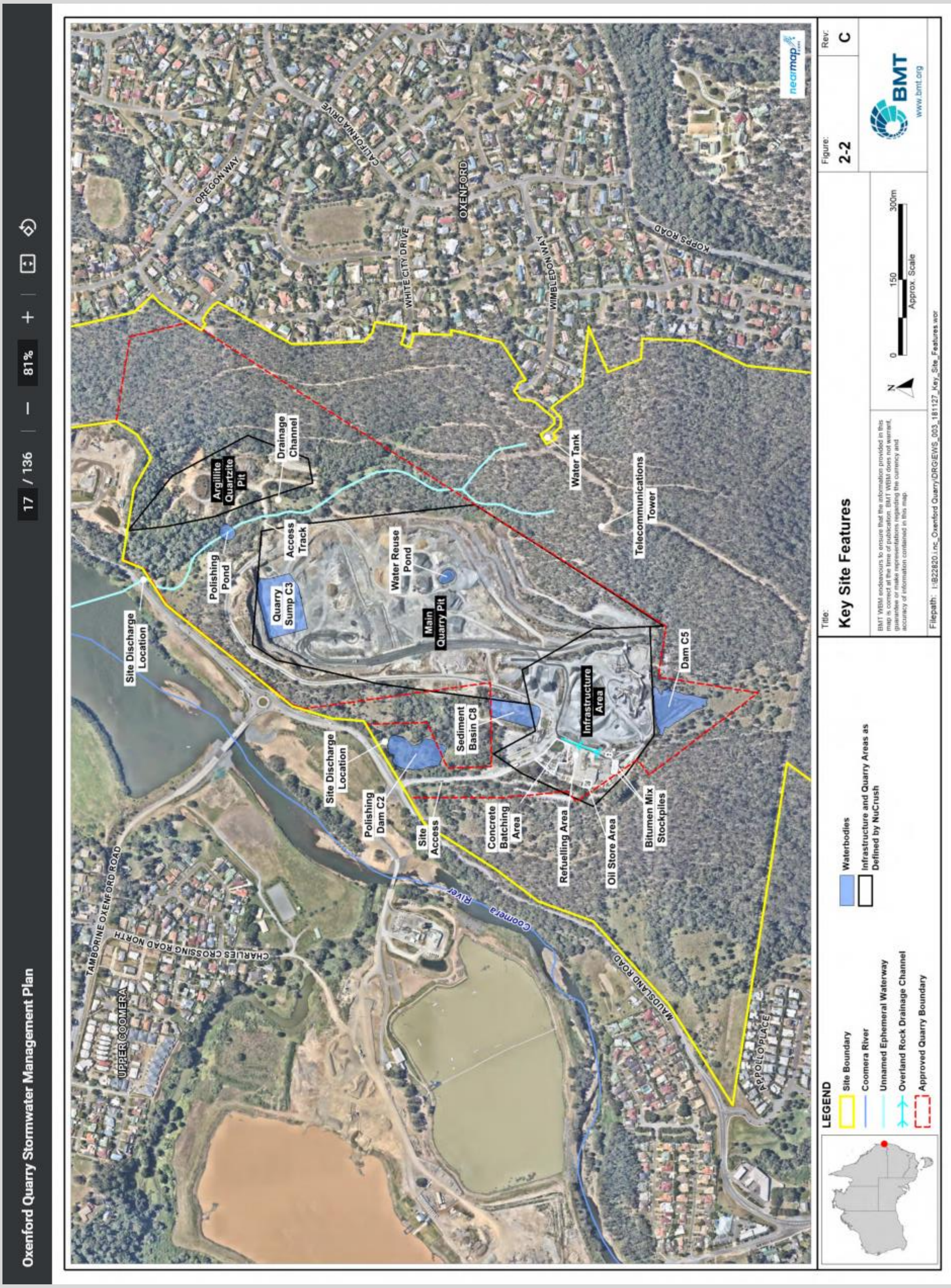
Has the DMP been prepared by suitably qualified person?			No		Yes	
Is the site area less than 800 square metres? If greater than 800 square metres, a detailed DMP is required to be submitted to Council of the City of Gold Coast (Council).			No		Yes	
Is the dewatering depth is less than one metre? If greater than one metre, a detailed DMP is required to be submitted to Council.			No		Yes	
Has the legal point of discharge been identified, (that is the capacity of the downstream system)?			No		Yes	
Does the site contain potential acid sulphate soil? If yes, a detailed DMP is required to be submitted to Council.			No		Yes	
Have geotechnical issues been addressed by a Registered Professional Engineer of Queensland (RPEQ) or an equivalent qualified professional? If no, the associated reports are required to be submitted to Council.						
1. Slope stability?	No		N/A		Yes	
2. Integrity of adjacent properties?	No		N/A		Yes	
3. Cone of influence and draw-down effects?	No		N/A		Yes	
Have measures been put in place to ensure *dewatering release criteria* by a suitable qualified person as defined in *Tables 1, 2 and 3*?			No		Yes	
Has noise, odour and dust issues been addressed in the *dewatering contingency plan*? If no, further approval by Council is required.			No		Yes	

The applicant is advised that if "*Yes*" has been answered to the above checklist, the following two certifications MUST be provided with any development application.

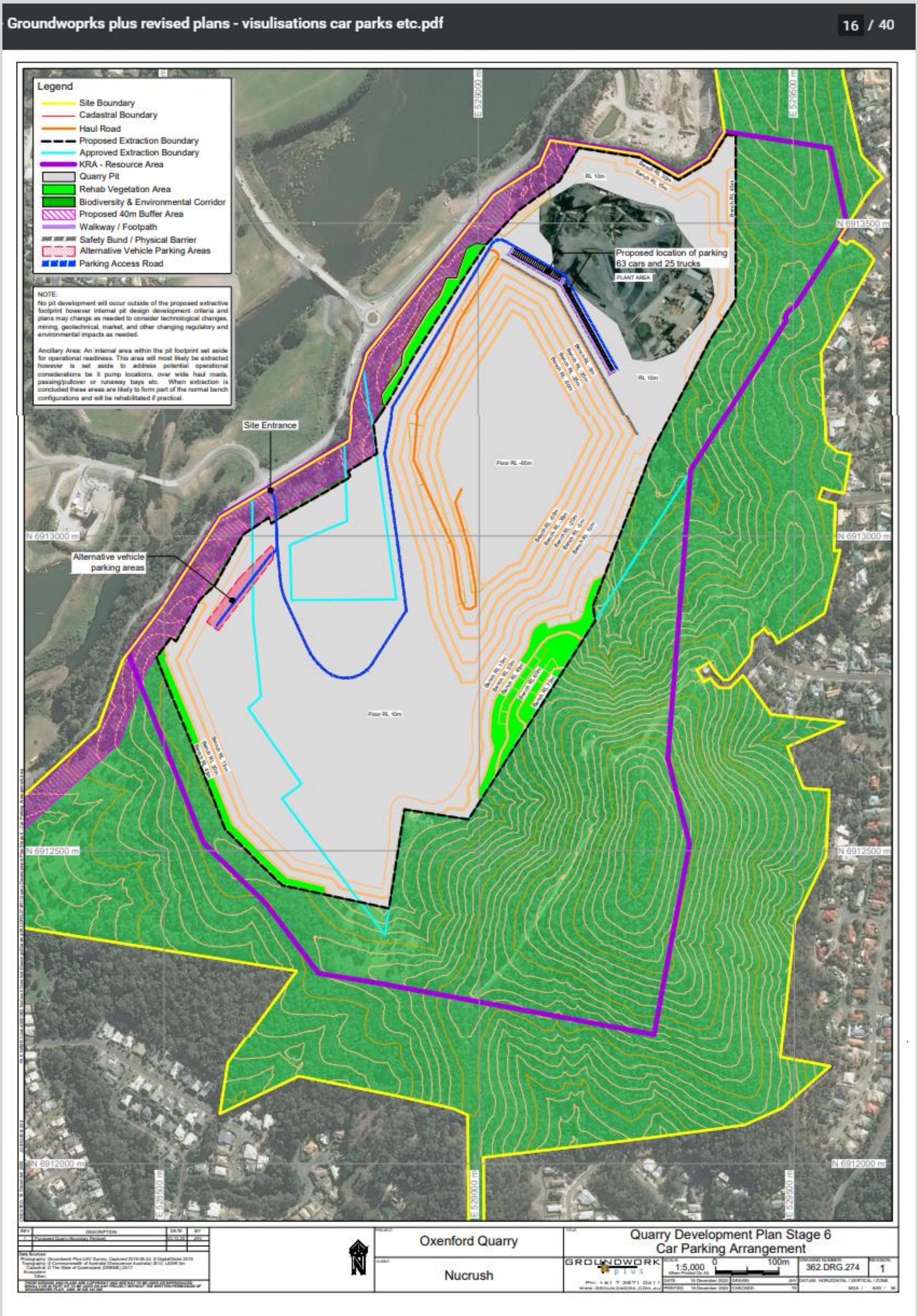
1. Provide certification *Appendix A* from a qualified scientist/engineer, specialising in dewatering that all the above requirements in *Part A* have been fulfilled and achieved. This certification is to be signed by a RPEQ.
2. Provide separate certification *Appendix B* that all geotechnical requirements have been addressed, including but not limited to slope stability, integrity, acid sulphate soils, cone of influence and draw-down effects.

The applicant shall also provide a monthly monitoring report in relation to dewatering discharge and measures in how it has met the release criteria *(Tables 1, 2 and 3)*. This report is to be submitted to Council for compliance and record keeping.

Attachment A11 - Existing Site Conditions Map (from Stormwater Management Plan)



Attachment A12 - Stage 6 - 'Sediment Basin C8', 'Polishing Dam C2', 'Dam C5' and 'Water Reuse Pond' engulfed in Extractive Footprint



Attachment B1 - Ultimate Site Conditions (from Stormwater Management Plan)

Oxenford Quarry Stormwater Management Plan 134 / 136

Ultimate Site Conditions - Nucrush Oxenford Quarry Daily Stormwater Management Plan

Protocol for Prior to the Onset of an Anticipated Rainfall Event

- Check water quality and levels in the Quarry Pit.
  - If water quality meets the maximum release limit of 50 mg/L and pH release limit of between 6.0-8.5 as identified in Table 1 adjacent and there is less than 119.7 ML of storage available in the Quarry Pit (40.5 ML of which is within the sump), undertake releases of water from the waterbody. Releases only to be undertaken if an increase in stored water resulting from a rainfall event will hinder quarrying activities.
  - If stormwater exceeds maximum release limit shown in Table 1, either wait until sediment settles or use a coagulant or flocculants to treat stormwater prior to discharge. The use of a coagulant or flocculants to treat stormwater in a sediment pond design must not cause environmental harm to receiving waters.
  - Record the final level of water in the quarry pit sump so that storage depth can be calculated after the event.
  - If releases from the site occur, undertake monitoring of the receiving environment monitoring locations for the parameters presented in Table 3. Report any identification of water quality non-compliance to the administering authority within 24 hours.

Protocol for During a Rainfall Event

- Check water quality and levels in the sump and follow the '*Waterbody Release Decision Support Tree*' shown in Figure 2.
  - If the volume exceeds the maximum storage limits, undertake dewatering as soon as practicable (but not more than 120 hours) following a rainfall event.
  - If the depth of water in the sump meets or exceeds the required storage volumes (identified in Table 2 below), release the water ensuring that discharged stormwater does not exceed the maximum release limits shown in Table 1.

Protocol for During a Rainfall Event

- Check water quality and levels in the sump and follow the '*Waterbody Release Decision Support Tree*' shown in Figure 2.
  - If the volume exceeds the maximum storage limits, undertake dewatering as soon as practicable (but not more than 120 hours) following a rainfall event.
  - If the depth of water in the sump meets or exceeds the required storage volumes (identified in Table 2 below), release the water ensuring that discharged stormwater does not exceed the maximum release limits shown in Table 1.

Table 2: Required Storage prior to storm event

Waterbody	Volume (m^3)	Depth (m)
Quarry Pit Sump	40542	5.3
Quarry Pit	79182	0.4*

**Assuming uniform depth over quarry pit floor. Alternatively, a sump could be constructed of equivalent volume*

  - The use of a coagulant or flocculants to treat stormwater in a sedimentation basin design must not cause environmental harm to receiving waters.

Protocol for After a Rainfall Event

- Follow the same procedure as noted above for '*Protocol for During a Rainfall Event*'.
  - Ensure that storage volumes can be achieved by 1st November (for the wet season).
  - Ensure that this storage volume is available throughout the wet season (November to April inclusive).
- Check that erosion and sediment control measures are installed correctly, accumulated sediment is removed, and measures are maintained in effective working order.
- Within 24 hours of becoming aware of a non-compliance, report to the administering authority.

Table 1: Stormwater Discharge Objectives and Monitoring frequency

Discharge Location	Parameter	Maximum release limit	Monitoring frequency
Quarry Pit Sump	*Suspended Solids*	*50 mg/L*[1]	*Minimum of upon release*[1]
Quarry Pit Sump	*pH*	*6 – 8.5 (range)*[2]	*Minimum of upon release*[1]

[1]Adopted from the *Stormwater guideline - Environmentally relevant activities* (DEHP 2016b)
[2] Adopted from the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000)

Attachment C1 - Environmental Protection (Water Policy 2009 - Coomera River environmental values and water quality objectives)

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Environmental Protection (Water) Policy 2009

Coomera River environmental values and water quality objectives

Basin No. 146 (part), including all tributaries of the Coomera River

July 2010

Table 2 Water quality objectives to protect aquatic ecosystem environmental value (refer to Plan WQ1462 for location of waters)

Water area/type (refer Plan WQ1462)	Management intent (level of protection)	Water quality objectives to protect aquatic ecosystem EV [1-11]
Lowland freshwater (comprising lowland streams, wallum/tannin-stained streams and coastal streams)	Aquatic ecosystem – moderately disturbed	• turbidity: <6 NTU • suspended solids: <8 mg/L • chlorophyll a: <4 µg/L • total nitrogen: <400 µg/L • oxidised N: <80 µg/L • ammonia N: <20 µg/L • organic N: <320 µg/L • total phosphorus: <50 µg/L • filterable reactive phosphorus (FRP): <20 µg/L • dissolved oxygen: (20th—>80th percentile) % saturation 85% – 110% • pH: 6.5 – 8.0 Coombabah Creek ▪ turbidity:<30 NTU ▪ chlorophyll a: <5 µg/L ▪ total nitrogen: 500 µg/L ▪ total phosphorus; 50 µg/L ▪ dissolved oxygen: >6 mg/L ▪ pH range: 6.5 - 9 temperature (single measurement) <2 degrees Celsius between stations

Agency interest: Water Schedule C	
Condition	**Condition**
C1	Other than as permitted within this environmental authority, contaminants must not be released to any **waters**.
C2	**Stormwater that is not contaminated by the activity** must be diverted away from areas where it may become contaminated by the activity. Stormwater that is contaminated by the activity must be directed to a treatment system.
C3	Erosion and sediment control measures must be implemented and maintained to minimise erosion and the release of sediment.
C4	Contaminants must only be released to surface waters in accordance with *Table 1: Stormwater discharge (event flow) monitoring parameters, mandatory discharge limits and monitoring frequency*. Monitoring must occur in accordance with *Table 2: Stormwater discharge (event flow) monitoring parameters, mandatory discharge limits and monitoring frequency.*

Table 2: Stormwater discharge (event flow) monitoring parameters, mandatory discharge limits and monitoring frequency

Monitoring site			Parameter	Maximum release limit	Monitoring frequency
Reference	Easting	Northing			
Discharge North	529079.343	6913586.952	Suspended Solids	50 mg/L[1]	Minimum of upon release[1]
Discharge South	528759.541	6913112.602			
Discharge North	529079.343	6913586.952	pH	6 – 8.5 (range)[2]	Minimum of upon release[1]
Discharge South	528759.541	6913112.602			
Discharge North	529079.343	6913586.952	Electrical Conductivity	520 µS	Minimum of upon release[1]
Discharge South	528759.541	6913112.602			
Upstream 1	528680.433	6913326.053	Total suspended solids and pH	N/A (monitoring only, not discharge site)	Minimum of upon release[1]
Downstream 1	528772.658	6914072.434			
Downstream 2	528495.650	6914537.878			

[1] Adopted from the *Guideline – Stormwater and environmentally relevant activities* (DES, 2019)

[2] Adopted from the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000)

C5	The release to waters permitted under condition C4 must not contain any other properties at a concentration capable of causing environmental harm.
C6	The release to waters permitted under condition C4 must not produce any slick or other visible evidence of oil or grease, scum, litter or other visually objectionable matter.
C7	Chemicals and fuels in containers of greater than 15 litres must be stored within a **secondary containment system**.

Attachment D1 - Dewatering Management Plan - Acid sulphate soils (ASS)

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4.2.2 Acid sulphate soils (ASS)

The occurrence of ASS in coastal areas is a common phenomenon. ASS contains iron sulphides, mostly pyrites and when they are exposed to the air they can generate large amounts of sulphuric acid. When iron sulphides have been exposed to oxygen, they become very acidic, that is with a pH less than or equal to four and can contaminate groundwater.

In the past, large scale drainage of coastal flood plains for flood mitigation, urban expansion and agriculture has exposed significant areas of ASS. This disturbance has generated acidic water, through the generation of sulphuric acid, together with elevated concentrations of typically aluminium, iron and arsenic. The discharge of acidic 'slugs' of water into streams, rivers or estuaries have resulted in major fish kills in rivers along the Queensland coast.

Attachment D2 - City Plan - Acid sulphate overlay

Attachment D3 - Main application - Acid sulphates

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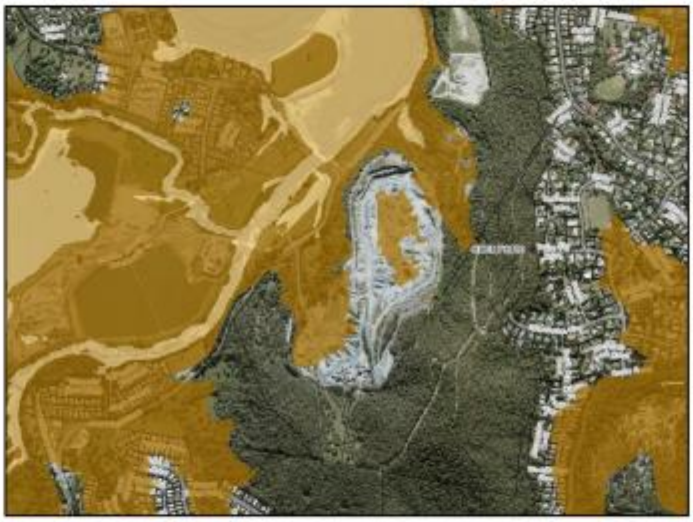
6.6 Overlay Maps

The subject sites have been identified on the following Overlay Maps within the Planning Scheme:

6.6.1 Acid sulfate soils

The subject sites are identified as being affected by land at below 5m and 20m AHD.



The occurrence of acid sulfate soils has been addressed within the Groundwater Impact Statement prepared by Australasian Groundwater and Environmental Consultants Pty Ltd.

Figure 9 – Excerpt from City Plan overlay mapping (Acid Sulfate Soils)

Attachment D4 - Groundwater Impact Assessment - Acid sulphates

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6.2.6 Rock chip sampling

Sulphide minerals and sulphide-bearing carbonaceous rocks have been identified to occur within the Neranleigh-Fernvale Beds. Weathering of sulphide minerals when exposed to moisture and oxygen has the potential to result in acidic groundwater quality. Sulphide-bearing minerals exposed to oxygen can potentially lead to acid mine drainage and acid sulphate soils.

Attachment D5 - Groundwater Impact Assessment - Acid sulphates contd.

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9 Summary and conclusions

There is potential to expose sulphur-bearing rocks within the quarry walls, however testing to date indicates that the sulphur was detected in minor concentrations in the weathered to fresh Neranleigh-Fernvale Beds samples obtained from the monitoring bores. Sulphur was reported in the rock chip samples collected from the bedrock penetrating bores at less than 0.04% at MB01, MB-03 and MB-04. Based on these laboratory test results, there is assessed to be low potential for acid rock drainage on site. The understanding is that the water level in the quarry void will recover back to an elevation that is consistent with the Coomera River post closure. Additionally, the water level recovery within the proposed development will saturate the exposed pit walls thereby limiting the potential for acid generation, should it occur.

Attachment D6 - Bogle-Chandler case

en.wikipedia.org/wiki/Bogle–Chandler_case

Bogle–Chandler case

From Wikipedia

The **Bogle–Chandler case** refers to the mysterious deaths of Gilbert Bogle and Margaret Chandler on the banks of the Lane Cove River in Sydney, Australia on 1 January 1963. The case became famous because of the circumstances in which the bodies were found and because the cause of death could not be established. In 2006 a filmmaker discovered evidence to suggest the cause of death was hydrogen sulphide gas. In the early hours of 1 January an eruption of gas from the polluted river bed may have occurred, causing the noxious fumes to pool in deadly quantities in the grove.

Hydrogen sulphide hypothesis

Main article: Hydrogen sulfide § Toxicity

Peter Butt's documentary *Who Killed Dr Bogle and Mrs Chandler?*, which was shown on the ABC in September 2006, suggests that the two deaths may have been caused by accidental hydrogen sulphide poisoning. Supporting evidence for this theory includes:

- In the 1940s and 50s, the local council received scores of letters from residents complaining of the smell of "rotten eggs" coming from the river, causing nausea and breathing difficulties. There was also a series of massive fish kills. With the residents facing permanent evacuation, the Maritime Services Board conducted a year-long study of the river. It found that the bottom muds were saturated to a depth of 50 centimetres (20 in) with hydrogen sulphide and that very large and rapid releases of hydrogen sulphide gas could occur from a section of the river impounded by the weir. The source was identified as a factory that had pumped its waste into the river since the 1890s. The worst affected location was within a quarter-mile of the weir, exactly where Bogle and Chandler died.
- On New Year's Day, police divers reported a great disturbance of black river-bed sediment. Although their search of the river was then delayed for 11 days, visibility remained poor.
- The very cool, still weather conditions at time of death would have allowed high concentrations of gas to accumulate.
- The location where the couple had sought privacy was at water-level in a slight depression, surrounded by a bank and mangroves, typical of where the heavier-than-air hydrogen sulphide would accumulate in calm conditions.
- Slight skin abrasions, shoe and knee prints suggest both victims were disorientated and had tried to leave the depression before collapsing.
- Both victims had been unable to correct their clothing, suggesting that the poison struck them down without warning, at the same time and with great speed.
- A pathology report, suppressed by the coroner at the time, revealed semen on Bogle's body and coat. This suggests sex was taking place and that both victims could not have been suffering earlier effects of poisoning before they were suddenly struck down.
- Most importantly, a purple discoloration was seen in the victims' blood which is characteristic of hydrogen sulphide poisoning (This phenomenon is not related to other colour changes in the blood such as cyanosis, or methaemoglobin/methemoglobinemia).
- The toxicologist who tested the victims' tissue samples claimed that had he known about the semen, it would have eliminated the majority of poisons he had tested for. This knowledge he claimed, along with the hint provided by the purple colouration of the blood, might have led him to suspect that the poison was hydrogen sulphide.
- A British forensic scientist contacted by the police suggested, after reading the case report, that the victims had been gassed.

With hydrogen sulphide (H_2S) at a level of 1 ppm, a victim will barely notice a bad smell; at 30+ ppm H_2S smells like rotten eggs but at 50-100 ppm it smells cloyingly sweet. At a level above 100 ppm, H_2S paralyses the olfactory nerve (sense of smell) almost instantly and, as the gas is effectively invisible, it would not be noticed despite it leading to vomiting and breathlessness. At 200 ppm respiratory failure occurs within seconds. At 1000 ppm a single breath causes instant cardiac arrest. Although no levels were measured at the river, there is anecdotal evidence of levels of up to 100 ppm being common in the area on still days. As H_2S is heavier than air, the gas tends to pool in hollows on calm days and needs a breeze in order to dissipate. If it is assumed that there was little or no gas around when Bogle and Chandler arrived and there was an eruption of gas upstream, the gas would seek the low points along the bank and at 100 - 150 ppm would be undetectable. The couple could remain for some time before feeling breathless and nauseous but would smell and see nothing to explain this. They would have become confused as a result of H_2S binding with haemoglobin in the blood and reducing its oxygen-carrying capacity, making an escape difficult.

Conclusions

It was the investigating detectives' belief that the victims' bodies were covered not by a murderer, but by a 'third person' who covered them for modesty after discovering the bodies. An initial suspect was a voyeur who contacted police twice, using different names. After interrogation, he was quickly dismissed. The prime suspect was a greyhound trainer who slipped his dogs daily on a path that passed the site where the bodies were found. He came forward only after his car was identified and, when interviewed by police, claimed to have used a different path that day and denied seeing the bodies. His obituary in 1977, however, claimed he had been the first to find the bodies. The theory regarding a motive of modesty for covering the bodies was supported by claims that the man was known to be a prude.

A woman who was a child at the time came forward at the time of the film's screening. She claimed she had found Mrs Chandler's handbag 4 km away in bushland between three houses. One of those houses was discovered to belong to a relative of the greyhound trainer and was near to his own home. A veteran greyhound racing steward also came forward and said that he received a call from the suspect soon after the deaths, during which he admitted that he had come across the bodies.[7] In August 2016, author Peter Butt published details of an alleged 1965 conversation between a Canberra psychologist and a woman who had claimed to be an eyewitness of the deaths. The parties were not identified but their claimed evidence appeared generally consistent with original "crime scene" data and a conclusion that the deaths were caused by hydrogen sulphide gas.[8]

Attachment D7 - Dewatering Management Plan - Geotechnical Issues

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4.2.3 Geotechnical issues

The DMP should also include an assessment of the potential geotechnical and hydrological impacts of groundwater extraction. It should demonstrate that nearby structures and infrastructure will remain stable during and after dewatering. Consideration of groundwater recharge should be given. This may require groundwater modelling. Details of dewatering volume, rate, duration, equipment and procedures must be included in the DMP.

A geotechnical investigation shall be undertaken to determine the groundwater level and the absorption rate for all sites. The lowest value obtained from the geotechnical investigation shall be used in the absorption calculations. The geotechnical investigation shall report the meteorological details of the test day, the general site condition and the level of the watertable applicable at the site.

The report must identify and address the overall potential adverse effects of dewatering on the stability and integrity of any adjacent property or structure. The report shall assess the radius of influence of the draw-down cone on potential settlements and lateral movements of any adjacent structures, properties or services.

A minimum of two boreholes per site is required. One of the boreholes shall be within the proposed absorption area and others in various locations throughout the site. For developments where the gross site area (GSA) is greater than or equal to 1000 square metres, an additional borehole is required for every 400 square metres or part thereof over 1000 square metres. For example, a site with GSA of 1450 square metres, four boreholes are required. Copies of the borehole logs are to be attached to the report. Unless groundwater is encountered, borehole depth shall be a minimum of four metres from the existing ground level.

Attachment D8 - Stormwater Management Plan - 'C.5.1 Model Assumptions' best case scenario

Oxenford Quarry Stormwater Man... 54 / 136 80%

C.5.1 Model Assumptions

To present a water balance model considered to represent the site (in lieu of comprehensive information), certain assumptions have been applied. These are outlined below:

- It has been assumed that quarry operations occur for six days per week, i.e. from Monday to Saturday inclusive.
- No increase in water use demand (with the exception of the 3 concrete production use scenarios presented) is anticipated during the ultimate site conditions.
- Capacity is constantly provided within the concrete batching area to cater for the 'first flush' event in accordance with exiting approvals.
- All heights presented in reduced level (RL) m Australian Height Datum (AHD) are best estimates based on data provided.
- The capacity of the waterbodies supplied in the concrete batching area are amalgamated for the purposes of this water balance model, as it is assumed that both waterbodies are used for concrete production water use.
- As suggested in the Groundwater Impact Assessment – Oxenford Quarry Extractive Boundary Realignment Project (G1913) (AGE 2018) and supported by *G1913A: Oxenford Quarry Response* (AGE 2019):

  "The inflow predictions show that the inflows are dominated by groundwater entering through the pit floor. The inflows predicted by the low bedrock conductivity scenario (total of 4 L/s or 130 ML/yr) are considered more likely to be representative of the magnitude of inflows to be observed during operations."

  Based off this statement, the groundwater inflow as anticipated at being 4 L/s (345.6 m^3/d) for the Quarry Pit Sump C3 for the ultimate site conditions.

  Further advice given in *G1913A: Oxenford Quarry Response* (AGE 2019), identifies that the groundwater inflow for the existing site conditions is 0 L/s.

- The two categories of 'water leaving the site' from the Quarry Pit Sump C3 have been classified as "Discharge Offsite" and "Pumped from Sump", classified below:
  - ***Discharge Offsite*** – This parameter is based on the water usage details as identified in Table 2-1. This is noted as approximately 90.7 ML/year. Water is discharged using this parameter only if there is enough water for the remainder of the onsite activities.
  - ***Pumped from Sump*** – this parameter is engaged when the volume of water in the sump is greater than the nominated maximum volume (see Table C-3). If this occurs, the water is pumped out at a rate of 6624 m^3/day (that is, approximately 80 L/sec for 24 hrs/day until max volume is once again received).

Reduction in 'water leaving the site' is expected to be observed due to increased demand for increased concrete production. This reduction will be primarily observed in the "Pumped from Sump" parameter.

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BMT

Attachment D9 - 'Groundwater Impact Assessment' - showing best case and worst case scenarios

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The inflows from Zone 1, the pit walls, varies from 15.1 ML/yr to 72.4 ML/yr when the permeability of the bedrock is varied from 0.001 m/d to 0.01 m/d. The 0.001 m/d value represents the anticipated permeability of the rock at depth, due in large part to the closure of fractures from the overburden pressure. The 0.01 m/d value represents the permeability of the bedrock as measured in the monitoring bores completed for this project.

The inflows from Zone 2, the pit floor, varies from 113.6 ML/yr to 359.2 ML/yr when the permeability of the bedrock is varied from 0.0001 m/d to 0.001 m/d. The 0.0001 m/d value represents low permeability rock at depth, due in large part to the closure of fractures from the overburden pressure. The 0.001 m/d value represents the highest probable floor permeability.

The inflow predictions show that the inflows are predominately from groundwater entering through the pit floor where the Neranleigh_Fernvale Beds are saturated. The inflows predicted by the low bedrock conductivity scenario (i.e. 4 L/s or 130 ML/yr) are considered more likely to be representative of the magnitude of inflows to be observed during operations.

Table 7.2 Analytical results

Scenario	Zone	K_{h1} (m/day) / K_{h2} (m/day)	Radius of influence (m)	Q (L/s)	Q (ML/yr)	Total (ML/yr)
Low bedrock conductivity	1	0.001	700	0.5	15.1	130 (best case)
	2	0.0001	700	3.6	113.6	
High bedrock conductivity	1	0.01	1,418	2.3	72.4	186
	2	0.0001	1,418	3.6	113.6	
High bedrock wall and floor conductivity	1	0.01	1,418	2.3	72.4	432 (worst case)
	2	0.001	1,418	11.4	359.2	

Attachment D10 - 'Groundwater Impact Assessment' - Borehole details

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6.2.6 Rock chip sampling

Sulphide minerals and sulphide-bearing carbonaceous rocks have been identified to occur within the Neranleigh-Fernvale Beds. Weathering of sulphide minerals when exposed to moisture and oxygen has the potential to result in acidic groundwater quality. Sulphide-bearing minerals exposed to oxygen can potentially lead to acid mine drainage and acid sulphate soils.

To assist in the identification of sulphide-bearing strata and to assess the potential for acid generation during the process of the proposed development, the rock chip (drill) cuttings were examined at 1 m intervals in all bore holes. A single trace of pyrite was identified in the drill cuttings at 25 mbgl at MB-01 and at 7 mbgl at MB-03.

In addition to the visual examination of the drill cuttings, a single sample was collected from each bore that intersected bedrock. The samples were submitted ALS under chain-of-custody for total sulphur analysis. The sampling results are presented in Table 6.3 and in the laboratory sheets attached in Appendix E.

Table 6.3 Soil sampling results

Parameter	Units	LOR#	MB-01	MB-03	MB-04d
Date sampled	-	-	27/02/2018	05/03/2018	06/03/2018
Sample depth	mbgl	-	28	8	9
Lithology	-	-	Slightly weathered to fresh Neranleigh-Fernvale Beds	Weathered Neranleigh-Fernvale Beds	Slightly weathered Neranleigh-Fernvale Beds
Sulphur - Total as S (LECO)	%	0.01	0.02	0.03	0.04

The rock chip sample collected from MB-01 was taken above the water table and the rock chip samples from MB-03 and MB-04d were collected from below the stabilised groundwater level in the bore (although the drill cuttings were dry at the time of collection). Sulphur is reported in percent and was detected in minor concentrations in the soil samples obtained from MB-03 and MB-04.

Attachment D11 - Dewatering Management Plan - Noise and vibration issues

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Dewatering management plan guidelines

4.2.4 Noise and vibration issues

The DMP should detail the type and location of equipment to be used and the duration of use. Potential noise/vibration issues and potential sensitive receivers should be identified within the DMP. It must detail any mitigation measures and how they will prevent any noise issues.

Treatment methods for the reduction of noise emitted from the mechanical plant involved in the dewatering process include, but are not limited to methods such as:

- installation of a fully acoustically attenuated enclosure around noise generating equipment, (for example, pumps and generators)
- the use of sound attenuating material such as hay bales to surround the plant
- installation and maintenance of mufflers and suitable exhaust systems for all noise generating plant and equipment
- operation of particularly noisy equipment within restricted time periods 7am – 6pm
- restriction of operating hours of the offending plant

All noise emitted from the dewatering process is to comply with the provisions of the *Environmental Protection Act 1994*.

Attachment D12 - Dewatering Management Plan - Odour issues

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4.2.5 Odour issues

The presence of potential odour-causing gas hydrogen sulphide (H_2S) should be detailed in the DMP. The DMP should identify potential mitigation measures and demonstrate they will be effective. The proposed treatment methods for the dewatering process are required to be included within the DMP. The proximity of the residents should be considered when undertaking dewatering activities.

The treatment of reducing odours resulting from dewatering activities varies in complexity and effectiveness. Options range from simple methods such as placing the discharge point directly into stormwater gullies or traps, to more complex ones such as installing a surge tank with an activated carbon filter to arrest odours. The intensity of the odour arising from the dewatering process will determine the extent of the treatment method required to reduce the odour. The odour threshold for H_2S is 0.08 – 0.2ppm (parts per million), *IUE Commission Cape Town, 2001*.

Attachment D13 - Dewatering Management Plan - Operational and monitoring requirements

Dewatering Management Guidelines 8 / 13 — 125% +

4.3 Operational and monitoring requirements

Assessment during the design phase will assist in the determination of the most appropriate operational methodology, tanked or sump and pump, and the corresponding monitoring method. This will assist in compliance with legislative requirements and addressing potential impacts on the completed structure after construction.

To avoid any environmental harm where water contains significant suspended solids and other harmful chemical and toxicants, the proponent should install and operate a settling basin/balance tank with a capacity to contain a minimum of two hours prior to release to the environment, depending on sediment characteristics. This is necessary to remove flocculating matters and also allow aeration and dissolved iron to precipitate and settle. It may be also necessary to apply chemical dosing such as lime to raise pH, metal salt to enhance removal of toxicants.

Where it is not possible due to lack of space, the proponent must explore mobile tanks or other forms of solids reduction such as filtration or chemical coagulation.

To ensure that any potential environmental harm is managed correctly and to enable the proponent to demonstrate compliance, regular monitoring of water quality parameters must continue in a manner advised by professionals. The monitoring regime will depend on the wastewater quality, water treatment methods and point of discharge. The details of monitoring plans should be contained in the DMP, including:

- water quality parameters to be monitored
- frequency of monitoring during dewatering
- monitoring techniques and equipment
- availability of monitoring records

The operator should develop and maintain a program that monitors, records and reports on the effects of dewatering. The program should include:

- a record of the quantity of water discharge rate
- regular visual inspection of the dewatering system to confirm its integrity and note impacts at the point of release
- suitable monitoring facilities, (for example, bores to record the effects of pumping on the water table)
- relevant water quality analysis of the water discharged and the receiving environment
- periodic investigations of the impacts on vegetation and water resources
- photographic records of vegetation and other sensitive parameters should be included as appropriate

It is important that during construction and operational phases of a project, the existing groundwater regime is maintained as close as possible to the pre-development condition. In this regard, consideration should be given to the level and flow attributes of the groundwater regime, through appropriate monitoring. In general a minimum monthly for static water levels via piezometers in the surrounding watertable is required to assess draw-down effects.

4.4 Dewatering contingency plan

A key feature of the DMP is that it will identify risks at the planning stage before construction begins. Where problems are unlikely and are not accounted for in the general dewatering procedures, contingency plans must be prepared. Triggers that activate the contingency plans should also be detailed within the DMP. Contingency plans within the DMP are binding through conditions of approval. The DMP should identify management actions for scenarios including but not limited to the following:

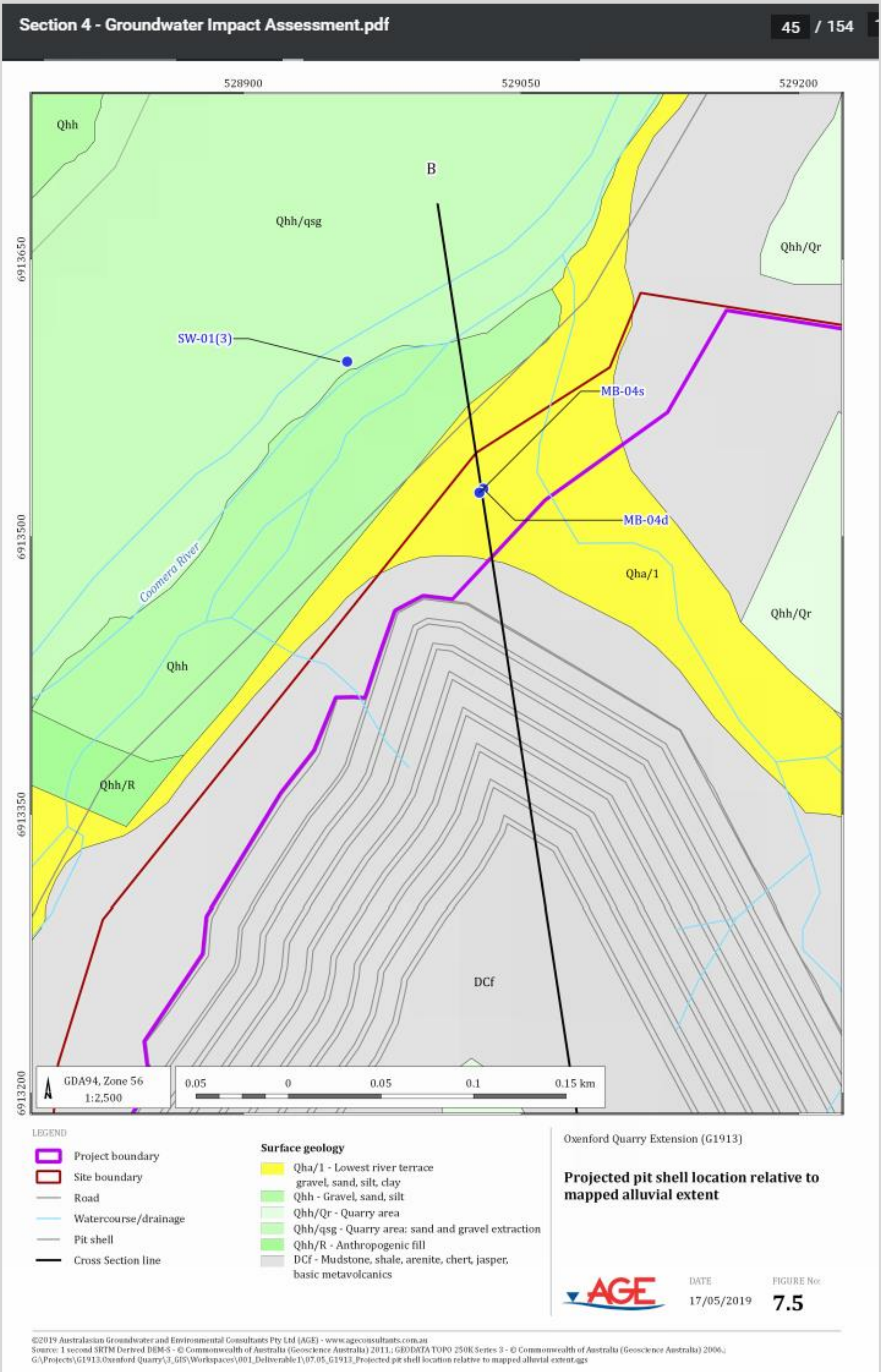
- noise complaints
- odour complaints
- complaints about appearance of wastewater discharge
- unexpected contaminants found during monitoring
- failure of treatment methods
- failure of pumping systems
- groundwater seepage into construction area
- heavy rainfall
- impacts on the stability of adjacent structures
- release of any toxicant materials outside the trigger values in *Tables 1, 2 and 3*

Examples of contingency actions may include:

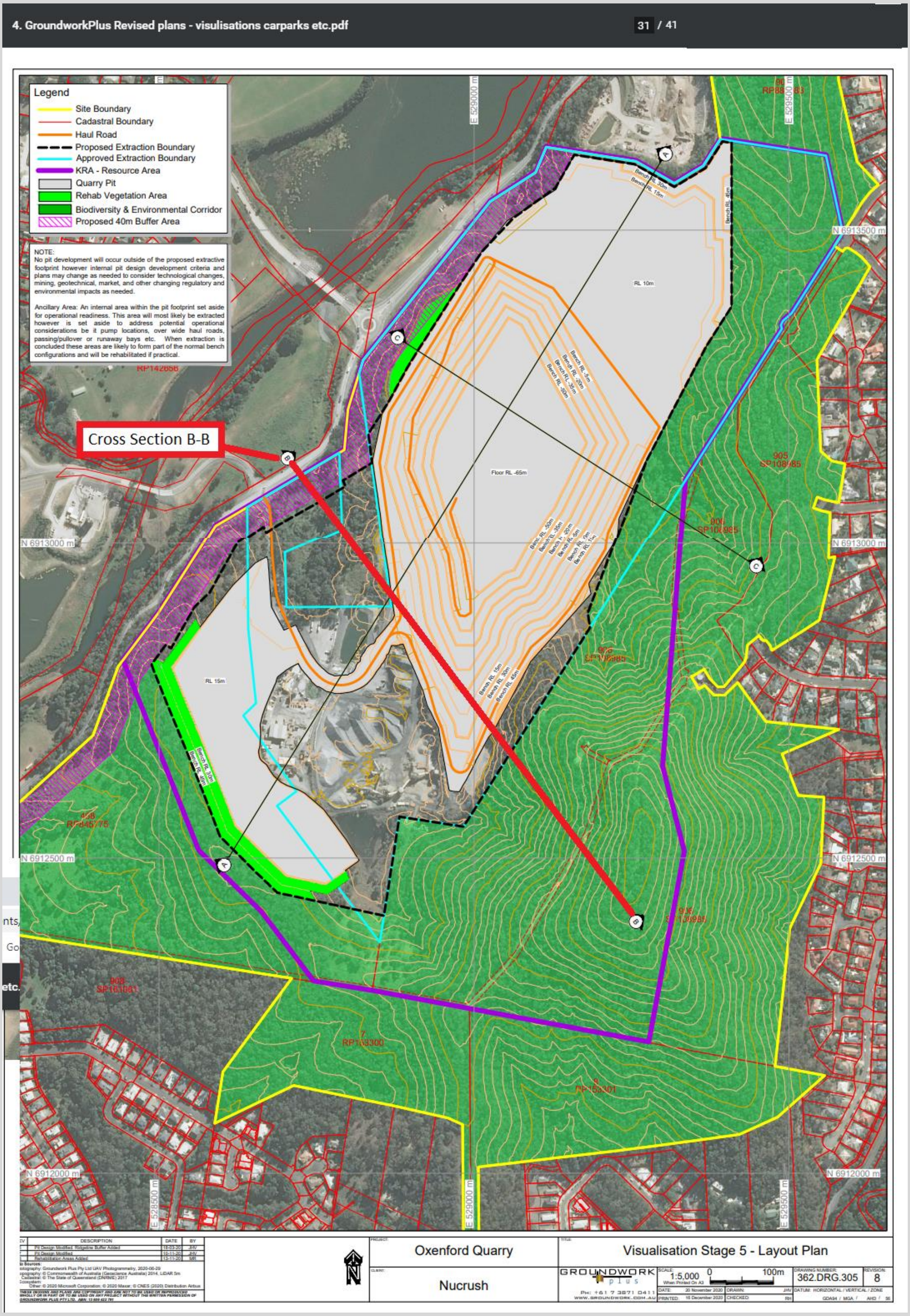
- consulting a professional
- stopping operations
- changing methods or equipment
- additional monitoring

Contingency plans with a higher level of detail and foresight prove more useful if the situation arises.

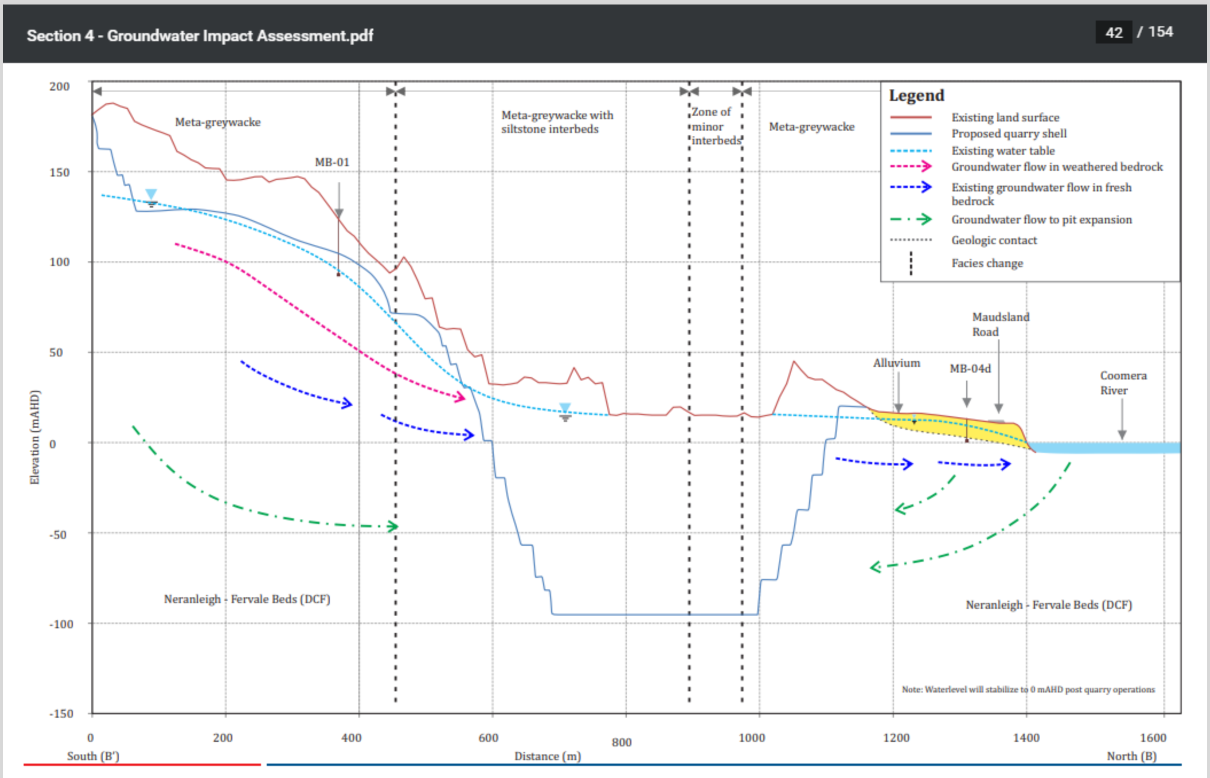
Attachment E1 - Quaternary Alluvium



Attachment E2 - Visualisation Stage 5



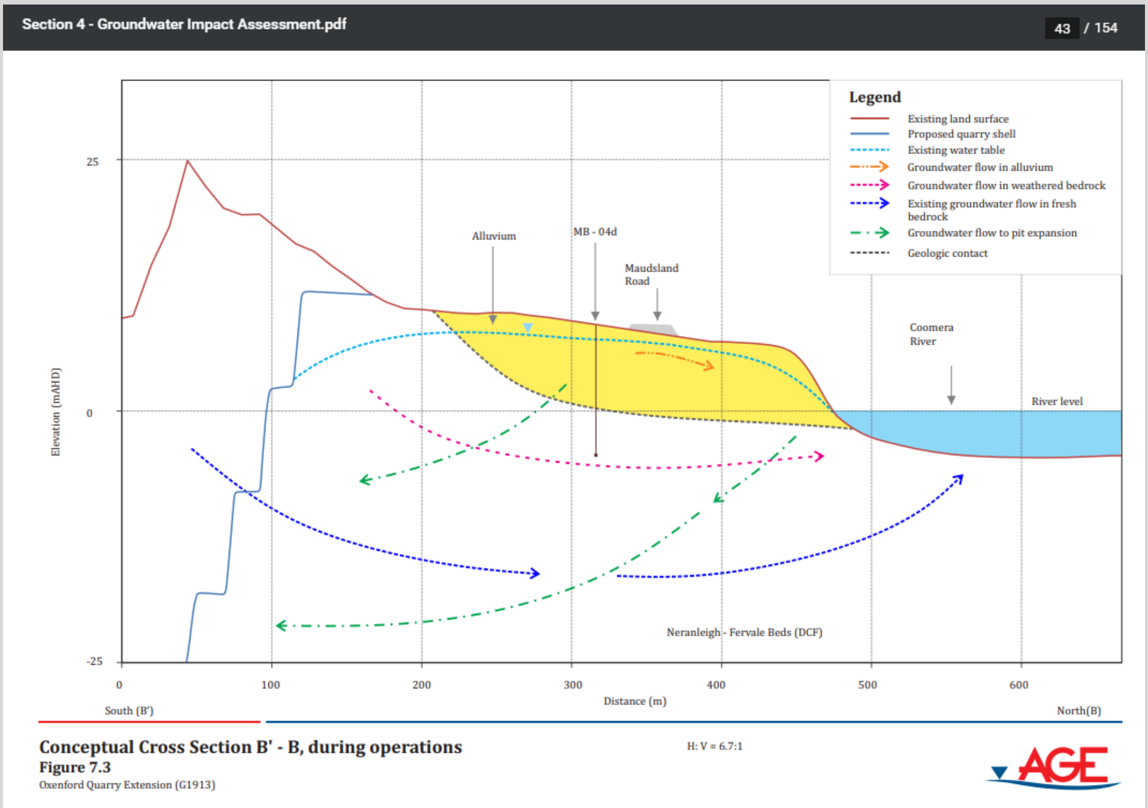
Attachment G1 - Groundwater Impact Assessment - Conceptual Cross Section Fig 7.2



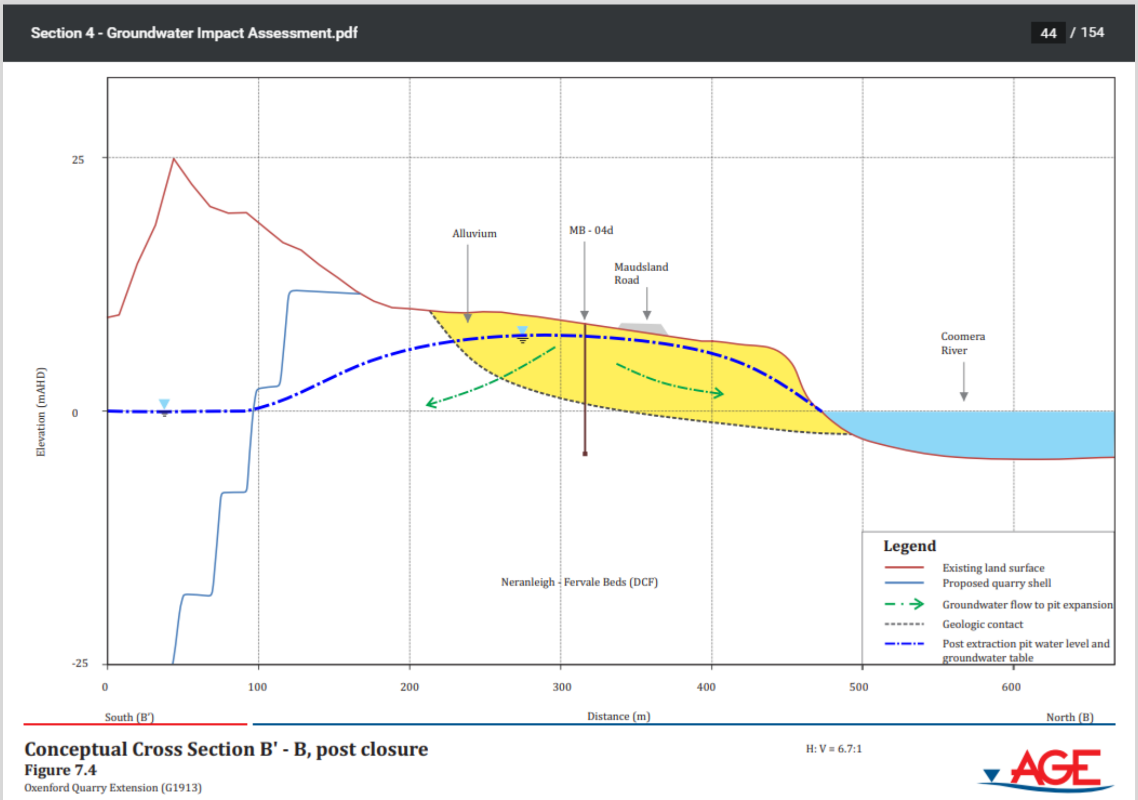
Conceptual Cross Section B' - B, MB-04 to MB-01
Figure 7.2
Oxenford Quarry Extension (G1913)

Attachment G2 - Google Maps representation of water table height

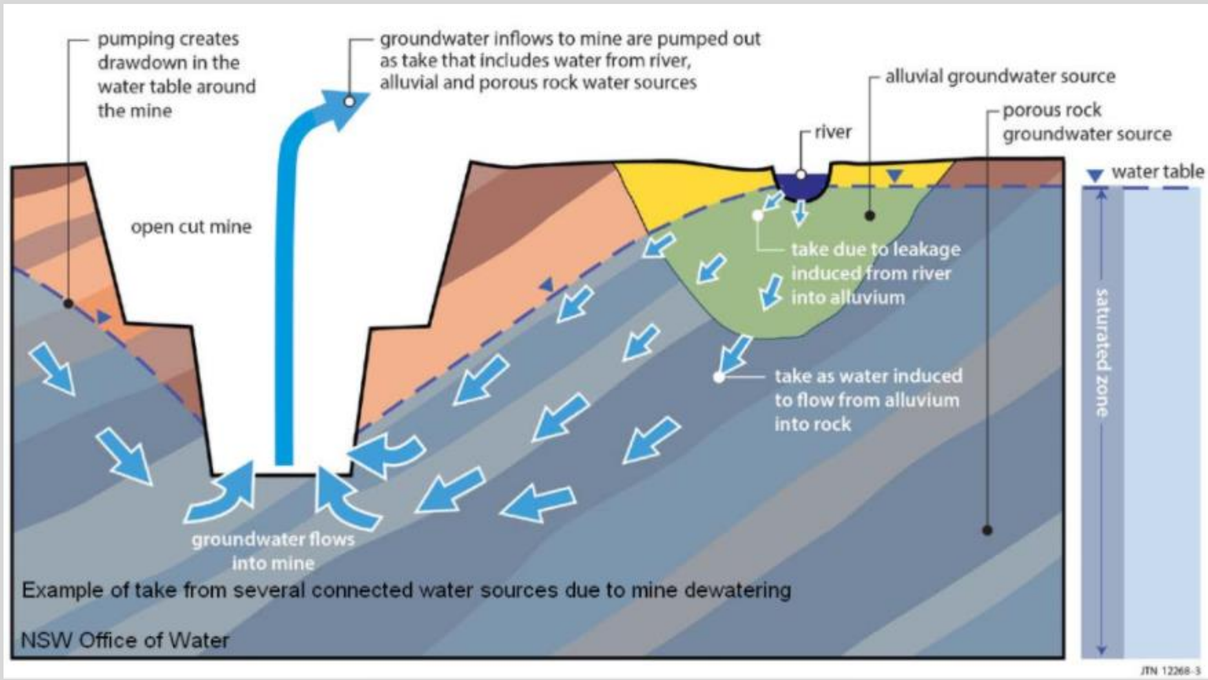
Attachment G3 - Groundwater Impact Assessment, Conceptual Cross Section during operations Fig 7.3



Attachment G4 - Groundwater Impact Assessment - Conceptual Cross Section post closure Fig 7.4



Attachment G5 - NSW Office of Water - Quarrying Water Table effect depiction



Attachment H1 - Council: 'Dewatering Management Guidelines', 'Dewatering release criteria'

4.1 Dewatering release criteria

Direct discharge of untreated groundwater may potently cause unlawful environmental harm which is prohibited under the *Environmental Protection Act 1994*. Prior to releasing any water from a construction site, discharges must comply with on-site discharge release criteria in accordance with *Council of the City of Gold Coast Land Development Guidelines (City Plan Policy)* . At the receiving water, 15 metres upstream and downstream of the point of discharge, discharges must comply with *receiving water release criteria* specified in *Tables 2 and 3*. However, when the receiving water discharge point is directly to Coomera River, Nerang River, Albert River, Pimpama River, Currumbin Creek or Tallebudgera Creek discharges must not exceed environmental values to protect aquatic ecosystem as outlined in *Environmental Protection (Water) Policy 1997 for Gold Coast Waterways*. For further information, refer to Department of Environment and Heritage Protection website.

At receiving water it is common that the impact from a site may be amplified as contaminants may accumulate. It is therefore critical that the receiving environment is fully investigated and understood when deciding how to manage releases from the site.

Table 1 – On-site dewatering water quality release criteria

Indicators	Criteria
Turbidity (NTU)	Less than 20
pH	6.5 – 8.5
Dissolve oxygen (DO)	90th percentile is greater than 80% saturation or 6mg/L
Litter	No visible litter washed from site

Table 2 – Receiving water dewatering water quality (physio-chemical) release criteria

Indicators	*Queensland Water Quality Guideline 2006*			
	Coastal	Estuary	Streams	Fresh water lakes
Ammonia (µg/L)	6-8	10-30	10-60	10
Total nitrogen (TN) (µg/L)	140-200	300-450	250-500	350
Chl-a (µg/L)	1-2	4-8	2-5	5
Total phosphorus (TP) (µg/L)	20	25-30	30-50	10
DO (% sat)	90-105	80-100	85-110	90
Turbidity (NTU)	1-6	8-25	25-50	1-20
pH	8.4-9	7-8.4	6.5-8.2	6.5-8
SS (mg/L)	10-15	20-25	6	-

Table 3 – Receiving water dewatering water quality (toxicants) release criteria

Metals	*ANZECC/ARMCANZ 2000 Guidelines* - Trigger values (µg/L)							
	Fresh water level of protection (% species)				Marine water level of protection (% species)			
	99%	95%	90%	80%	99%	95%	90%	80%
Aluminium pH > 6.5	27	55	80	150	-	-	-	-
Copper	1.0	1.4	1.8	2.5	0.3	1.3	3	8
Lead	1.0	3.4	5.6	9.4	2.2	4.4	6.6	12
Zinc	2.4	8.0	15	31	7	15	23	43

Attachment H2 - Council: ‘Dewatering Management Guidelines’, ‘Treatment of Groundwater

Dewatering Management Guidelines 5 / 13

4.2.1 Treatment of groundwater

The DMP must address methods for the treatment of groundwater that is to be discharged to the stormwater system includes, but are not limited to the following:

- treatment of the groundwater – off-site removal of groundwater from the site to a treatment facility for treatment and disposal
- physical treatment – filtration of the groundwater to remove suspended solids/reduce turbidity on-site before disposal into the stormwater system
- chemical treatment, (for example ,flocculation) – addition of lime to the groundwater in order to form a precipitate of the waste content of the water – this process should be used as last resort because it can cause other solid/sludge disposal implications/costs |

Often the dewatering wastewater will require treatment prior to discharge. A qualified company/ professional should be consulted and supervise water treatment procedures. The DMP must detail proposed treatment processes and operating protocols, in addition to justify these decisions. It must indicate where the treatment is being carried out in relation to the pump and other equipment and the point of discharge. Erosion prevention methods should also be detailed including pump protection at inlet and outlet.

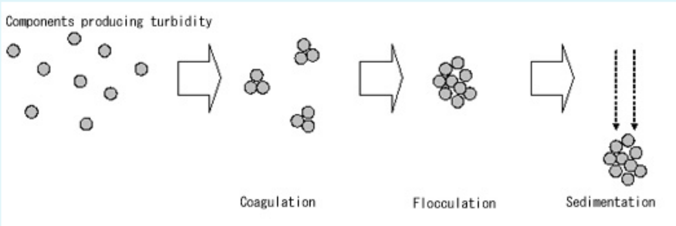
Attachment H3 - Coagulation Process

safewater.org/fact-sheets-1/2017/1/23/conventional-water-treatment

Conventional Water Treatment: Coagulation and Filtration

WHAT IS COAGULATION?

The coagulation process involves adding iron or aluminum salts, such as aluminum sulphate, ferric sulphate, ferric chloride or polymers, to the water. These chemicals are called coagulants, and have a positive charge. The positive charge of the coagulant neutralizes the negative charge of dissolved and suspended particles in the water. When this reaction occurs, the particles bind together, or coagulate (this process is sometimes also called flocculation). The larger particles, or floc, are heavy and quickly settle to the bottom of the water supply. This settling process is called sedimentation. The following diagram illustrates the basic reactions and processes that occur during coagulation.



Process of Coagulation, Flocculation and Sedimentation

The chart below shows the length of time that is required for particles of different sizes to settle through the water.

Diameter of Particle	Type of Particle	Settling time through 1 m. of water
10mm	Gravel	1 seconds
1mm	Sand	10 seconds
0.1mm	Fine Sand	2 minutes
10 micron	Protozoa, Algae, Clay	2 hours
1 micron	Bacteria, Algae	8 days
0.1 micron	Viruses, Colloids	2 years
10 nm	Viruses, Colloids	20 years
1 nm	Viruses, Colloids	200 years

Settling Time for Particles of Various Diameters;
Peterson, H. G. 2001. Rural Drinking Water and Waterborne Illness. In: Maintaining Drinking Water Quality, Lessons from the Prairies and Beyond, Proceedings of the Ninth National Conference on Drinking Water. Regina, Saskatchewan, Canada. May 16-18, 2000. Canadian Water and Wastewater Association. W. Robertson (Editor).

In a water treatment facility, the coagulant is added to the water and it is rapidly mixed, so that the coagulant is circulated throughout the water. The coagulated water can either be filtered directly through a medium filter (such as sand and gravel), a microfiltration or ultrafiltration membrane, or it can be moved to a settling tank. In a settling tank, or clarifier, the heavy particles settle to the bottom and are removed, and the water moves on to the filtration step of the treatment process.

Attachment H4 - Flocculation Process

ncbi.nlm.nih.gov/pmc/articles/PMC4831466/

Flocculation Process in Water Treatment

In most water treatment plants, water from the reservoir passes through the first compartment into which flocculants are added. The water then moves to the sedimentation tank where the flocculation process occurs and suspended particles settle at the bottom of the tank. The clarified water from this stage goes through a filtration process prior to being disinfected for distribution to end users. The main reaction stage where natural organic matter and other contaminants are removed is the flocculation stage (Jarvis et al. 2012; Rong et al. 2013). Flocculation is a process whereby colloids, cells, and suspended solids are removed from the suspension. The solids simply look like flocs or flakes as a consequence of aggregation (Bhunia et al. 2012). Flocculants are substances that are used in the separation of solid–liquid by the process of flocculation in various industrial processes (Hu et al. 2006), they could be of natural or synthetic origin. The larger the size of the particle, the faster the sedimentation rate, resulting in an efficient and rapid flocculation process that produces a clearer upper phase (Lachhwani 2005).

Attachment I1 - Council: 'Dewatering Management Guidelines', 'Legislative Requirements'

Dewatering Management Guidelines 4 / 13

3. LEGISLATIVE REQUIREMENTS

Person/s conducting dewatering activities shall do so in accordance with the requirements of the *Environmental Protection Act 1994* and *Environmental Protection Regulation 2008. Parts of State Planning Policy, Planning and Managing Development Involving Acid Sulphate Soils*, is also applicable.

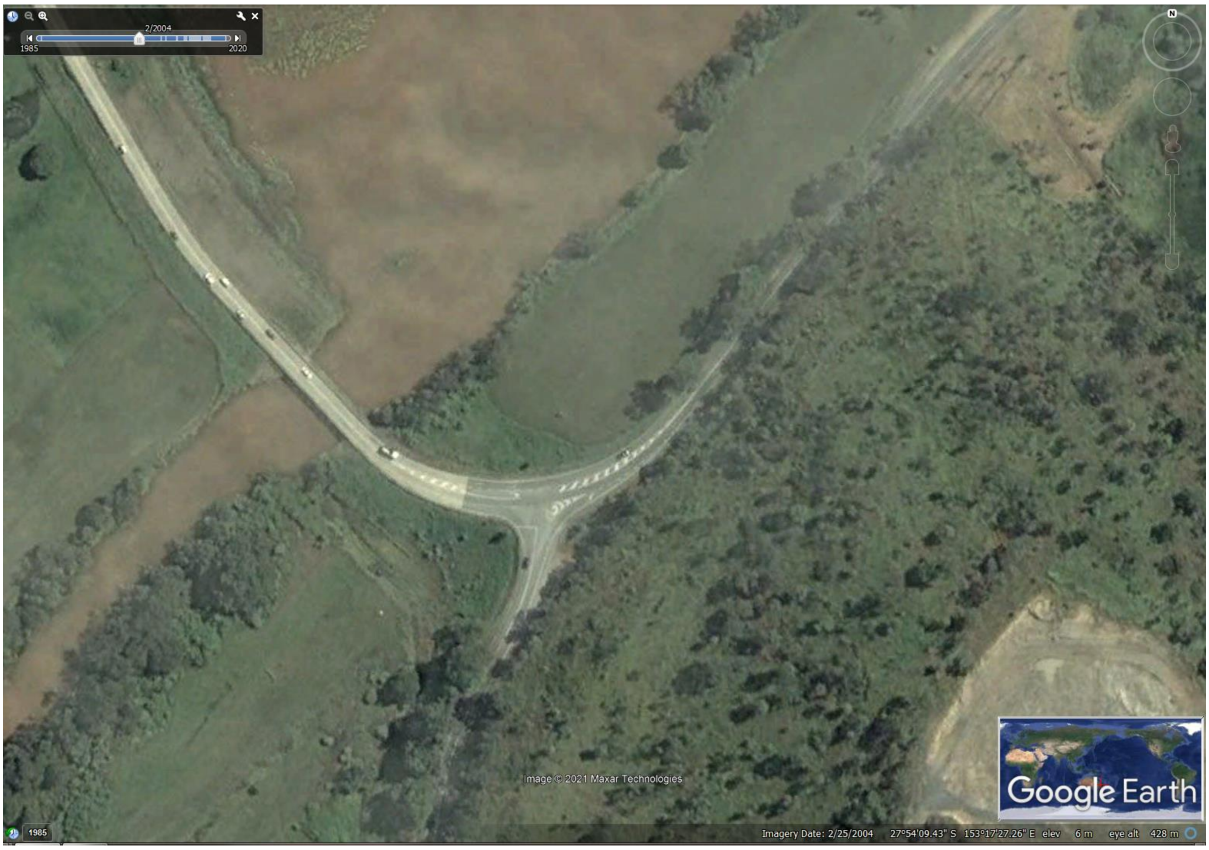
Person/s conducting dewatering activities shall take all reasonable and practicable measures to:

- ensure all groundwater that is discharged from a site into receiving waters is adequately treated and disposed of so as not to create environmental nuisance or harm
- ensure all contaminated groundwater that is to be treated off-site is done so in accordance with all relevant legislation
- prevent the emission of nuisance odours associated with the dewatering process
- ensure there is no scouring or erosion at the point of discharge into the receiving waters
- manage and resolve any complaints generated by the activity
- ensure all plant and equipment associated with the dewatering process is to be adequately acoustically attenuated to comply with the *Environmental Protection Act 1994*

The *Act* provides that all persons have a general environmental duty to take all practical and reasonable measures to prevent or minimise harm when carrying out activities. Person/s carrying out dewatering activities shall take all reasonable and practical measures to ensure:

- dewatering wastewater is treated to meet requirements and is discharged or disposed in a way that does not cause environmental harm or environmental nuisance
- all groundwater treated off-site or unable to be treated is done so in accordance with relevant legislation
- no scouring or erosion at the point of discharge into the receiving waters
- no offensive odours or nuisance noise are released as a result of dewatering

Attachment J1 - Google Maps of the Southern discharge location and the John Muntz Bridge Feb 2004



Attachment J2 - Google Maps of the Southern discharge location and the John Muntz Bridge June 2008

Attachment J3 - Google Maps of the Southern discharge location and the John Muntz Bridge June 2011

Attachment J4 - Google Maps of the Southern discharge location and the John Muntz Bridge Jan 2014

Attachment J5 - Google Maps of the Southern discharge location and the John Muntz Bridge July 2020

Attachment J6 - Google Maps of the area just beyond the weir June 2008

Attachment J7 - Google Maps of the area just beyond the weir Aug 2017

Attachment J8 - City Plan view of the discharge location into the Coomera River and the John Muntz Bridge

Attachment K1 - What is Sediment Pollution

cfpub.epa.gov/npstbx/files/ksmo_sediment.pdf

What is Sediment Pollution?

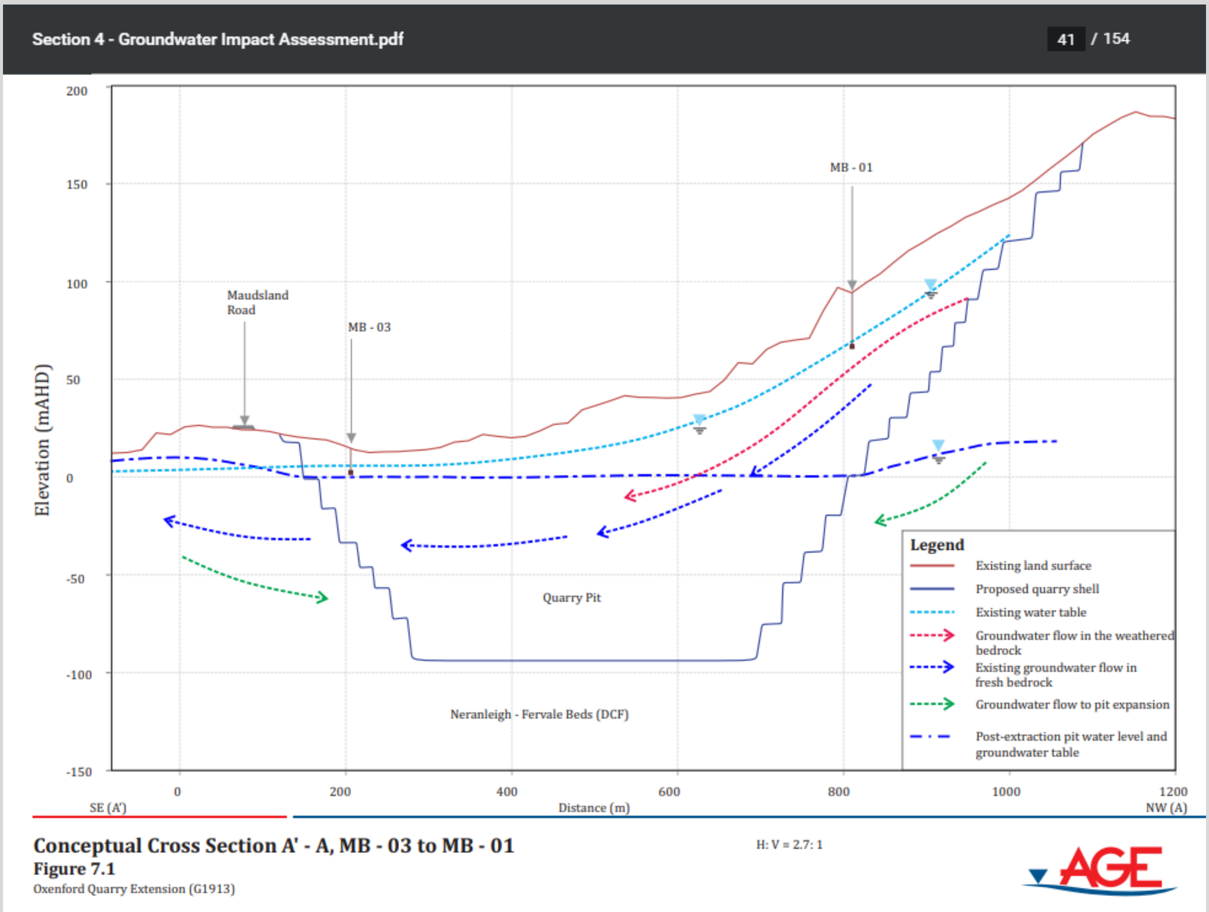
Facts about Sediment

- The Environmental Protection Agency lists sediment as the most common pollutant in rivers, streams, lakes and reservoirs.
- The most concentrated sediment releases come from construction activities, including relatively minor home-building projects such as room additions and swimming pools.
- Sediment pollution causes $16 billion in environmental damage annually.

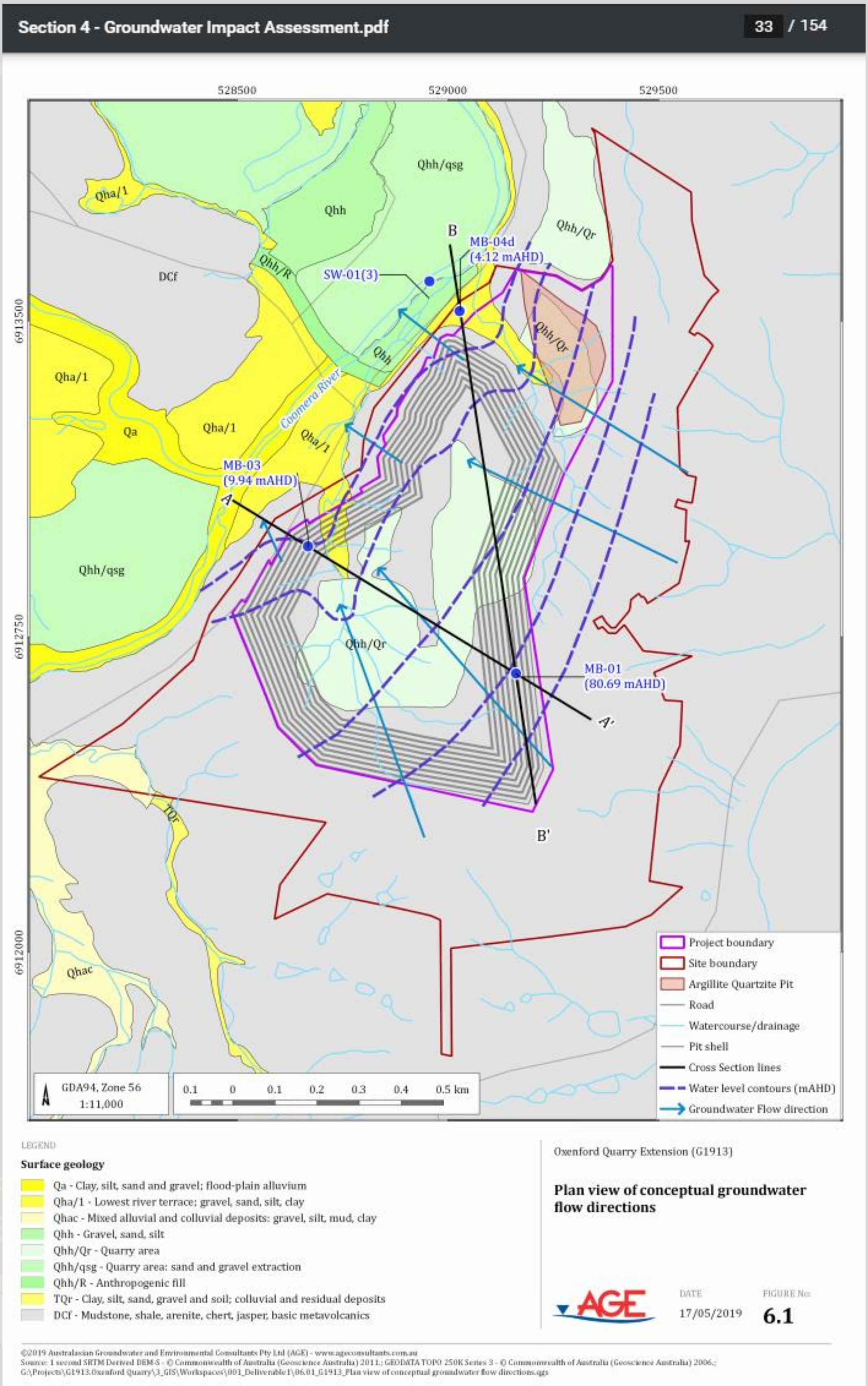
Sediment entering stormwater degrades the quality of water for drinking, wildlife and the land surrounding streams in the following ways:

- Sediment fills up storm drains and catch basins to carry water away from roads and homes, which increases the potential for flooding.
- Water polluted with sediment becomes cloudy, preventing animals from seeing food.
- Murky water prevents natural vegetation from growing in water.
- Sediment in stream beds disrupts the natural food chain by destroying the habitat where the smallest stream organisms live and causing massive declines in fish populations.
- Sediment increases the cost of treating drinking water and can result in odor and taste problems.
- Sediment can clog fish gills, reducing resistence to disease, lowering growth rates, and affecting fish egg and larvae development.
- Nutrients transported by sediment can activate blue-green algae that release toxins and can make swimmers sick.
- Sediment deposits in rivers can alter the flow of water and reduce water depth, which makes navigation and recreational use more difficult.

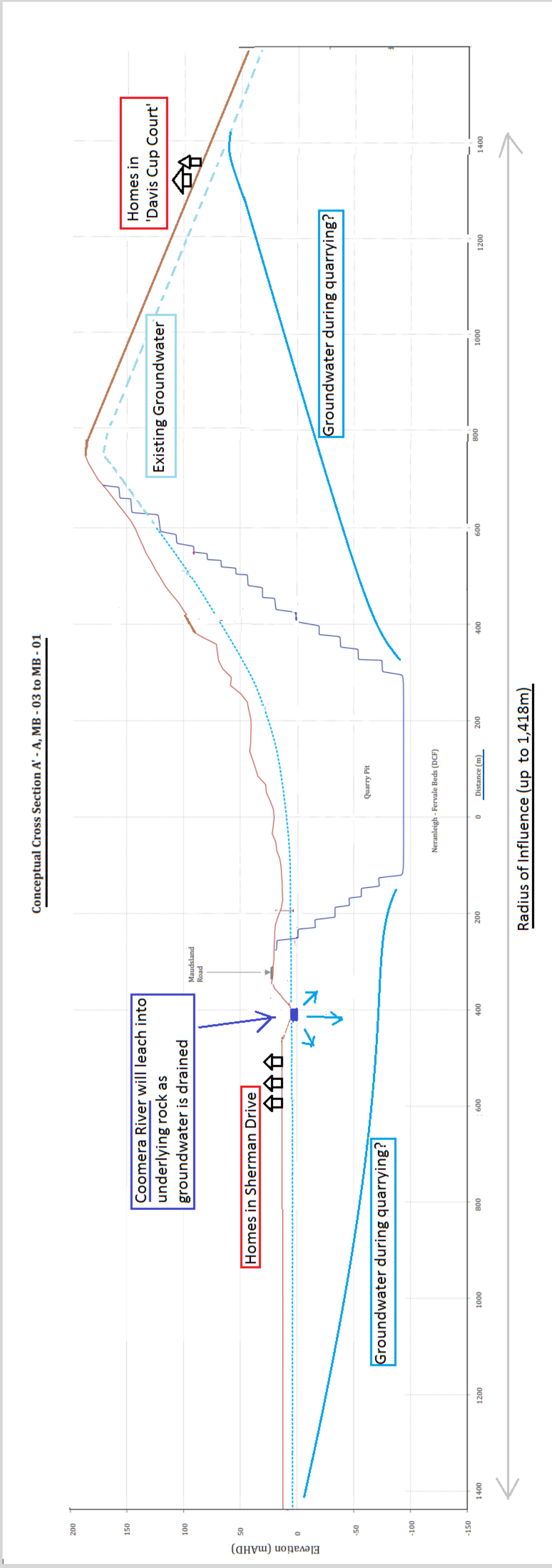
Attachment L1 - Groundwater Impact Assessment - 'Conceptual Cross-Section A-A'



Attachment L2 - Groundwater Impact Assessment - 'Conceptual Cross-Section A-A'



Attachment L3 - ‘Conceptual Cross-Section A-A’ extended to show the ‘Radius of Influence’



Attachment M1 - WA.Gov.au *'Water Quality Protection Guidelines for Mining and Mineral Processing - Mine Dewatering'* - Introduction

water.wa.gov.au/__data/assets/pdf_file/0014/4370/44630.pdf

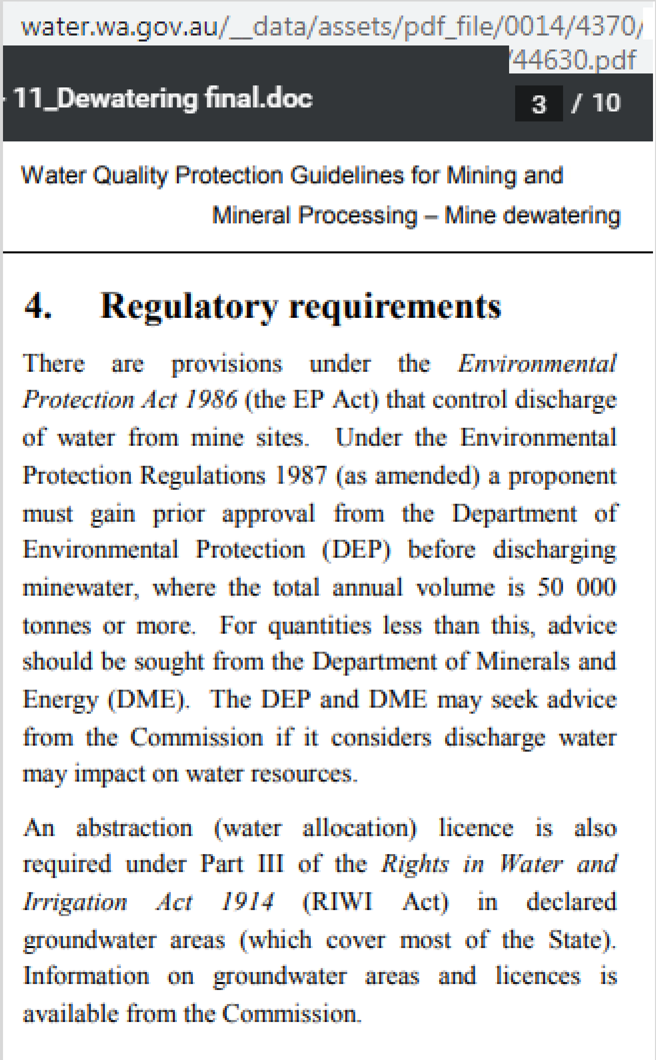
11_Dewatering final.doc 3 / 10

Water Quality Protection Guidelines for Mining and Mineral Processing – Mine dewatering

1. Introduction

Dewatering is a commonly used method of coping with groundwater seepage, mine excavations intersecting aquifers or excessive rainfall on mining operations. Dewatering can affect the natural biota and significantly alter the state of the receiving waterbody.[3] Discharge water containing high solids load or a high concentration of contaminants, or differing substantially in nature from the receiving waterbody, can affect regional water quality. A change in the volume of water in a receiving waterbody may also impact on its normal ecosystem function. This may lead to a number of detrimental environmental effects including deoxygenation of water, toxicity to biota and reduced light penetration. It may also impact on downstream uses such as agricultural pursuits and farmstead and industrial water supplies. If discharge of water can be avoided or if it can be used on site, environmental impact may be minimised. The use of discharge water on site also minimises demands on other resources.

Attachment M2 - WA.Gov.au *'Water Quality Protection Guidelines for Mining and Mineral Processing - Mine Dewatering'* - Regulatory Requirements


water.wa.gov.au/__data/assets/pdf_file/0014/4370/44630.pdf

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Water Quality Protection Guidelines for Mining and Mineral Processing – Mine dewatering

4. Regulatory requirements

There are provisions under the *Environmental Protection Act 1986* (the EP Act) that control discharge of water from mine sites. Under the Environmental Protection Regulations 1987 (as amended) a proponent must gain prior approval from the Department of Environmental Protection (DEP) before discharging minewater, where the total annual volume is 50 000 tonnes or more. For quantities less than this, advice should be sought from the Department of Minerals and Energy (DME). The DEP and DME may seek advice from the Commission if it considers discharge water may impact on water resources.

An abstraction (water allocation) licence is also required under Part III of the *Rights in Water and Irrigation Act 1914* (RIWI Act) in declared groundwater areas (which cover most of the State). Information on groundwater areas and licences is available from the Commission.

Attachment M3 - WA.Gov.au *'Water Quality Protection Guidelines for Mining and Mineral Processing - Mine Dewatering'* - Assessment of Impacts

water.wa.gov.au/__data/assets/pdf_file/0014/4370/44630.pdf

11_Dewatering final.doc 3 / 10

5. Guidelines

5.1 Assessment of impacts

a. The impact of dewatering must be assessed as part of the mine project feasibility study and within proposal applications to the DEP and DME. The proponents/operators need to understand the environment they are working in and to evaluate potential impacts of dewatering discharge. The proponent or operator is required to ensure that appropriate measures are taken to prevent pollution or degradation of the receiving waterbody.

b. To determine the potential impact of dewatering, the proponent/operator is required to provide:

- a hydrogeological[7] and hydrological[8] assessment of the project area to estimate quantity and quality of water to be discharged;
- verification that the quality of discharge water will comply with the receiving water criteria set out in Table 1;
- duration and frequency of the discharge;
- seasonal variability of the receiving water quality;
- assessment of the viability of treating or recycling the wastewater;
- a water audit, which should be carried out by or endorsed by a suitably trained auditor;
- baseline assessment of the existing environment (e.g. fauna, water quality) that will receive the discharge;
- a strategy for monitoring and managing any impacts during the life and after the closure of the project.

c. Discharge water should **not** be allowed to:

- enter poorly defined channels, as water may leave the channel and inundate vegetation;
- enter any surface water (e.g. ephemeral stream, creek or river), or groundwater where the physical, chemical or biological nature of the discharge will affect the beneficial use of the receiving waterbody;
- cause or contribute to soil erosion;
- have a detrimental impact on flora and fauna downstream of the discharge point. Further advice on the protection of flora and fauna should be sought from the Department of Conservation and Land Management (CALM).

d. Dewatering that may lower the watertable near a coastal or estuarine environment should be assessed for potential saltwater intrusion of the aquifer.

e. The operator should control dewatering to ensure there is no significant change in water quality or change in the natural watertable or flow regime of surface water.

f. An assessment of the impact on local vegetation, springs, wetlands and groundwater bores used by others in the vicinity of the project should be made prior to dewatering. Where assessment indicates potential reduction in watertable or quality of groundwater, the operator should either design the dewatering system to overcome this threat or provide an acceptable alternative water supply to affected parties.

g. Evaluation criteria to assess the impacts of dewatering will be developed in consultation with the mining industry.

Attachment N1 Gold Coast Bulletin article re Pollution at Lake Hugh Muntz in Mermaid Beach

Gold Coast Bulletin

Paul Weston, Gold Coast Bulletin

COUNCIL

August 2, 2021 5:18pm

Revealed: The stunning verdict on the future of one of the Gold Coast's most popular family lakes

One of the Gold Coast's largest and most loved suburban waterways can never be guaranteed to be healthy enough for swimmers all year round, a new report has found.

NIPPERS may not return to one of the Gold Coast's most-loved suburban lakes because of the water quality, a new report warns.

Latest research reveals there is no easy solution to improving water quality at Lake Hugh Muntz in Mermaid Waters, leaving council to consider multiple future options.

More than 500 people have signed a petition to the State Parliament, calling on MPs to demand the council allocate a special budget to back recommendations by the Griffith University Australian Rivers Institute.

A care group describes the lake as one of the Coast's "best kept secrets", where nippers once trained in a unique shark-free calm water that reached 12m in depth.

The latest report by council officers concludes:

- No single remedial works option has the capability to prevent future algal blooms in Lake Hugh Muntz.
- No combination of remedial works options will maintain a water-quality standard that facilitates a permanently swimmable lake.

Until the city finalises a management plan, council officers recommend "to manage and maintain the 66 gully baskets located in the roadside stormwater infrastructure around the lake".

About 87 tonnes of phoslock will be dumped in the lake this month to stop algal blooms, and a trial of emergent planting will be undertaken on the lake foreshore at Otway Park.

The report tracked the lake's deteriorating water conditions since the 1990s, having been created after spoil was removed from the area to make surrounding properties flood resilient.

The lake forms part of the catchment's stormwater system. Sixteen drains are linked to it.

"Over the past 40 years, stormwater run-off into the lake has deposited a thick layer of nutrient-rich sediment across the lake floor. This layer has gradually turned anoxic – lacking oxygen – resulting in varying oxygen levels of the water column," the report said.

"Over time an increase in the salinity of groundwater entering the lake caused by the growth in canal estates, has also contributed to the changes in water quality within the lake. This has contributed to a change in the lake's ecosystem from a freshwater environment to a brackish water environment."

Residents on the Save Lake Hugh Muntz Facebook page are continuing to post photographs of the lake's poor water quality, including shots of dead eels.

Area councillor Pauline Young said the council's decision to fund $280,000 on phoslock was the largest investment yet after she had lobbied successfully for whole-of-city funding.

The new report will be debated by councillors at the next round of committee meetings.

"Ideally, we all want to see this issue resolved but we need to be realistic," Cr Young said. "Nature is a tough opponent. Hopefully, this latest effort will go a long way towards resolving these blooms.

"I need to stress there is no guarantee of success but we are optimistic for a significant improvement for lake residents and the thousands who use the lake annually."