

P& E APPEAL 4515/17 – AUSTRALIAN INNOVATION CENTRE V REDLAND CITY COUNCIL – DEEMED REFUSAL FOR STANDARD FORMAT 1 LOT INTO 19 LOTS PLUS OPEN SPACE AT 289-301 REDLAND BAY ROAD, THORNLANDS

Objective Reference: **A2814553**
 Reports and Attachments (Archives)

Attachments:

1. [Locality Map](#)
2. [Site Map](#)
3. [Briefing Note](#)
4. [Proposed Layout](#)
5. [Plan of Development - Precinct 4d \(Greenspace Overlay\)](#)
6. [Thornlands Creek Corridor](#)
7. [DTMR Response](#)
8. [Surrounding Approvals](#)
9. [Non Standard Lot](#)
10. [Road Movement Network Plan](#)
11. [DILGP position on appeal](#)

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PURPOSE

This report is referred to Council in order to confirm its position on the development proposal in the Planning and Environment Court appeal.

The site is located at 289-301 Redland Bay Road, Thornlands (refer **Attachments 1 and 2**) and forms part of the wider South East Thornlands Structure Plan area. Council received an application seeking approval for Reconfiguring a Lot for a 1 into 19 lot subdivision, road and open space on the 18 August 2016. The application was referred to the State as it adjoins a State-controlled road.

Council's decision on the application was due on 22 November 2017. The applicant did not agree to extend the decision due date. On the 23 November 2017, the applicant filed an appeal with the Planning & Environment (P&E) Court against the deemed refusal of the development application. The Chief Executive, Department of Infrastructure, Local Government and Planning, has elected to co-respond to the Notice of Appeal.

On 17 January 2018, the co-respondent (DTMR) notified the parties of its position in relation to the appeal and reaffirmed its support for the proposal, subject to unspecified conditions. By 31 January 2018 the respondent (Council) is to notify the parties whether it supports or opposes the approval of the development application the subject of this appeal.

If Council notifies that it opposes the approval of the development application, reasons for this opposition are to be provided.

BACKGROUND

There are no previous planning approvals for the site relevant to this proposal. The site contains an existing dwelling house and ancillary structures.

During the appeal proceedings associated with the Waterline Estate (**Attachment 8**) it became clear to Council officers that access through the subject site would be financially burdensome given the small quantum of developable land. Officers therefore drafted a briefing note in March 2013 on Council's options and recommended to Council's Executive Leadership Group that Council commence negotiations with the landowner to purchase the subject site (**Attachment 3**).

In mid-2013 Ausbuild approached the Department of Transport and Main Roads (DTMR) for pre-lodgement discussions on the Esperance estate (**Attachment 8**), who confirmed that they would accept an alternative access. By August 2013 DTMR officers confirmed that they would accept staggered intersections and as such Council officers did not continue to pursue the property purchase. Officers were satisfied with DTMR's advice that the alternative access to the Esperance estate would not compromise the delivery of the ultimate access via the subject site.

A development application was lodged in October 2013 over land to the south, which is now known as the Esperance Estate. This development was approved with a left in and left out access onto Redland Bay Road (Council Ref: ROL005695).

ISSUES

Development Proposal & Site Description

Proposal

The application as originally lodged consisted of a 1 into 22 lot reconfiguration, including new road and open space. A minor change to the application was made during the assessment, and the proposal now comprises a 1 into 19 lot reconfiguration, with new road and open space (refer **Attachment 4**). The proposed lot sizes range from 303m² to 729m² and are arranged around a new cul-de-sac street, which is a continuation of Connie Way to the south.

The subdivision also includes dedication of land for park (29796m²), and a 14m wide road widening, acoustic fence and buffer planting along Redland Bay Road. Pedestrian movement between the site and public areas has been provided for, with pedestrian links to Redland Bay Road from the end of the cul-de-sac street.

Site & Locality

The site is located within the northern portion of the South East Thornlands Structure Plan (SETSP) Overlay area and is bounded by Redland Bay Road to the east, which is a State-controlled road. The site is part of the wider SETSP area which includes land zoned for residential purposes appropriate to accommodate expected future population growth within this area of the City. As such, the site forms part of an emerging residential community.

The part of the site zoned for residential purposes is predominantly clear of vegetation while the remainder of the site contains a heavily vegetated creek corridor.

Adjoining sites to the north consist of larger Park Residential zoned lots containing dwelling houses. Development to the south consists of a large approved residential development of varying lot sizes that is currently being developed in accordance with the approval; and is known as the Esperance Estate.

The current use of the site is for rural residential living and contains a dwelling and associated outbuildings. All existing structures will be removed from the site to facilitate the subdivision.

Application Assessment

Sustainable Planning Act 2009

The application was made in accordance with the *Sustainable Planning Act 2009* (SPA) Chapter 6 – Integrated Development Assessment System (IDAS) and constituted an application for Reconfiguration of Lots under the Redlands Planning Scheme.

SEQ Regional Plan 2009-2031

The site is located within the Urban Footprint in the SEQ Regional Plan 2009-2031.

State Planning Policies & Regulatory Provisions

State Planning Policy / Regulatory Provision	Applicability to Application
SEQ Koala Conservation SPRP	<p>The site is within Division 3 (now Planning Regulation Schedule 11 Part 2 (2)) Broadhectare - South East Thornlands Structure Plan.</p> <p>Aerial photography indicates that about 2500m² of vegetated land adjacent to the western and southern boundaries will be impacted in some way by the proposed layout. This is the location of the Connie Way extension, proposed Lots 1 and 19 and the rear of proposed Lots 16-18. From on-site visual inspection and aerial photography, some trees in this area appear to be viable koala habitat. This is supported by observations discussed in the ecology report of koala habitat trees, as well as some exotic and weed species.</p> <p>In respect of koala habitat, the applicants' ecological consultant stated that:</p> <p><i>“Sclerophyll bushland area of the [parent] site could potentially comprise some temporary/transitory habitat value for the Koala and Grey-headed Flying-fox within a broader home-range, however a targeted direct/trace search revealed no current/recent presence at time of survey and they are considered a sporadic / uncommon occurrence at most”.</i></p> <p>This is at odds with known data including individual koala tracking records and independently-compiled vehicle strike statistics that indicate frequent koala use of the vegetated creek corridor to the rear of the proposed development footprint, which links via Redland Bay Road to the Pinklands site opposite. The crossing point is about 150-200m to the north of the subject site where koala movements are known to be frequent. The parent site's native vegetation to the rear of the proposed development footprint is directly connected to a known koala habitat area within the creek</p>

	<p>corridor.</p> <p>Given the historical clearing of the proposed development footprint itself, it is considered reasonable to conclude that koala usage of the cleared area would be minimal.</p> <p>From the information provided with the application, it appears that there may be 2-3 non-juvenile koala habitat trees impacted by the development. A detailed plan showing species, height, trunk diameter and canopy spread of trees within a 10m radius of all structures will be required at operational works. Where non-juvenile koala trees are shown to be impacted and require removal, they will be required to be replaced at a ratio of three new koala habitat trees for every one non-juvenile koala habitat tree removed or a financial contribution, in accordance with the Offsets Act.</p>
SPRP (Adopted Charges)	The development is subject to infrastructure charges in accordance with the SPRP (adopted charges) and Council's adopted resolution. Details of the charges applicable have been provided under the Infrastructure Charges heading of this report.
State Planning Policy April 2016	<p><u>Biodiversity – MSES – Wildlife habitat</u></p> <p>The proposed development is largely located outside the area designated as MSES – Wildlife Habitat. Further assessment has been undertaken regarding fauna movement and protection of vegetation within the habitat area. This land would be dedicated to Council as part of any approval. Therefore there are no further issues requiring assessment against the SPP.</p> <p><u>Water Quality – Climatic regions – stormwater management design objectives</u></p> <p>The applicant provided a Site Based Stormwater Management Plan, prepared by DNBS Consulting Engineers, which proposes a bio-retention system along the north west boundary of the lot. The calculations indicate a surface area of 480m² and a filter area of 345m². The modelling indicates that the system would meet the SPP water quality standard.</p> <p><u>Hazards & Safety – Bushfire hazard</u></p> <p>The development is located within the potential impact buffer which adjoins a high potential bushfire intensity designation. The submitted Bushfire Hazard Management Plan adequately demonstrates that the SPP requirements in relation to bushfire hazard would be met. The proposal avoids natural hazard areas, does not unduly burden disaster management response capacity and avoids risks to public safety.</p>

Redlands Planning Scheme

The application was assessed under the Redlands Planning Scheme version 7.1.

The application was subject to impact assessment and is therefore assessable against the entire planning scheme. However it was recognised that the following codes are most relevant to the application:

- Urban Residential Zone Code
- Open Space Zone Code
- Community Purposes Zone Code
- Reconfiguration Code
- Development Near Underground Infrastructure Code
- Excavation and Fill Code
- Infrastructure Works Code
- Stormwater Management Code
- Overlays: Acid Sulfate Soils Overlay Code, Bushfire Hazard Overlay Code, Habitat Protection Overlay Code, Flood Prone Storm Tide and Drainage Constrained Land Overlay Code, Road and Rail Noise Impact Overlay Code, South East Thornlands Overlay Code and Waterways Wetlands and Moreton Bay Overlay Code.

The proposal is on a site zoned Urban Residential, Open Space and Community Purposes. Reconfiguring a Lot is code assessable within the Urban Residential zone and impact assessable within the Open Space zone. The proposed development has been assessed against the applicable codes and is considered to conflict with the Redlands Planning Scheme. The key issues in this regard are discussed below.

Access

Specific Outcome S2.1 of the SETSP overlay code states that “(1) *Principal streets that include trunk collector and collector streets are provided generally in accordance with Map 2 – Road Movement Network Plan*” (**Attachment 10**) and “(2) *Trunk collector and collector streets are designed to accommodate the safe and efficient movement of public transport buses*”. Map 2 shows a left in and left out intersection is anticipated to the north eastern corner of the lot, which allows a collector street to run through the subject site and connect to Redland Bay Road.

The proposed subdivision layout only provides an internal cul-de-sac and does not provide a left in left out intersection onto Redland Bay Road; consequently the development does not comply with specific outcome S2.1 of the code. The proposal must therefore be assessed against the overall outcome as follows:

Overall outcome “(2)(b) *Movement Network (Map 2, Map 3)*” states that:

“(i) *Uses and other development reinforce a safe, integrated, highly accessible and interconnected road network that:*

- a. *provides high levels of legibility, connectivity and permeability for all street uses, while ensuring appropriate levels of safety, amenity and protection from the impact of traffic movements;...*

It is noted that the intersection of Harrington Boulevard and Redland Bay Road to the south of the site, was approved as a permanent access to the Esperance development under application (ROL005695). This provided an alternative outcome to the anticipated intersection with Redland Bay Road (refer to Map 2 in **Attachment 10**), and was approved by the State government as part of their concurrence agency responsibility for this development. It is noted that an extension of Connie Way was included as part of this

development, and an approximately 18m wide road verge was approved (and which has been constructed) to facilitate access through the subject site in the future.

A further development located across the road to the east of the site (Waterline Estate, **Attachment 8**), which was approved by a Court order, required the construction of traffic lights to provide access to the site from Redland Bay Road. It was envisaged as part of this application that any future development on the lots to the west and south west would ultimately result in this three way intersection being upgraded to a four way intersection, allowing for access through the subject site in accordance with the anticipated road layout in the SETSP (**Attachment 10**).

It is noted that in relation to the proposed development application, the concurrence agency (DTMR) after assessing the development and considering impacts on State transport infrastructure (Redland Bay Road), advised Council to impose conditions, which endorsed the proposed layout, with no direct access to Redland Bay Road. This severely hampered Council's ability to not approve the proposed access arrangements, as the State government has jurisdiction for access to its own State-controlled road network.

However, after receiving the State's concurrence agency response, Council officers met with DTMR officers to discuss concerns with their decision. As part of these discussions, DTMR officers indicated that a signalised four way intersection along Redland Bay Road would be preferable in order to facilitate a safe and efficient road network and improve accessibility for residents within the estates accessing to and from Redland Bay Road.

DTMR could not however amend their concurrence agency response once issued and so DTMR officers, including the Director-General of the Department, instead confirmed their intention to support Council should the matter proceed to Court. Following the filing of the appeal the Department of Infrastructure, Local Government and Planning (DILGP), which handles appeals affecting all state agencies, elected to co-respond to the Notice of Appeal. DILGP advised Council and other parties of its position in the appeal on 17 January 2017, confirming that the application could be approved, subject to undisclosed conditions (**Attachment 11**) which appears to maintain their original concurrence agency response. The letter also confirmed that DILGP would not oppose a solution that incorporated a 4-way signalised intersection so long as it is provided at no cost to the State.

In light of the above, and despite the position of the State in the appeal, it is considered that the development would not comply with overall outcome (2)(b)(i) of the SETSP Overlay Code by providing a safe, integrated, highly accessible and interconnected road network for the area.

It is noted that, should a four way intersection be required on this site, further works to the current left in left out arrangement at the intersection of Harrington Boulevard and Redland Bay Road may be required, due to its proximity to the future intersection.

Open Space under Private Ownership

The table of assessment within the Open Space Zone Code identifies reconfiguring a lot as Impact Assessable where not being undertaken by local government or where the land within the Open Space zone is not contained in a single lot. The proposal is not considered to be inconsistent within the zone, however a number of outcomes need to be satisfied as residential lots would be located partly within the Open Space zone.

The site has a split zoning of Urban Residential, Open Space and Community Purposes. The eastern part of the site is zoned Community Purposes and will be dedicated to the State and Council for road widening and landscaping/acoustic treatments. The majority of

the land zoned Open Space is proposed to be dedicated to Council as open space. However, ten (10) of the proposed residential lots (Lots 10-19) are located partly within the Open Space zone along with the stormwater bio retention system.

Specific Outcome S1.3 of the Open Space Zone Code states:

“(1) reconfiguration –

- (a) facilitates the dedication of open space land to Council as non-trunk or trunk infrastructure as identified in Part 10 – Priority Infrastructure Plan;*
- (b) enhances social, cultural and recreational opportunities;*
- (c) provides linkages between existing and/or open space areas;*
- (d) does not prejudice the future use of this land for open space purposes.*

The proposal dedicates the majority of the open space zoned land to Council as non-trunk infrastructure, which comprises land that is heavily vegetated and will be protected through this dedication. It will act as an important connection between the Council-owned land to the south, which was dedicated as part of the Esperance development, and the vegetated corridor protected by covenants on the adjoining lots to the north.

This area of open space zoning is also identified as Precinct 4d (Thornlands Creek Corridor) in the SETSP overlay map. (**Attachment 5**)

Specific Outcome S1.6 (g) of SETSP overlay code specifies that where in Sub-precincts 4a, 4b, 4c, 4d and 4f - be progressively transferred to public ownership. The proposal does not comply with this as it includes approximately 3,000m² (10% of the Open Space zoned part of the lot) of Precinct 4d which will be in private ownership and will form part of proposed Lots 10 to 19. The proposal must therefore be considered against the relevant overall outcome of this code.

Overall outcome (2)(a)(ii)(d) of SETSP overlay code stipulates that “*Sub-precinct 4d Thornlands Creek Corridor protects and enhances publicly owned land that:*

- buffers the ecologically sensitive habitats and receiving waters of Thornlands Creek;*
- maintains the hydraulic capacity of Thornlands Creek and its riparian flood plains to accommodate local flooding and overland stormwater flows;*
- incorporates an important habitat and movement corridor for koalas and other fauna.”*

Thornlands Creek does traverse the site (refer **Attachment 6**) and the entire area that buffers this creek is proposed to be dedicated to Council as open space. Additionally, the fauna movement corridor follows this creek corridor and buffer area, and therefore will be protected in accordance with the overall outcome. It is therefore considered that the proposal meets overall outcome (2)(a)(ii)(d) of SETSP overlay code.

Esplanade Road

Notwithstanding the section above regarding development in the Open Space zone, Specific Outcome S2.3 and Overall Outcome 2(b)(i)c of the South East Thornlands Structure Plan Overlay code requires the provision of esplanade roads to separate urban development from the Greenspace Precinct. These provisions are intended to ensure that Council’s open space areas are safe and accessible and incorporate CPTED principles by increasing passive surveillance of public spaces, footpaths and cycleways. It also serves to reduce the impact of urban encroachment into open space areas that can occur as a result of back fence fly tipping and garden boundary encroachment.

The proposed development incorporates rear gardens of proposed lots within the Greenspace Precinct and as such conflicts with these provisions. The application is therefore considered to conflict with the South East Thornlands Structure Plan Overlay in this regard.

Pedestrian connectivity to Redland Bay Road

Specific Outcome S2.8 of the South East Thornlands Structure Plan Overlay code requires the provision of an integrated network of pedestrian and cycle paths in accordance with Map 3 – Cycling and Public Transport Network Plan to ensure safe and convenient access in accordance with CPTED principles. The proposed development could be conditioned to provide a pedestrian link to Cleveland Redland Bay Road via the proposed cul-de-sac head, however this is not considered to comply with the requirements of the Overlay. Overall Outcome 2(b)(i) and (ii) seek a pedestrian and cycle network with a high level of legibility, connectivity and permeability for all street uses, while ensuring appropriate levels of safety, amenity and protection from the impact of traffic movements.

As discussed above, in this location the Overlay anticipates the provision of an esplanade road that incorporates the extension of the existing footpath along Harrington Blvd. The proposed development is not a legible extension to this existing infrastructure, and whilst it represents a low-speed traffic environment, given it is the primary route for a large number of residents to the planned regional recreational park across Redland Bay Road, it is not considered to meet the level of amenity and safety planned for by the Redlands Planning Scheme.

Frontage Width and Density

The proposal includes construction of a new road and therefore constitutes a major reconfiguration in accordance with the planning scheme.

Probable Solution P2.1(2)(a) of the Reconfiguration Code identifies a deemed-to-comply minimum lot size of 350m² for medium and major reconfigurations.

Based on the Urban Residential zoned part of the site which is approximately 8,600m², the proposal will achieve a residential density of approximately 1 dwelling per 452m², with lot sizes ranging between 303m² to 729m². The proposed lot size for Lots 2 and 3 are 303m² and 317m² respectively and Lots 10 to 13 are between 338m² to 348m² which are less than the deemed to comply solution of 350m².

Specific Outcome S2.1(2) states:

- “(2) The creation of Standard Format Plan lots results in a mix of lot sizes that suit a variety of needs with areas and dimensions that –*
- (a) use land efficiently and allow amalgamation of lots to suit specific needs;*
 - (b) protect environmental values, and cultural and scenic features;*
 - (c) address site constraints such as identified hazards, slope and site drainage;*
 - (d) retain significant features, such as native plants;*
 - (e) take into account the slope of the land to minimise the need for excavation and fill;*
 - (f) for housing, are of a size and width that -*
 - (i) take advantage of microclimatic benefits;*

- (ii) have dimensions to allow on-site solar access and access to breezes;*
- (iii) provide locations for private outdoor places;*
- (iv) provide convenient vehicle access and onsite parking;*
- (v) where reticulated sewer is not available, have a sufficient area for on-site wastewater management systems;”.*

Specific Outcome S2.2(1) states:

“In Urban Residential Zone, lots are of a size and width that –

- (a) achieve a density that meets expected population growth;*
- (b) maintains a quality lifestyle;*
- (c) meets the requirements of people with different housing needs;*
- (d) provides housing choice*

The proposal is considered to achieve the specific outcomes as the proposal will protect environmental values and scenic features through the dedication of the majority of the open space zoned part of the lot, filling is required only to achieve drainage to sewer, there will be minimal impact on vegetation and will provide lots of a size and width to achieve sufficient solar access and breeze, provide sufficient private open space and dwelling design will be able to provide necessary onsite parking. The proposal will also provide lot sizes to suit specific housing needs in demand in the current market.

Further, all lot frontages are at least 10m wide, except for proposed Lots 15 to 18 which have frontages of approximately 8.8m when measured at a 90° degree angle, in accordance with Diagram 5 of the Reconfiguration Code for a non-standard lot (**Attachment 9**). These frontages do not meet the probable solution of 10m and, more importantly, do not meet specific outcome S1.1 of the Urban Residential zone code, which identifies that lots with frontage less than 10m are inconsistent development in this zone. It is recommended that Council identify this as an additional issue in dispute for the appeal. In order to achieve specific outcome S1.1 of the Urban Residential zone code, the applicant should provide a lot layout which achieves lots with frontages of 10m or greater.

Infrastructure Works

New infrastructure is to be provided as part of the subdivision works. The latest sewer plans demonstrate that a gravity sewer can service the development with acceptable earthworks undertaken to achieve this. The current design does not comply with the SEQ Code as some of the proposed sewer grades are too flat. This could be resolved at operational works which may require minor additional filling to get grade where required.

Stormwater is proposed to be directed to the north into a basin which is sufficient in size to cater for the development and will achieve stormwater quality in accordance with the Stormwater Management Code. Detailed designs will be assessed as part of any operational works application.

All other services can be provided on standard alignments in the proposed road reserve.

Excavation and Fill

Probable Solution P1 of the Excavation and Fill Code seeks that excavation and fill maintains the amenity of adjoining properties by ensuring that retaining walls are setback at

least half the height of the wall from any boundary of the site, do not exceed 2.5m in height and are stepped or terraced .75m for every 1.5m in height to incorporate landscaping.

Further detailed assessment of any retaining walls, if required, will be undertaken as part of any future operational works application which will be conditioned as part of this approval.

Road and Rail Noise Impact Overlay

The eastern boundary adjoins Redland Bay Road which is a State-controlled road. The DTMR has conditioned acoustic attenuation by including the “*Environmental Noise Impact Assessment*” report, dated 07/08/2017, prepared by CRG Acoustics, in their conditions. The DTMR response provided to Council will form part of Council’s conditions package, if approved. Landscaping will be provided in front of this acoustic fence to provide screening to reduce impact on the road.

Infrastructure Charges

The proposed development is subject to infrastructure charges in accordance with the State Planning Regulatory Provisions (adopted charges). The total charge applicable to this development is:

This charge has been calculated as follows in accordance with Council’s [Adopted Infrastructure Charges Resolution \(No. 2.3\) August 2016](#).

Offsets

There are no offsets that apply under Chapter 8 Part 2 of the *Sustainable Planning Act 2009*.

Refunds

There are no refunds that apply under Chapter 8 Part 2 of the *Sustainable Planning Act 2009*.

State Referral Agencies

- **State Assessment & Referral Agency (SARA) (Attachment 7)**

SARA provided a referral agency response dated 25/08/2017 in regards to the State-controlled road in response to the amended layout. The Department indicated no objection to the proposed development subject to referral agency conditions in regards to stormwater management and noise attenuation measures. The Department’s referral response, including conditions, must be attached to Council’s Decision Notice if approved.

Consultation

The assessment officer consulted with internal assessment teams and advice was received which formed part of the assessment process and is included in this report where appropriate.

Copies of the application were provided to the local Councillor on 4 August 2016.

Council officers also consulted with officers from the Department of Transport and Main Roads as discussed above.

Public Consultation

The proposed development is Impact assessable and required public notification. The application was publicly notified for 15 business days from 30/11/2016 to 20/12/2016. A notice of compliance for public notification was received on 21/12/2016.

Submissions

There were three (3) properly made submissions received during the notification period. However, a further two (2) submissions were received which were not properly made but which were accepted under section 305(3) of SPA. Other issues were raised in further submissions which were not properly made and discussed and supported by the divisional Councillor.

The matters raised within these submissions are outlined below:

1.	<p>Issue High density development.</p> <p>Officer's Comment The lot sizes proposed are considered to comply with the planning scheme.</p>
2.	<p>Issue Adequate buffer to be provided between property to the north and the proposed development due to noise associated with vehicle movements.</p> <p>Officer's Comment An amended layout now proposes residential lots between the road and the lot to the north which will reduce noise associated with vehicle movements. However, this arrangement removes the esplanade road that is sought by the structure plan overlay code in the vicinity of this boundary. This is discussed in the Issues section of this report.</p>
3.	<p>Issue Ensure that adequate measures put in place to prevent stormwater impacting on adjoining land.</p> <p>Officer's Comment An amended site-based stormwater management plan has been provided demonstrating that no net worsening of stormwater will occur to the adjoining land to the north as a basin is proposed along the northern boundary. Further design detail will be provided as part of an application for operational works.</p>
4.	<p>Issue Street lights to be positioned and directed away from bedrooms of the adjoining lot to the north.</p> <p>Officer's Comment</p>

	<p>The amended layout now proposes dwellings to be located between the road and the boundary and therefore street lighting should not present any issues to the adjoining lot.</p>
5.	<p>Issue</p> <p>Dust minimisation during construction phase.</p> <p>Officer's Comment</p> <p>This will be addressed as part of operational works.</p>
6.	<p>Issue</p> <p>Connecting adjoining land to reticulated sewer.</p> <p>Officer's Comment</p> <p>This matter is not relevant to the proposed development.</p>
7.	<p>Issue</p> <p>Development does not propose an intersection as indicated in the structure plan.</p> <p>Officer's Comment</p> <p>This is discussed in detail in the report.</p>
8.	<p>Issue</p> <p>Vehicles performing U-turns on Redland Bay Road on a daily basis to gain access to Harrington Boulevard which is illegal and dangerous.</p> <p>Officer's Comment</p> <p>Whilst illegal U-turns are generally a police matter, they are also a symptom of an inefficient road network. Some of these U-turns may be alleviated by the construction of the planned four way intersection at Beveridge Road, however it is likely that illegal manoeuvres into the estate at this point will remain an attractive option for residents living closer to the subject site.</p>
9.	<p>Issue</p> <p>Pedestrian/cycle movements are restricted and dangerous. Continuation of a footpath along Redland Bay Road should be provided to the signalised intersection to provide safe crossing.</p> <p>Officer's Comment</p> <p>The proposal includes the extension of the existing footpath on the western side of Redland Bay Road to continue to the signalised intersection and therefore will provide a safe crossing.</p>
10.	<p>Issue</p> <p>Important remnant vegetation will be protected in perpetuity through its transition into public ownership. However the Environmental Impact Report greatly underestimates the value of this remnant both in the vegetation and fauna use. There are veteran trees in this patch including a Eucalyptus tereticornis that is estimated to be 400 years of age.</p> <p>Officer's Comment</p> <p>Approximately 2.8 hectares of largely remnant vegetation will be transferred to public ownership. This is the area containing the waterway system and is considered to contain the most viable wildlife corridor. The submitter acknowledged that this is a good outcome and indicated support for the transfer to public ownership. This is also</p>

	discussed further in this report.
11.	<p>Issue</p> <p>Fauna usage is downplayed as koalas have been seen and heard in abundance for many years as neighbours would testify. Gliders, in particular squirrel gliders, are frequently seen with a spotlight from neighbouring properties and fairly uncommon birds such as whipbirds and rufous night heron have also been seen.</p> <p>Officer's Comment</p> <p>The presence or absence of koalas has been discussed within the assessment section of this report. The ecological report appears to have been based on a relatively brief field survey over a limited time period. Given the seasonal patterns in native fauna use, it is not surprising that the report recorded limited direct evidence of fauna use at the time. Observations by members of the public and Council over a long time period have noted usage of the general vicinity by a number of significant native species. Casualty data alone has identified frequent koala crossings of Redland Bay Road 200 metres to the north-west. This is the point where the waterway in the future public portion of the site crosses under the road, and is where fauna movement in general would be expected to occur. Regardless of the report's level of detail, it is acknowledged that fauna usage is significant, and is a reason in itself for transfer of the balance of the site to public ownership.</p>
12.	<p>Issue</p> <p>The Open Space zoning (RPS) / Greenspace (SETSP) on the northern side of the block towards Cleveland Redland Bay Road appears far wider than the 4 metres shown in the application. According to the SETSP, access streets are not supposed to extend into the Greenspace Network. This area is clearly meant to form a wildlife corridor as it is the nearest part of the structure plan area to access the Pinklands Reserve and parkland over the road. This is supported by the Open Space and Recreational Areas and Facilities Diagram 5 in the SETSP which shows the area as part of the "Urban Habitat Corridor".</p> <p>Officer's Comment</p> <p>It is not considered desirable to encourage fauna movement through the narrow corridor at the north of the site which adjoins a major road. Fauna movement is encouraged along the waterway alignment where it crosses into the Pinklands reserve about 200 metres to the north-west of the subject site. The development will maintain a habitat and movement corridor for Koalas and other fauna within the Thornlands Creek catchment area further to the west.</p>
13.	<p>Issue</p> <p>A koala tracked by UQ researchers in 2010 was found to cross Cleveland Redland Bay Road many times. This gives the lie to the belief that koalas are "encouraged" into areas of danger by the planting of trees. Koalas cross roads because of hunger and the absence of trees only exacerbates the problem.</p> <p>Officer's Comment</p> <p>Matters relating to the presence or absence of koalas, vegetation retention and enhancement are discussed in the assessment section of this report. It is assumed that the submitter is referring to a radio tracking exercise that recorded an individual koala's regular movements back and forth across Redland Bay Road over a 3 month</p>

period. The tracking data shows that the individual regularly moved between the Pinklands reserve, the Park Residential lots to the north west of the site and the waterway alignment to the rear of the development area. There were several road crossing points centred on the waterway alignment where it crosses into the Pinklands reserve about 200 metres to the north-west of the subject site. It is expected that other koalas and fauna generally also follow the same route as there is vegetation on both sides of the road.

Appeal

Council's decision on the application was due on 22 November 2017. The applicant did not agree to extend the decision due date. On the 23 November 2017, the applicant filed an appeal with the Planning & Environment (P&E) Court against the deemed refusal of the development application. The Chief Executive, Department of Infrastructure, Local Government and Planning, elected to co-respond to the Notice of Appeal.

On 17 January 2018, the co-respondent (DTMR) notified the parties of its position in relation to the appeal and reaffirmed its support for the proposal, subject to unspecified conditions (**Attachment 11**). By 31 January 2018 the respondent (Council) is to notify the parties whether it supports or opposes the approval of the development application the subject of this appeal. If Council notifies that it opposes the approval of the development application, reasons for this opposition are to be provided.

STRATEGIC IMPLICATIONS

Legislative Requirements

In accordance with the Planning & Environment Court Order, Council is to notify the parties whether it supports or opposes the approval of the development application the subject of this appeal, by 31 January 2018. If Council notifies that it opposes the approval of the development application, reasons for this opposition are to be provided.

Risk Management

Not applicable.

Financial

Council will incur legal costs associated with being party to this appeal. If Council chooses to oppose the development, it would take a more active role in the appeal and likely incur higher costs as a result.

People

Not applicable. There are no implications for staff.

Environmental

Environmental implications are detailed within the assessment in the “issues” section of this report.

Social

Social implications are detailed within the assessment in the “issues” section of this report.

Alignment with Council's Policy and Plans

The assessment and officer's recommendation align with Council's policies and plans as described within the “issues” section of this report.

CONSULTATION

The assessment manager consulted with other internal assessment teams where appropriate. Advice has been received from relevant officers and forms part of the assessment of the application. Officers also consulted with the relevant asset owners in City Spaces, City Infrastructure and Redland Water.

OPTIONS

Option One

That Council resolves as follows:

1. To oppose the approval of the development application for Standard Format 1 Lot into 19 Lots plus open space at 289-301 Redland Bay Road, Thornlands, for reasons generally in accordance with the following:
 - a. The proposed development is contrary to orderly development as contemplated by the South-East Thornlands Structure Plan in that:
 - i. The proposed development will prevent the subject site from achieving the road connection through the subject site shown on Map 1 - Land Use Precincts and Map 2 - Road Movement Network;
 - ii. The proposed development will prevent the subject site from achieving the esplanade treatment (separating that part of the subject site within the Greenspace precinct from urban development) shown on Map 2 - Road Movement Network;
 - iii. The proposed development will prevent the subject site from achieving the pedestrian and cycle link shown on Map 3 - Pedestrian/Cycleway and Public Transport Network Plan.
 - b. That the proposed development fails to protect the amenity of the residents of the existing dwelling houses on the Park Residential zone land adjoining the structure plan area in that:
 - i. The proposed development includes residential lots within that part of the subject site located within both the Open Space Zone and the Greenspace Precinct (4d Thornlands Creek Corridor);
 - ii. The lot sizes proposed are inconsistent with the park residential nature of the adjoining development to the north.

- c. That the proposed development fails to ensure an appropriate level of safety by preventing the provision of a 4 way signalised intersection at the intersection of Cleveland Redland Bay Road, Waterline Boulevard and the Collector Street through the subject site shown on Map 2 - Road Movement Network in the South-East Thornlands Structure Plan; and
- d. That the development proposes lots with frontages of less than 10m in width (lots 15 to 18 which have frontages of approximately 8.8m) and consequently the development is inconsistent in the zone and in conflict with the Urban Residential Zone Code; and

2. That this report and its attachments remain confidential.

Option Two

That Council resolves to advise the relevant parties in the appeal that it supports the approval of the development application, subject to appropriate conditions.

OFFICER'S RECOMMENDATION

That Council resolves as follows:

1. **To oppose the approval of the development application for Standard Format 1 Lot into 19 Lots plus open space at 289-301 Redland Bay Road, Thornlands, for reasons generally in accordance with the following:**
 - a) **The proposed development is contrary to orderly development as contemplated by the South-East Thornlands Structure Plan in that:**
 - iv. **The proposed development will prevent the subject site from achieving the road connection through the subject site shown on Map 1 - Land Use Precincts and Map 2 - Road Movement Network;**
 - v. **The proposed development will prevent the subject site from achieving the esplanade treatment (separating that part of the subject site within the Greenspace precinct from urban development) shown on Map 2 - Road Movement Network;**
 - vi. **The proposed development will prevent the subject site from achieving the pedestrian and cycle link shown on Map 3 - Pedestrian/Cycleway and Public Transport Network Plan.**
 - b) **That the proposed development fails to protect the amenity of the residents of the existing dwelling houses on the Park Residential zone land adjoining the structure plan area in that:**
 - iii. **The proposed development includes residential lots within that part of the subject site located within both the Open Space Zone and the Greenspace Precinct (4d Thornlands Creek Corridor);**
 - iv. **The lot sizes proposed are inconsistent with the park residential nature of the adjoining development to the north.**
 - c) **That the proposed development fails to ensure an appropriate level of safety by preventing the provision of a 4 way signalised intersection at the intersection of Cleveland Redland Bay Road, Waterline Boulevard and the Collector Street through the subject site shown on Map 2 - Road Movement Network in the South-East Thornlands Structure Plan; and**

- d) That the development proposes lots with frontages of less than 10m in width (lots 15 to 18 which have frontages of approximately 8.8m) and consequently the development is inconsistent in the zone and in conflict with the Urban Residential Zone Code; and
2. That this report and its attachments remain confidential.

ROL006084 – Attachment 1 – Locality Map



ROL006084 – Attachment 2 – Site Map



To: Acting General Manager EP&D - Gary Photinos

Date: 13 March 2013

From: Service Manager - Planning Assessment - David Jeanes

Author: Senior Planner – Planning Assessment - Janice Johnston

Subject: Possible purchase or acquisition of 289 Redland Bay Road, Thornlands, to facilitate development of the South East Thornlands Structure Plan area

SUMMARY

The South East Thornlands Structure Plan (SETSP) provides regional and strategic solutions to facilitate orderly development. However, certain sites constitute pivotal links in this network for both road and stormwater infrastructure. Without these sites in play, the opportunity for a well planned regional solution is inhibited.

One such site is 289 Redland Bay Road, Thornlands (Lot 5 on RP14839), located to the north of the proposed [redacted] development and across the road from the Heritage development site. This northern site is the key to the development of the [redacted] and Heritage sites because it facilitates the intended intersection onto the major collector road in this location and accommodates a regional stormwater solution.

It is considered that Council should purchase or acquire the property at 289 Redland Bay Road, Thornlands, in order to facilitate timely development of the South East Thornlands Structure Plan area. Agreement is sought from Senior Management to initiate the purchase of the property.

CONSULTATION

Planning Assessment has consulted with Property Services, City Services and the City Planning and Environment Groups regarding the issues raised in this briefing note.

BACKGROUND AND ISSUES

The map below indicates the location of the future roads through this part of the SETSP area. The issues relating to access to the road network are summarised as follows:

- Ausbuild own multiple properties in the central precinct and have indicated that they wish to develop these in the near future. The SET overlay code indicates that the

access points to this central precinct are to be located at 289 Redland Bay Road ([redacted]), and the properties at [redacted]

- The property at 289 Redland Bay Road is in separate ownership and not within the control of any developer. This site contains a small developable area, a portion of the collector street which is to be constructed and the intersection with Redland Bay Road (Intersection A). It also contains a bio-retention basin to capture stormwater from this northern portion of the SETSP area. [redacted] have been unsuccessful in negotiating the purchase this property because of its minimal developable area. It is considered that the best use of the site (from a financial perspective) is as a large, single house lot.

█ has proposed to relocate the intersection with Redland Bay Road, to the property to the South. This is not envisaged by the overlay code and complicates the potential of signalling a future four way intersection (as currently required by the Department of Transport and Main Roads). There are also traffic safety concerns regarding staggered access points if future signalisation of the intersection was to occur.

█ would also need to find an alternative location to direct and treat stormwater if this property, owned by █ remains undeveloped.

- In addition to providing the northern access point into this central precinct, the property at 289 Redland Bay also contains the regional stormwater facility which is to cater for the majority of the █ development site, approximately half of the Finlandia retirement village and the █ site. █ have indicated that their intention is to provide a linear regional stormwater system in the open space zoned area. Given the fall of the land, it is unlikely that this proposed system will be able to cater for flows from the █ property. Depending on the design of the system, additional maintenance costs may be borne by Council if this is adopted as a regional solution, given the linear design and requirement for an additional system to service the █ property.
- Council's property manager has indicated that purchase costs of the property are expected to be approximately █ (this figure is to remain confidential at this stage). If negotiations to purchase the land are unsuccessful, compulsory acquisition may be required. The compulsory acquisition process is likely to take approximately 6 months to complete.
- Funds for purchase of the site could be sourced from the environmental levy. It is noted that the cost to purchase or acquire the land can be offset by the land purchase component of contributions for stormwater drainage, as well as future development potential. For example, the regional stormwater facility on this site has been split into two separate bio filtration basins, one located in the Open Space zone and the other in the Urban Residential zone. It is considered that both basins could be located in the Open Space zoned portion of the site to increase the residential land available for development.

OPTIONS

There are multiple options that Council should consider in relation to the issues raised above, including:

1. Do nothing (which has been the strategy to date). Council could take a firm position, requiring that the site be developed in accordance with the zoning (fixed infrastructure locations) and letting the developers within the SETSP area come to an agreement with the landowner of 289 Redland Bay Road, Thornlands in order to proceed with their proposal. █ has verbally indicated that they have previously tried and cannot reach an agreement with this landholder, so it is likely, if Council chooses this option, that development within the SETSP area will be stalled, temporary access points will be constructed and/or refusals of development applications may end up in appeal.
2. Allow construction of permanent infrastructure solutions which are not in accordance with the SETSP. This would result in a staggered intersection on Cleveland Redland Bay Road. Although this may work from a vehicle movement perspective, it is not ideal in terms of provision of future signalisation and facilitating pedestrian movement across the road to the district park. Additionally, regional stormwater facilities would also be constructed outside of the intended location and may be linear in shape and/or temporary facilities only. Additional maintenance costs could therefore be borne by Council depending on the design and location of the facilities. If these facilities are not accepted as the permanent, regional facility, there would be no credit available to the developer therefore reducing the feasibility of the proposal.
3. Purchase or acquire the entire site at 289 Redland Bay Road (to allow for road and stormwater facility construction). This option would solve the issues of stormwater discharge and road intersection location to facilitate development in accordance with the SETSP. █ would have access to the land to construct both the road (non-trunk) and regional stormwater facility fully within the open space zoning (these would be trunk works therefore creditable to the developer in accordance with the PIP). If this option is taken, costs of purchase could be partially or fully recouped as follows:
 - The PIP includes a 'land cost' for the relevant bio retention basin █ Developer contributions (infrastructure charges levied as part of development approvals), would therefore assist in recovering some of the costs of purchase of this land. Recovery of costs via infrastructure charges is expected to █

- The Urban Residential zoned land at the front of the property could be sold or developed by Council in partnership with Ausbuild;
 - The remainder of the site (zoned Open Space), could be resold as a single dwelling house site with a designated building area, with vegetation protected by zoning or covenant. This would require clearing of a designated building area. It is anticipated that this subdivided block will attract a substantial sale price, notwithstanding the loss of the residential portion.
 - The existing dwelling could be sold for relocation.
4. Purchase or acquire part of the site at 289 Redland Bay Road (to allow for road and stormwater facility construction only). Similar to option 3, this option would solve the issues of stormwater discharge and road intersection location to facilitate development in accordance with the SETSP. The owner of the land would be able to maintain the existing house and land zoned Urban Residential. The cost of purchasing the land would be less than the option above, given that the main developable section of the land is not being purchased. If this option is taken, costs of purchase could be partially recouped as follows:
- The PIP includes a 'land cost' for the relevant bio retention basin [REDACTED]. Developer contributions would therefore assist in recovering some of the costs of purchase of this land;
 - The remainder of the site (zoned Open Space), could be resold as a single dwelling house site with a designated building area, with vegetation protected by zoning or covenant. This would require clearing of the designated building area.

RECOMMENDATION

It is recommended that the Executive Leadership Group be briefed on this matter.

Council officers are of the opinion that the do nothing approach will restrict timely development within the structure plan area. As such, this option is not considered appropriate.

In order to solve both access and stormwater issues, whilst having minimal impact on Council financially (given the ability to resell portions of the land), it is considered that the best option is for Council is to purchase or acquire the entire site at 289 Redland Bay Road.

It is recommended that a report be prepared to Council to commence negotiations with the property owner for the acquisition of this site. The report to include options under section 714 of the Sustainable Planning Act relating to taking of land (compulsory acquisition).

[REDACTED]
Janice Johnston
Senior Planning Officer

NOTED AND AGREED

[REDACTED]
David Seanes
Service Manager – Planning Assessment

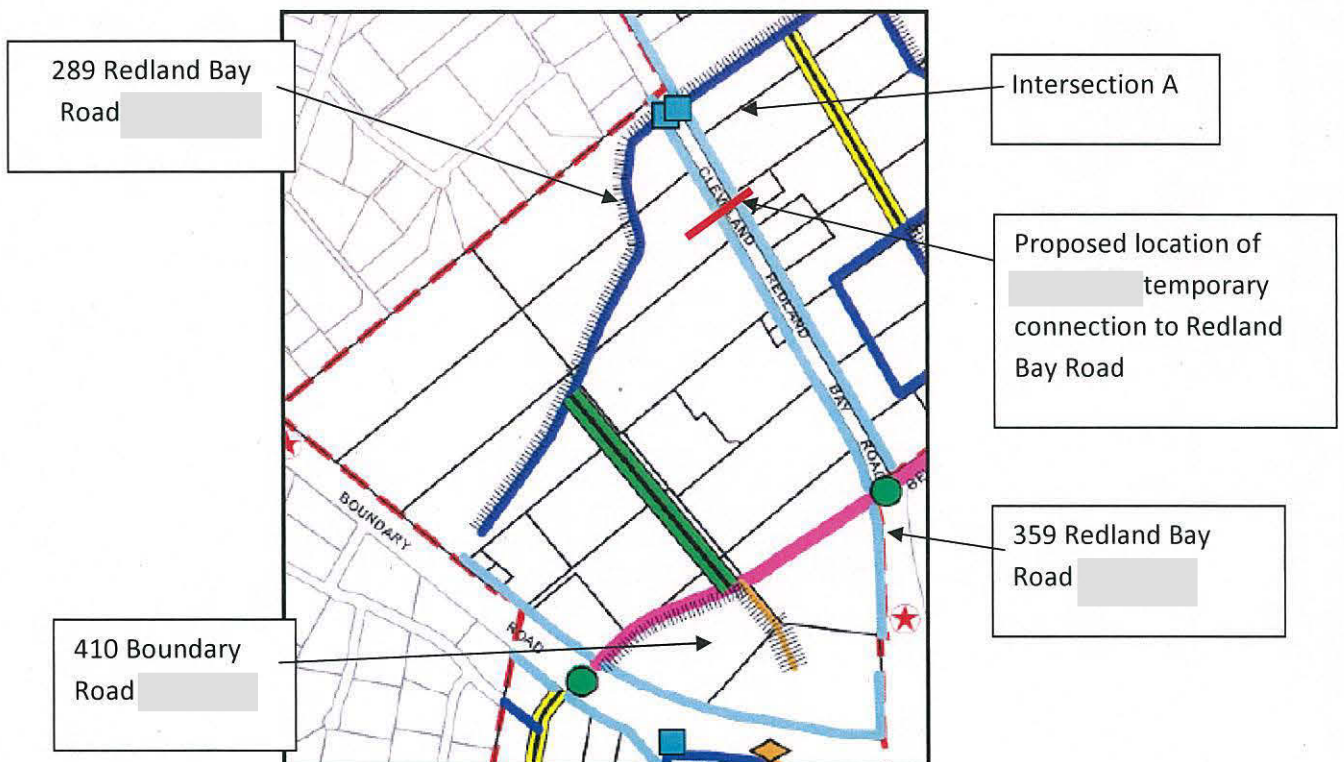
[REDACTED]
Bruce Macnee
Group Manager

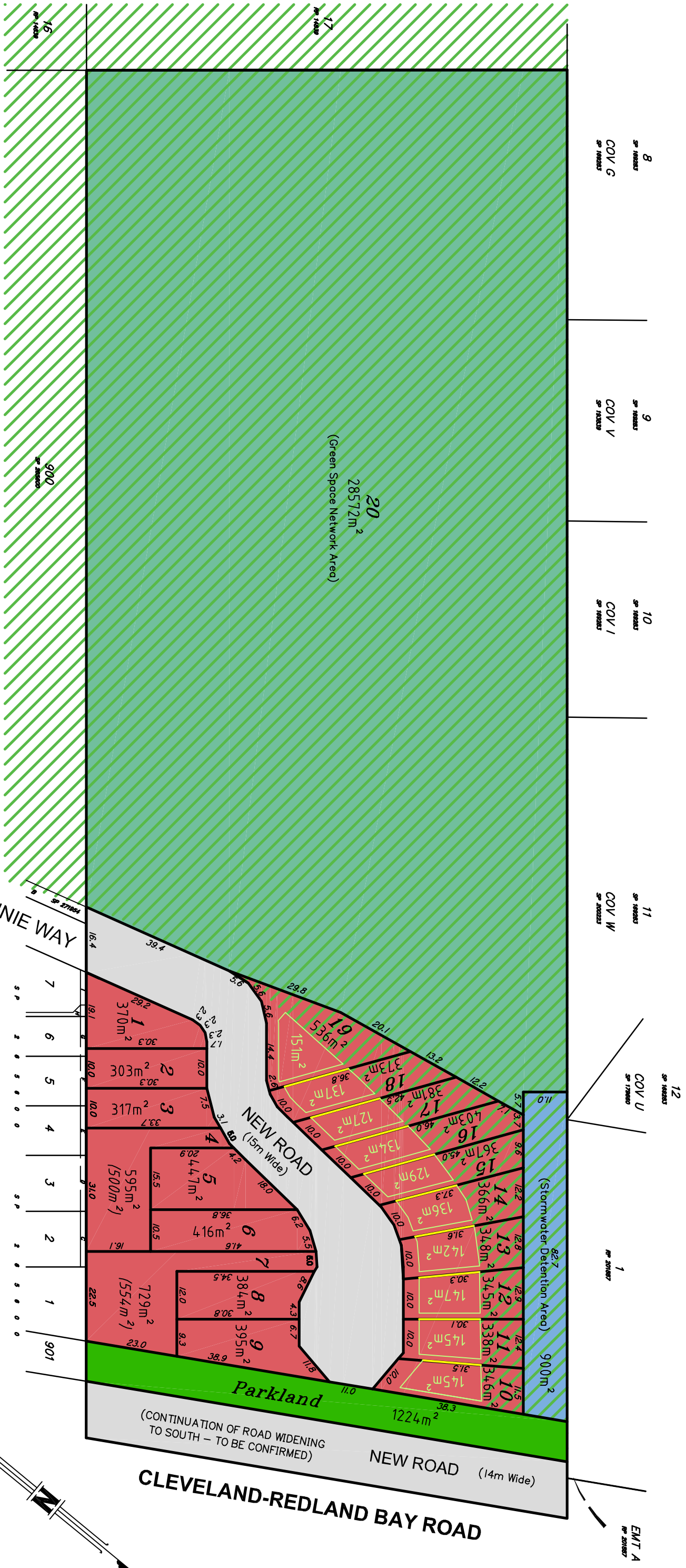
NOTED AND RECOMMENDED

[REDACTED]
Gary Photinos
Acting General Manager

Attachment: Map

**SOUTH EAST THORNLANDS
NORTHERN SITE**





LEGEND

- Single Detached Dwelling (500m²) Lot area excluding access handle.
- Building Envelope (130m²)
- Total Frontage (70)
- Precinct 4d (As taken from page 28 of 05_14 - SET - ADOPTED)
- Zero Lot Line

ARNOLD DEVELOPMENT CONSULTANTS

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 Phone: (07) 4199 6317, Facsimile: (07) 4922 6908

North Queensland: Level 1/25 Sturt Street, Townsville
 Phone: (07) 4722 2721, Facsimile: (07) 4722 2778

DEVELOPMENT SUMMARY

Lot 5	
Site Area (Combined)	4.27 ha
Road Reserve (Approx)	4239m ²
Open Space	30696m ²
Net Developable Area	7759m ²
No. of Lots	19
No. of Dwellings Detached	19
Attached	-
Gross Density = Dwellings/ha	4.45
Net Density = Dwellings/ha	24.5

TITLE

PLAN OF DEVELOPMENT

Residential, Management,
 Green Space Network & New Road

PROJECT
 289-301 Cleveland-Redland Bay Road
 Thornlands
 Lot 5 on RP 14839

CLIENT

Mark Winfield

Scale: 1:1000 @ A3

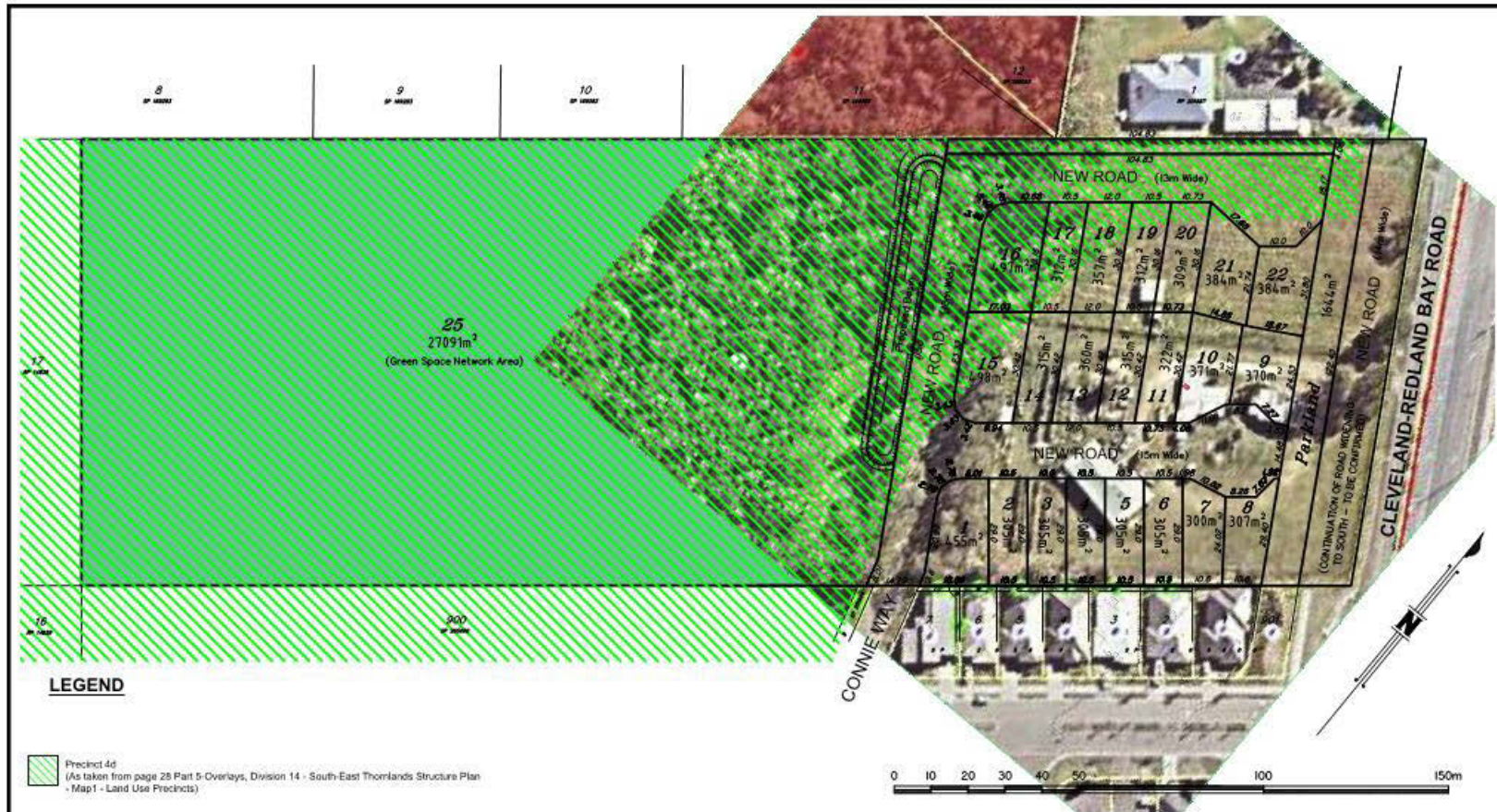
Planner: MGA/ASC

Drawn: DGF/MLT

REVISION: --

PROJECT No.	7092.12_POD	SHEET	1 of 1	DATE	10/08/2016
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ROL006084 – Attachment 5 Plan of Development – Precinct 4d (Greenspace Overlay)



LEGEND

Precinct 4d
(As taken from page 28 Part 5-Overlays, Division 14 - South-East Thorntlands Structure Plan
- Map1 - Land Use Precincts)



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North Queensland: Level 1/25 Sturt Street, Townsville
Phone: (07) 4722 2721, Facsimile: (07) 4722 2778

DEVELOPMENT SUMMARY

	Lot 5
Site Area (Combined)	4.27 ha
Road Reserve (Approx)	6267m ²
Open Space	28735m ²
Net Developable Area	7692m ²
No. of Lots	22
No. of Dwellings	25
Detached	19
Attached	6
Gross Density = Dwellings/ha	5.85
Net Density = Dwellings/ha	32.5

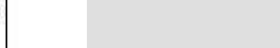
TITLE

PLAN OF DEVELOPMENT

Residential, Management,
Green Space Network & New Road

PROJECT
289-301 Cleveland-Redland Bay
Road
Thorntlands
Lot 5 on RP 14839

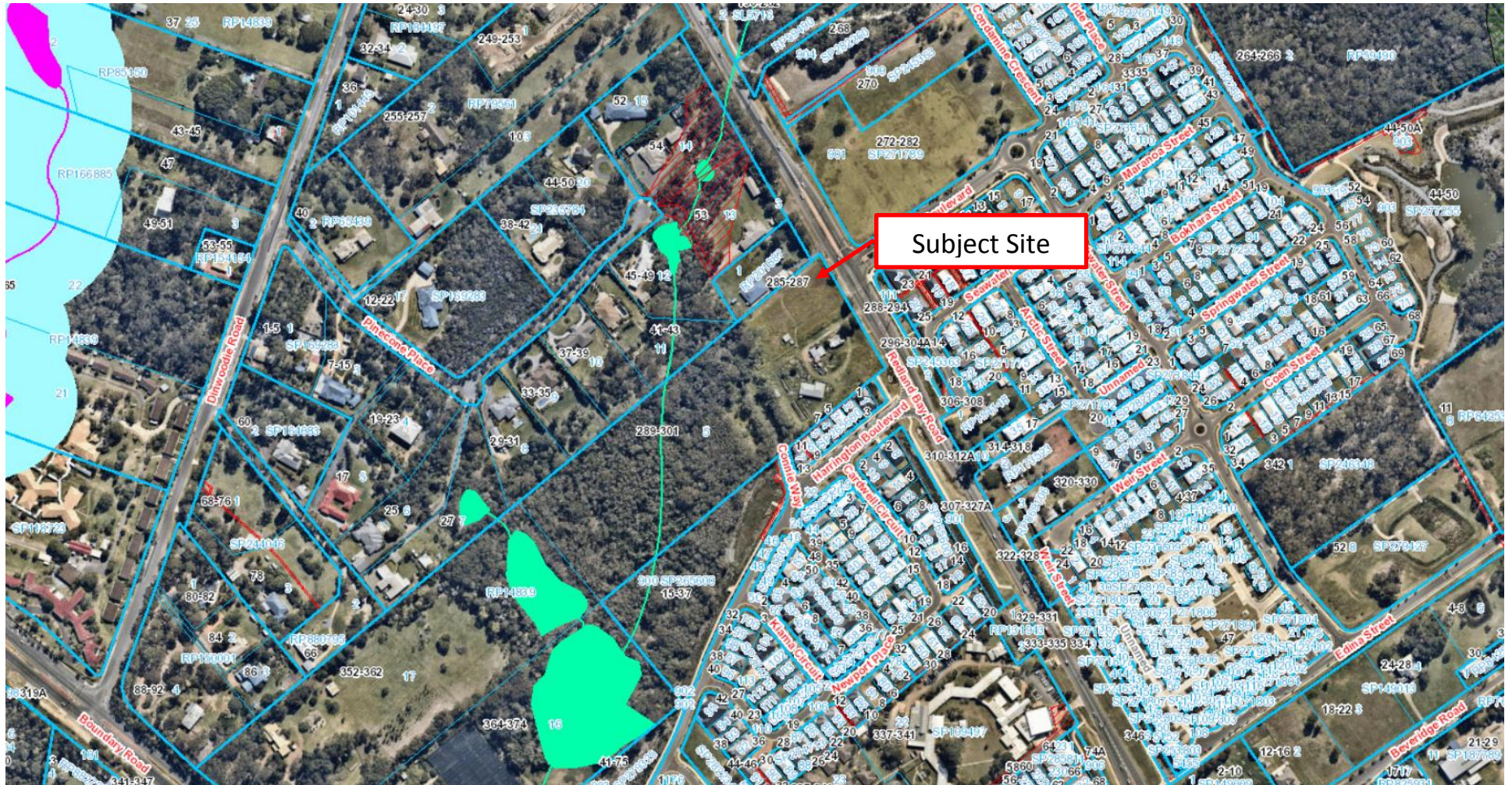
CLIENT



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Planner: MGA/SC	--
Drawn: DGF/MLT	

PROJECT No. 7092.10_AER	SHEET 1 of 1	DATE 09/03/2017
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Attachment 6 Thornlands Creek Corridor





Department of Infrastructure,
Local Government and Planning

Our reference: SDA-0916-033946
Council reference: ROL006084

25 August 2017

The Chief Executive Office
Redland City Council
PO Box 21
CLEVELAND QLD 4163

Dear Sir/Madam

Amended concurrence agency response – with conditions

289-301 Redland Bay Road, Thornlands QLD 4164 - Lot 5 on RP14839
(Given under section 290(1)(b) of the *Sustainable Planning Act 2009*)

The Department of Infrastructure, Local Government and Planning (the department) issued a concurrence agency response under section 285 of the *Sustainable Planning Act 2009* (the Act) on 25 October 2016. On 4 August 2017 the department received representations from the applicant requesting that the department amend its concurrence agency response under section 290(1)(b)(i) of the Act.

The department has considered the written representations and agrees to issue the following amended concurrence agency response.

Applicant details

Applicant name: Australian Innovation Centre Pty Ltd c/- Arnold Development Consultants

Site details

Street address: 289-301 Redland Bay Road, Thornlands, QLD 4164
Lot on plan: Lot 5 on RP14839
Local government area: Redland City Council

Application details

Proposed development: Development Permit for Reconfiguring a Lot for 1 into 19 lots, new roads, stormwater detention basin and 2 Parks

Original Concurrence Agency Response

Date of original
concurrence agency
decision: 25 October 2016

Original concurrence
agency decision details: Approved subject to conditions

Nature of the changes

The nature of the changes agreed to are:

1. Amendment to condition 1 to appropriately reflect the amended Environmental Noise Impact Assessment Report and the amended Site Based Stormwater Management Plan.
2. Amendment to condition 2 to appropriately reflect the amended Environmental Noise Impact Assessment Report.

An amended concurrence agency response for this request is attached.

For further information, please contact Fraser Gassman, Senior Planning Officer, on (07) 5644 3216 or via email GCSARA@dilgp.qld.gov.au who will be pleased to assist.

Yours sincerely



Adam Norris

A/Manager – Planning and Development Services – SEQ South

cc: Australian Innovation Centre Pty Ltd c/- Arnold Development Consultants, cathy.boyle@adcqld.com.au

enc: Attachment 1—Amended conditions to be imposed
Attachment 2—Reasons for decision to impose conditions
Attachment 3—Further advice
Attachment 4—Amended approved plans and specifications
Attachment 5—Applicant written agreement to amended concurrence agency response

Our reference: SDA-0916-033946
Council reference: ROL006084

Amended concurrence agency response

(Given under section 290 of the *Sustainable Planning Act 2009*)

Applicant details

Applicant name: Australian Innovation Centre Pty Ltd c/- Arnold Development Consultants

Applicant contact details: PO Box 1968
MILTON QLD 4064
cathy.boyle@adcqld.com.au

Site details

Street address: 289-301 Redland Bay Road, Thornlands, QLD 4164

Lot on plan: Lot 5 on RP14839

Local government area: Redland City Council

Application details

Proposed development: Development Permit for Reconfiguring a Lot for 1 into 19 lots, new roads, stormwater detention basin and 2 Parks)

Referral trigger

The development application was referred to the department under the following provisions of the *Sustainable Planning Regulation 2009*:

Referral trigger: Schedule 7, Table 2, Item 2 – State-controlled road

Amended Conditions

Under section 287(1)(a) of the Act, the amended conditions set out in Attachment 1 must be attached to any development approval.

Reasons for decision to impose conditions

Under section 289(1) of the Act, the department must set out the reasons for the decision to impose conditions. These reasons are set out in Attachment 2.

Further advice

Under section 287(6) of the Act, the department offers advice about the application to the assessment manager—see Attachment 3.

Amended approved plans and specifications

The department requires that the following amended plans and specifications set out below and in Attachment 4 must be attached to any development approval.

Drawing/Report Title	Prepared by	Date	Reference no.	Version/Issue
Aspect of development: Reconfiguring a Lot – Subdivision				
Environmental Noise Impact Assessment	CRG Acoustics	7 August 2017	16057	Revision 1
Site Based Stormwater Management Plan	DNBS Consulting Engineers	10 August 2017	2016030	Issue 4

Our reference: SDA-0916-033946
 Council reference: ROL006084

Attachment 1—Conditions to be imposed

No.	Conditions	Condition timing
Development Permit for Reconfiguring a Lot		
Schedule 7, Table 2, Item 2 – State-controlled road—Pursuant to section 255D of the <i>Sustainable Planning Act 2009</i> , the chief executive administering the Act nominates the Director-General of the Department of Transport and Main Roads to be the assessing authority for the development to which this development approval relates for the administration and enforcement of any matter relating to the following condition(s):		
1.	The development must be in accordance with the <i>Site Based Stormwater Management Plan</i> , prepared by DNBS Consulting Engineers, dated 10 August 2017, reference 2016030, Issue 4.	At all times
2.	<p>The development must be in accordance with the Report <i>Environmental Noise Impact Assessment</i>, prepared by CRG Acoustics, dated 7 August 2017, reference 16057, Revision 1 in particular:</p> <ul style="list-style-type: none"> • Section 6.1 Acoustic Barrier Treatment Recommendations • Appendix A – Sketch No.1: Development Layout and Recommended Acoustic Barrier (Not to Scale) 	Prior to submitting the Plan of Survey to the local government for approval and to be maintained at all times.
3.	<p>a) The existing vehicular property access located between the subject site and Cleveland Redland Bay Road must be permanently closed and removed.</p> <p>b) The existing pipe crossing must be removed and the grass between the pavement edge and the property boundary must be reinstated in accordance with the appropriate Redland City Council's verge and shoulder profiles.</p>	Prior to submitting the Plan of Survey to the local government for approval.

Our reference: SDA-0916-033946
Council reference: ROL006084

Attachment 2—Reasons for decision to impose conditions

The reasons for this decision are:

- To ensure the road works on, or associated with, the state-controlled road network are undertaken in accordance with applicable standards.
- To ensure that the impacts of Stormwater events associated with development are minimised and managed to avoid creating any adverse impacts on the state-transport corridor.
- To ensure the development is carried out generally in accordance with the plans of development submitted with the application.

Our reference: SDA-0916-033946
Council reference: ROL006084

Attachment 3—Further advice

Approval for Access and Access Works	
1.	<p>Under sections 62 and 33 of the <i>Transport Infrastructure Act 1994</i>, written approval is required from the Department of Transport and Main Roads to obtain access to a State-controlled road and to carry out road access works within the State-controlled road reserve.</p> <p>An application for approval can be made by submitting the relevant forms and supporting information to scrcmallocations@tmr.qld.gov.au. Copies of the forms and additional information regarding this process can be obtained from http://www.tmr.qld.gov.au/Community-and-environment/Planning-and-development/Other-matters-requiring-approval.aspx.</p>

Our reference: SDA-0916-033946
Council reference: ROL006084

Attachment 4—Amended approved plans and specifications

PLANS AND DOCUMENTS
referred to in the
DEVELOPMENT APPROVAL



Approval no: SDA-0916-033946

Date: 25 August 2017

Proposed Residential Subdivision
289 to 301 Cleveland Redland Bay Road, Thornlands
(Lot 5 on RP14839)

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

Prepared For:

Arnold Developments Consultants

7 August 2017

crgref: 16057 Report rev.1

1.0 INTRODUCTION

This report is in response to a request by Arnold Development Consultants for an environmental noise assessment of a proposed residential subdivision along Cleveland Redland Bay Road at Thornlands.

This report is a revision to a previous assessment (CRGref: 16057 report dated 17 July 2016) and is required due to amended development plans.

In undertaking the above, unattended road traffic noise measurements were conducted and through modelling; predictions of future road traffic noise immissions were produced. Based upon the predicted noise levels, recommendations regarding acoustic treatment at the site have been provided.

2.0 SITE & DEVELOPMENT DESCRIPTION

The subject site is described as Lot 5 on RP14839, 289 to 301 Cleveland Redland Bay Road at Thornlands. The site is bounded by Cleveland Redland Bay Road to the northeast and residential properties to the northwest, southeast and southwest. For site location refer to Appendix A.

A recently completed residential subdivision (“Esperance”) is located to the immediate southern boundary, which has an acoustical barrier of approximately 3.4m above natural ground, with the land raised on fill by approximately 1m. The recently completed “Waterline” residential estate is located directly across Cleveland Redland Bay Road (refer to the attached photographs in Appendix A).

The proposal is to subdivide that land to yield nineteen (19) residential lots (Lots 1 to 19). For development plans refer to Appendix B.

As the proposal is constructing a noise sensitive use in proximity to Cleveland Redland Bay Road; the development is required to be assessed under the State Assessment Referral Agency (SARA) Module 1 “*Community Amenity: 1.1 managing noise and vibration impacts from transport corridors state code*” and also the Department of Transport and Main Roads’ (DTMR) “*Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure Version 2, 10 May 2013*”.

The development is also required to be assessed in accordance with Part 5, Division 10 of Redland Shire Council’s Planning Scheme Policy, “*Road and Rail Noise Impacts Overlay*”.

Further, under the Queensland Government’s SPP Interactive Mapping System the north-eastern end of the site (within 100m of the nearest line marking of Cleveland Redland Bay Road) is located within Transport Noise Corridor (refer to Attachment A in Appendix A for Categories); hence building shell treatments are required for all habitable rooms of affected future lots in accordance with the Queensland Development Code “*Mandatory Part 4.4 – buildings in transport noise corridors*”.

This assessment provides specific Noise Categories for all of the proposed lots within 100m of the nearest line marking of Cleveland Redland Bay Road based upon 3D noise modelling which is an alternate solution to applying the blanket Noise Category Classification as detailed in the Development Code MP 4.4. This revised Noise Category classifications would apply once dwelling designs have been determined.

3.0 AMBIENT NOISE SURVEY

3.1 Instrumentation

The following equipment was used to record ambient noise levels at the subject site locale.

- Rion NC 73 Calibrator; and
- Rion NL 21 Environmental Noise Logger.

All instrumentation used in this assessment hold current calibration certificates from a certified NATA calibration laboratory.

3.2 Unattended Measurement Methodology

The logger was located to the immediate north of the subject site, at 275 – 289 Cleveland – Redland Bay Road, fronting Cleveland Redland Bay Road. The microphone was located in a free-field location approximately 1.4m above ground and 17m from the nearest lane of Cleveland Redland Bay Road. For logger location, refer to Figure 5 in Appendix A of this report.

The logger was set to record noise statistics in 15 minute blocks continually between Thursday 19/05/2016 and Thursday 26/05/2016.

All noise measurements were conducted generally in accordance with Australian Standard AS 1055:1997 – “Acoustics-Description and measurement of environmental noise” and AS 2702 – 1984 “Acoustics – Methods for the Measurement of Road Traffic Noise”. The operation of the sound level equipment was field calibrated before and after the measurement session and was found to be within 0 dB of the reference signal.

Daily weather observations were obtained from the Bureau of Meteorology’s website from the Redlands weather station (refer to Appendix C of this report for results). Weather conditions during the noise monitoring period were fine, with temperatures between approximately 10 and 27°C and relative humidity ranging between 32 and 78%.

3.3 Unattended Measurement Results

Table 1 below presents the measured ambient noise levels at the logger location. Graphical presentation of the measured levels is presented in the Appendix C to this report.

Descriptor	Time period	Measured level dB(A)			
		23/05/16	24/05/16	25/05/16	Average
Road Traffic Noise Descriptors					
L ₁₀ 18hr	6am to Midnight	63	64	63	63
L _{max} (10pm to 6am)	10pm to 6am	76	75	75	75
L ₁₀ 12hr	6am to 6pm	65	65	65	65
L _{eq} 1hr Daytime	6am to 10pm	63	63	63	63
L _{eq} 1hr Night time	10pm to 6am	61	59	60	60
L ₉₀ 18hr	6am to Midnight	46	48	48	48
L ₉₀ 8hr	10pm to 6am	33	34	34	34

Table 1: Measured ambient noise levels at the logger location.

4.0 NOISE CRITERIA

As Cleveland – Redland Bay Road is controlled by the State Government, the development is required to be assessed in accordance with the requirements of the State Assessment Referral Agency (SARA) Module 1 “Community Amenity: 1.1 managing noise and vibration impacts from transport corridors state code” and also the Department of Transport and Main Roads’ (DTMR) “Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure Version 2, 10 May 2013”. For road traffic noise in the year 2027 (ten years after the completion of the development) the following noise criterion applies:

Table 1.1.2: Reconfiguring a lot

Performance outcomes	Acceptable outcomes
Future anticipated accommodation activity near a state-controlled road or type 1 multi-modal corridor	
<p>PO1 Development involving land where a future anticipated accommodation activity is made exempt or self-assessable development under a local planning instrument is to achieve acceptable noise levels for residents and visitors by mitigating adverse impacts on the development site from noise generated by a <u>state-controlled road</u> or a <u>type 1 multi-modal corridor</u>.</p>	<p>AO1.1 Land for a future anticipated accommodation activity exposed to noise from a <u>state-controlled road</u> or <u>type 1 multi-modal corridor</u> meets the following external noise criteria at the building envelope or if the building envelope is unknown, the deemed-to-comply setback distance for buildings stipulated by the <u>local planning instrument</u> or relevant building regulations#:</p> <p>(1) ≤ 57 dB(A) L_{10} (18 hour) free field (measured L_{90} (18 hour) free field between 6 am and 12 midnight ≤ 45 dB(A))</p> <p>(2) ≤ 60 dB(A) L_{10} (18 hour) free field (measured L_{90} (18 hour) free field between 6 am and 12 midnight > 45 dB(A)).</p>
Noise barriers or earth mounds	
<p>PO4 Noise barriers or earth mounds erected to mitigate noise from transport operations and infrastructure are designed, sited and constructed to:</p> <ol style="list-style-type: none"> maintain safe operation and maintenance of <u>state transport infrastructure</u> minimise impacts on surrounding properties complement the surrounding local environment maintain fauna movement corridors where appropriate. 	<p>AO4.1 Where adjacent to a <u>state-controlled road</u> or a <u>type 1 multi-modal corridor</u>, noise barriers and earth mounds are designed, sited and constructed in accordance with Chapter 7 Integrated Noise Barrier Design of the <i>Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise</i>, Department of Transport and Main Roads, 2013.</p> <p>OR</p> <p>AO4.2 Where adjacent to a <u>railway</u> or a <u>type 2 multi-modal corridor</u>, noise barriers and earth mounds are designed, sited and constructed in accordance with the <i>Civil Engineering Technical Requirement – CIVIL-SR-014 Design of noise barriers adjacent to railways</i>, Queensland Rail, 2011.</p> <p>OR</p> <p>AO4.3 No acceptable outcome is prescribed for noise barriers and earth mounds adjacent to a <u>busway</u> or <u>light rail</u>.</p>

Table 2: Extract of the relevant noise criterion from SARA.

Transport infrastructure	Development type	Location within Development	Environmental criteria
State-controlled road OR Multi-modal corridor which does not include a railway or includes <15 single railway events	Accommodation activities Residential care facilities	All facades	≤ 60 dB(A) L_{10} (18hr) facade corrected (measured L_{90} (8hr) free field between 10pm and 6am ≤ 40 dB(A))
			≤ 63 dB(A) L_{10} (18hr) facade corrected (measured L_{90} (8hr) free field between 10pm and 6am > 40 dB(A))
		Private open space	≤ 57 dB(A) L_{10} (18hr) free field (measured L_{90} (18hr) free field between 6am and midnight ≤ 45 dB(A))
			≤ 60 dB(A) L_{10} (18hr) free field (measured L_{90} (18hr) free field between 6am and midnight > 45 dB(A))
	Passive recreation areas	≤ 63 dB(A) L_{10} (12hr) free field (between 6am and 6pm)	

Table 3: Extract of the relevant noise criterion from the DTMR.

Part 5, Division 10 of Redland Shire Council’s Planning Scheme Policy, “Road and Rail Noise Impacts Overlay” also provides road traffic noise criterion to be applied to new residential developments.

Measurement Location	Design Level Noise Criteria - See Notes
For - Aged Persons and Special Needs Housing, Apartment Building, Bed and Breakfast, Display Dwelling, Dual Occupancy, Dwelling House, Mobile Home Park or Multiple Dwelling.	
1 metre in front of the building facade to a habitable room ¹ at a height corresponding to 1.5 metres above the finished floor level These measures do not apply to upper levels. See Notes	<p><u>For a State-controlled road -</u></p> <p>(1) Comply with the external noise criteria specified in Section B6 of the <i>Road Traffic Noise Management Code of Practice</i> (Queensland Department of Main Roads) -</p> <p>(a) 63 dB(A) $L_{A10(18\text{hour})}$ or less, where the $L_{A90(8\text{ hour})}$ between 10pm and 6am is greater than 40 dB(A); or</p> <p>(b) 60 dB(A) $L_{A10(18\text{hour})}$ or less, where the $L_{A90(8\text{ hour})}$ between 10pm and 6am is less than or equal to 40 dB(A).</p> <p><u>For all other roads -</u></p> <p>(1) Comply with Schedule 1 of the <i>Environmental Protection (Noise) Policy 1997</i> -</p> <p>(a) 63 dB(A) assessed as the $L_{A10(18\text{ hour})}$ level;</p> <p>(b) 60 dB(A) assessed as the highest 1 hour equivalent continuous A-weighted sound pressure level between 10.00pm and 6.00am;</p> <p>(c) 80 dB(A) assessed as a single event maximum sound pressure level.</p>
Inside bedrooms of a proposed dwelling unit ¹	(1) Average $L_{Amax(10\text{pm}-6\text{am})}$ not greater than 50 dB(A); (2) $L_{Aeq(1hr)(10\text{pm}-6\text{am})}$ - not greater than 35 dB(A)
Inside living rooms of a proposed dwelling unit ¹	(1) $L_{Aeq(1hr)(6\text{am}-10\text{pm})}$ - not greater than 40 dB(A)
At the private open space area of the dwelling unit ¹	(1) $L_{Aeq(1hr)(6\text{am}-10\text{pm})}$ not greater than 55 dB(A)
Balance of external site area, excluding private open space area and identified setback or buffer area	(1) 63 dB(A) assessed as the $L_{10(18\text{ hour})}$ level
For - Community Facility, Education Facility, Child Care Centre, Commercial uses, Industrial uses, Institution or Place of Worship	
Inside common areas of buildings associated with the use	(1) In accordance with the recommended design sound levels specified in Table 1 of the <i>Australian Standard 2107 - 2000: Acoustics - Recommended Design Sound Level and Reverberation Time for Building Interiors</i> .

Table 4: Extract of the relevant noise criterion from Redland Shire Council.

Given that future lots within 100m of the nearest line marking of Cleveland Redland Bay Road are located within a Transport Noise Corridor (refer to Attachment A in Appendix A), building shell treatments are required for habitable rooms of the future lots in accordance with the Queensland Development Code (QDC) “Mandatory Part 4.4 – buildings in transport noise corridors”.

Based upon the above measured background noise levels (refer to Table 1 in Section 3.3), the following traffic noise criterion applies:

External Noise Criterion	Private Open Space:	60 dB(A) $L_{10\ 18\text{hr}}$ free-field. 55 dB(A) $L_{eq\ 1\text{hr}}(6\text{am}-10\text{pm})$.
	Passive Recreation:	63 dB(A) $L_{10\ 12\text{hr}}$ free-field.
	Building Façades:	60 dB(A) $L_{10\ 18\text{hr}}$ façade corrected.
Internal Noise Criterion:	QDC MP4.4.	

5.0 PREDICTED NOISE IMPACTS

5.1 Road Traffic Volumes

The current year 2015 and predicted year 2025 traffic volumes for Cleveland Redland Bay Road, including the percentage of heavy vehicles, were obtained from the Queensland Government's SPP Interactive Mapping System (refer to Attachment B in Appendix A). The predicted volumes for years 2016 and 2027 assume a 1% compound growth per annum sourced from the Queensland Government's SPP Interactive Mapping System. For modelling purposes, the 18 hour volumes are assumed to be equal to 95% of the 24 hour volumes.

Surveyed 2013 Traffic Volume:	17,414 vehicles per 24 hour, 3.04% heavy vehicles
Predicted 2016 Traffic Volume:	17,942 vehicles per 24 hour, 3.04% heavy vehicles
Predicted 2025 Traffic Volume:	19,623 vehicles per 24 hour, 3.04% heavy vehicles
Predicted 2027 Traffic Volume:	20,017 vehicles per 24 hour, 3.04% heavy vehicles

5.2 Modelled Road Traffic Noise Levels – Existing Year 2016 Situation

Road traffic noise predictions were conducted using PEN3D, a CoRTN based model acceptable under the Environmental Protection (Noise) Policy. To verify the road traffic noise prediction model, the existing $L_{A10\ 18hr}$ traffic noise level was calculated for the logger locations and compared to the measured noise level. The calculated existing $L_{A10\ 18hr}$ noise level, approximately 17m from the nearest lane of Cleveland Redland Bay Road is 63.6 dB(A). Compared with the measured level of 63.4 dB(A) is within the allowable 2 dB(A) deviation from measured levels. For PEN3D point calculation results refer to Appendix C.

5.3 Modelled Road Traffic Noise Levels – Ultimate Year 2027 Situation

The following parameters were also used in developing the PEN3D model for the development site:

- 2.5 dB façade correction at building façade receiver locations.
- 70 km/hr posted speed limit on the Cleveland Redland Bay Road.
- Stone mastic asphalt road surface (-1.0 dB road surface correction).
- ARRB correction for Australian conditions of -1.7 dB at façade and -0.7 dB free-field.
- Sub-division plan including existing and finished ground levels for the site provided by DNBS Consulting Engineers (refer to Appendix B).
- Finished ground levels and acoustic barrier details for the southern adjacent residential subdivision ("Esperance") obtained from Redland City Council's PD Online website.
- Ground floor level private open space receiver heights taken at 1.5m above ground levels.
- Ground floor level building façade receiver heights taken at 1.8m above ground.
- Aboveground first floor level building façade receiver heights taken at 4.6m above ground.
- Assumed building pad levels (refer to Table 5).
- L_{Aeq} levels based on the measured differences between the $L_{A10\ 18hrs}$ level (refer to Table 1).

Road upgrade plans for Cleveland Redland Bay Road were obtained from the plan room of DTMR. We were provided with road upgrade plans to the north of the site (near the Dinwoodie Road intersection), south of the site (near the Beveridge Road intersection) and plans for the recently completed Waterline Boulevard intersection directly adjacent the site.

We were advised that there no available duplication plans for the road corridor directly adjacent the site; therefore, year 2027 modelling assumes that both northbound and southbound lanes will be two lanes (four lanes in total) separated by a 4m wide median strip with the same grade height as the current lanes.

Based upon year 2027 road traffic volumes and the development layout, the PEN3D model predicts road traffic noise levels in Table 5 below, which presents impacts with and without the recommended acoustic barriers detailed in Section 6.1. For PEN3D calculation results refer to Appendix C.

Figures 1 to 3 provide road traffic noise contours across the development with the inclusion of the acoustic barriers detailed in Section 6.1.

NO ACOUSTIC BARRIER CONSTRUCTION

Lot Number	Assumed Pad Level (m)	GROUND LEVELS (Free-field)		ABOVEGROUND LEVELS (Free-field)		GROUND Private Open Space (Free-field)	
		Predicted Year 2027	Predicted Year 2027	Predicted Year 2027	Predicted Year 2027	Predicted Year 2027	Predicted Year 2027
		L ₁₀ 18hr dB(A)	Max. L _{eq} 1hr dB(A)	L ₁₀ 18hr dB(A)	Max. L _{eq} 1hr dB(A)	L ₁₀ 18hr dB(A)	L _{eq} 1hr (6am-10pm) dB(A)
1	11.35	52	52	54	54	52	52
2	11.30	53	53	55	55	52	52
3	11.20	54	54	56	56	53	53
4	11.30	56	56	59	59	55	55
5	11.15	56	56	58	58	54	54
6	11.15	57	57	59	59	56	56
7	11.30	61	61	63	63	59	59
8	11.10	59	59	61	61	58	58
9	11.10	61	61	63	63	61	61
10	11.00	62	62	63	63	61	61
11	11.00	60	60	62	62	59	59
12	11.00	58	58	60	60	56	56
13	11.00	57	57	59	59	54	54
14	11.00	56	56	58	58	53	53
15	11.00	55	55	57	57	53	53
16	11.00	55	55	57	57	52	52
17	11.10	54	54	56	56	52	52
18	11.10	54	54	56	56	51	51
19	11.10	53	53	55	55	51	51

ACOUSTIC BARRIER CONSTRUCTION AS DETAILED IN SECTION 6.1

Lot Number	Assumed Pad Level (m)	GROUND LEVELS (Free-field)		ABOVEGROUND LEVELS (Free-field)		GROUND Private Open Space (Free-field)	
		Predicted Year 2027	Predicted Year 2027	Predicted Year 2027	Predicted Year 2027	Predicted Year 2027	Predicted Year 2027
		L ₁₀ 18hr dB(A)	Max. L _{eq} 1hr dB(A)	L ₁₀ 18hr dB(A)	Max. L _{eq} 1hr dB(A)	L ₁₀ 18hr dB(A)	L _{eq} 1hr (6am-10pm) dB(A)
1	11.35	51	51	53	53	51	51
2	11.30	52	52	54	54	51	51
3	11.20	52	52	55	55	51	51
4	11.30	54	54	59	59	52	52
5	11.15	54	54	57	57	53	53
6	11.15	54	54	59	59	54	54
7	11.30	56	56	63	63	54	54
8	11.10	56	56	61	61	55	55
9	11.10	56	56	63	63	55	55
10	11.00	56	56	63	63	53	53
11	11.00	56	56	62	62	55	55
12	11.00	56	56	60	60	54	54
13	11.00	55	55	58	58	53	53
14	11.00	54	54	57	57	52	52
15	11.00	54	54	57	57	52	52
16	11.00	53	53	56	56	52	52
17	11.10	53	53	56	56	51	51
18	11.10	52	52	55	55	51	51
19	11.10	52	52	54	54	51	51

Table 5: Predicted road traffic noise impacts across the subject site.

Figure 1: Predicted ground floor free-field $L_{A10\ 18hr}$ road noise impacts with barrier construction.

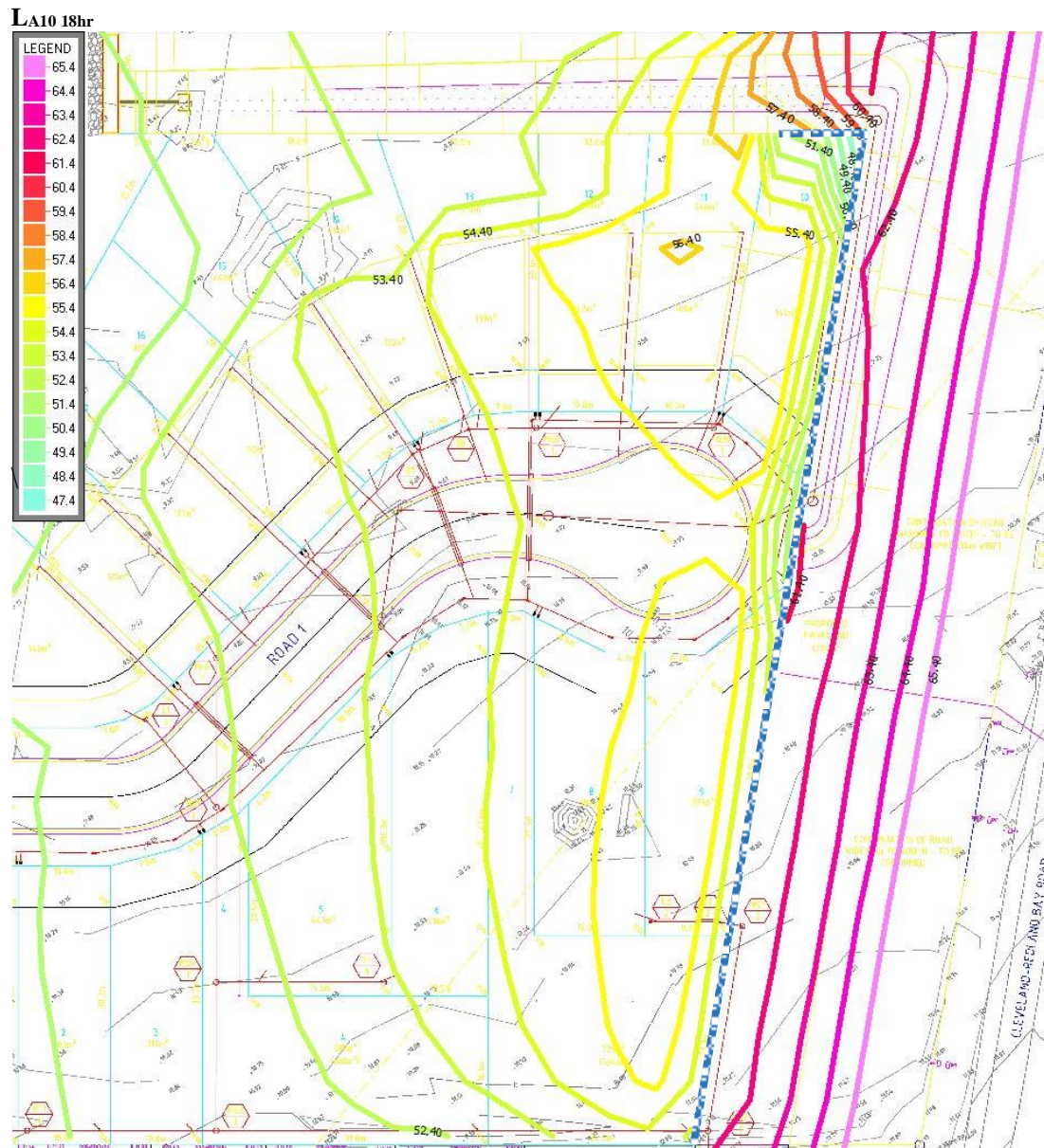


Figure 2: Predicted aboveground floor free-field $L_{A10\ 18hr}$ road noise impacts with barrier construction.

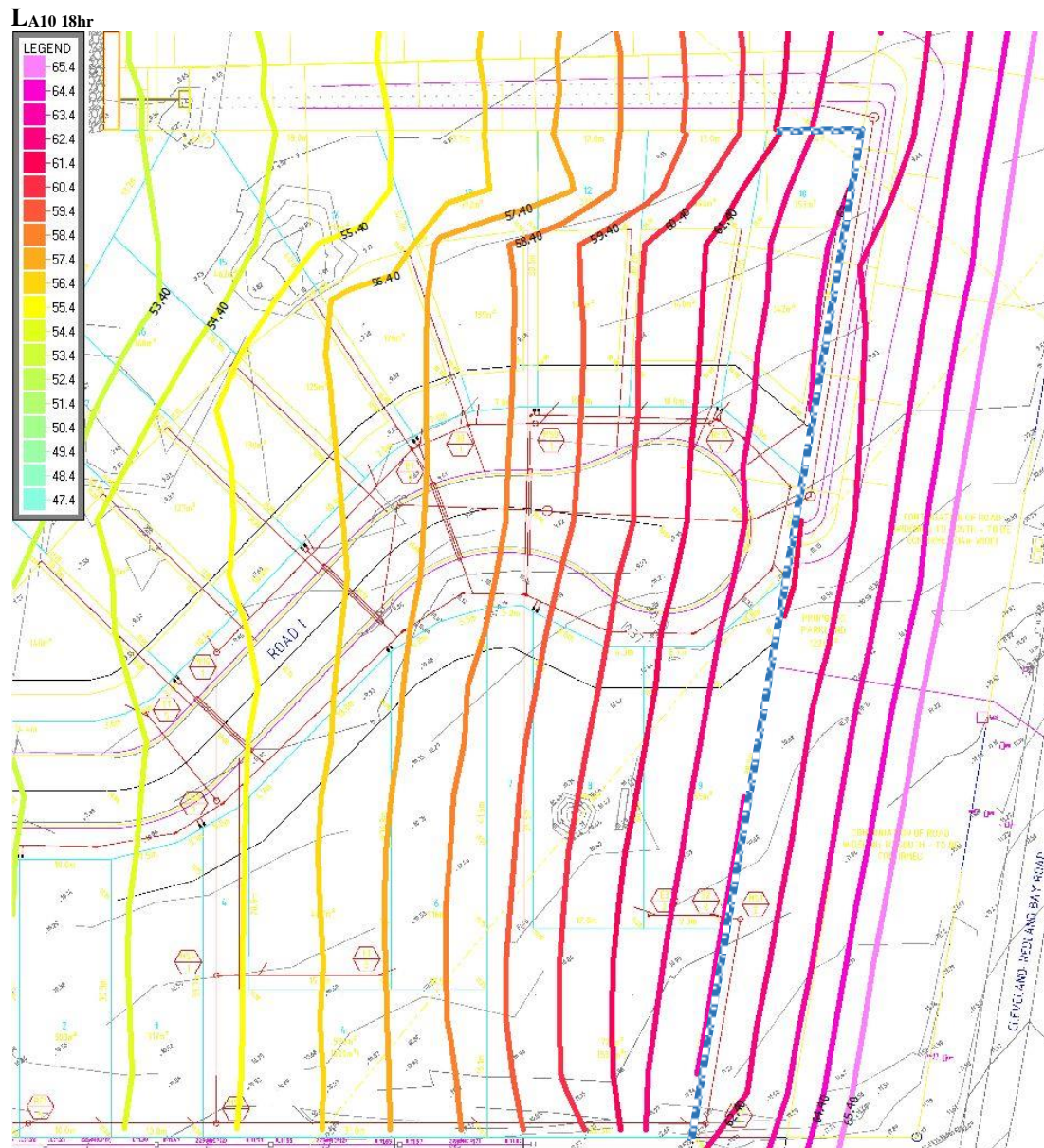
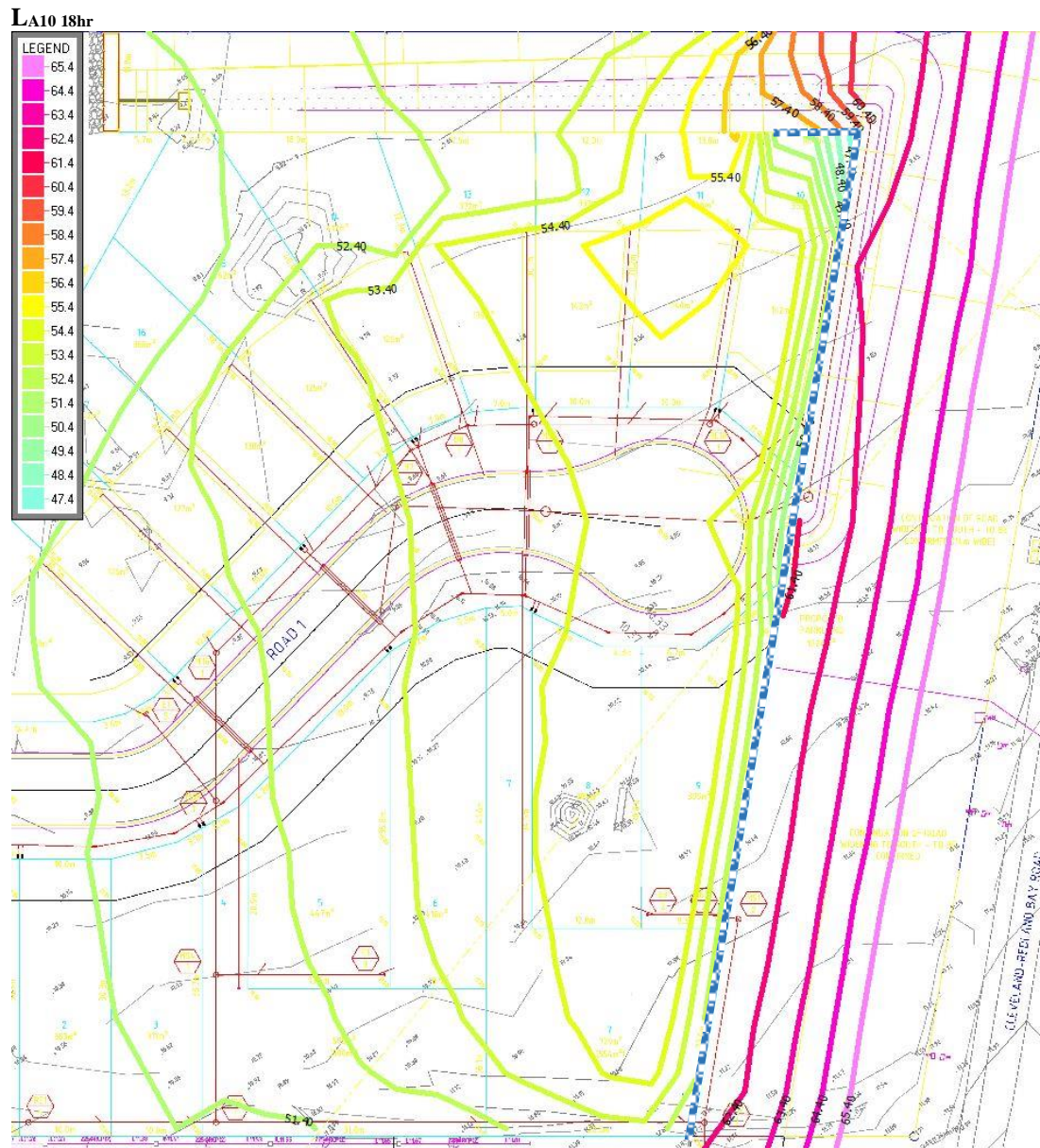


Figure 3: Predicted ground floor free-field $L_{A10\ 18hr}$ private open space road noise impacts with barrier.



6.0 RECOMMENDED ACOUSTIC TREATMENTS

6.1 Acoustic Barrier Treatment Recommendations

We recommend construction of the 2.5m to 4m high acoustic barriers as detailed in Sketch 1 of Appendix A to mitigate road traffic noise impacts at the ground level building façades and outdoor recreation areas of the proposed lots.

Acoustic barriers are to be constructed in accordance with DTMRs' MRTS15 "Noise Fences"; and Chapter 7 of DTMRs' "Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise, November 2013" in accordance with the Acceptable Solution 4.1 of SARA Module 1 "Community Amenity".

6.2 QDC MP4.4 Acoustic Building Shell Treatment Recommendations

The Queensland Development Code "Mandatory Part 4.4 – buildings in transport noise corridors" states the following with regards to acoustic treatments to mitigate road traffic noise:

"The external envelope of each habitable room in a relevant residential building must comply with the minimum R_w^1 for each building component specified in Schedule 1 to achieve a minimum transport noise reduction level for the relevant noise category by:

(a) *using materials specified in Schedule 2 (of the Development Code);*

OR

(b) *using materials with manufacturer's specifications² that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category."*

The predicted Noise Categories for the lots of the proposed development are presented in Table 6 (Columns 4 and 5 of the Table), which have been determined from the façade corrected road traffic noise predictions with construction of the recommended acoustic barrier (Columns 2 and 3).

The specific Noise Categories in Table 6 and the requirements of Schedule 1 of the Development Code (as detailed in Table 7 of this report) should be used in combination to determine the specific building shell treatments for the habitable rooms of the proposed development.

We note that more detailed road traffic noise QDC MP4.4 assessments can also be undertaken once detailed dwelling designs have been finalised so that specific Noise Categories can be determine for each habitable room (i.e. bedrooms and living areas). The opportunity to undertaken such an assessment would typically be alerted to the owner of the purchased lot by the Certifier prior to dwelling construction.

Under the meaning of "Transport Noise Reduction", the Code states that *"the predicted levels of transport noise will be achieved only when doors, windows and other openings in the relevant parts of the building's external envelope are closed"*. It is noted that there are requirements under the Building Code of Australia for ventilation that may need to be reviewed if external openings are closed to exclude road noise intrusion.

¹ R_w means the "Weighted Sound Reduction Index" as specified in ISO 140-3.

² Manufacturers' Specifications means specifications that have been measured in accordance with AS/NZS ISO 717.1 for a material or system and have been approved by a registered testing Authority.

Lot Number	Façade Corrected $L_{10\ 18hr}$ dB(A)		Predicted QDC MP4.4 Noise Categories	
	Ground Floor Levels	Aboveground Floor Levels	Ground Floor Level Noise Category	Aboveground Floor Level Noise Category
1	Beyond 100m from the Nearest Line Marking of Cleveland Redland Bay Road			
2	53	56	0	0
3	54	56	0	0
4	55	60	0	1
5	55	59	0	1
6	56	60	0	1
7	57	65	0	2
8	57	62	0	1
9	57	64	0	2
10	57	65	0	2
11	58	63	1	2
12	58	61	1	1
13	57	60	0	1
14	56	59	0	1
15	55	58	0	1
16	55	58	0	1
17	54	57	0	0
18	54	56	0	0
19	Beyond 100m from the Nearest Line Marking of Cleveland Redland Bay Road			

Table 6: Predicted QDC MP4.4 Noise Categories for the Proposed Lots within 100m of Cleveland Redland Bay Road.

Schedule 1

Noise category	Minimum transport noise reduction (dB (A)) required for habitable rooms	Component of building's external envelope	Minimum R_w required for each component
Category 4	40	Glazing	43
		External walls	52
		Roof	45
		Floors	51
		Entry doors	35
Category 3	35	Glazing	38 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			35 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	47
		Roof	41
		Floors	45
Entry doors	33		
Category 2	30	Glazing	35 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			32 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	41
		Roof	38
		Floors	45
Entry doors	33		
Category 1	25	Glazing	27 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			24 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	35
		Roof	35
Entry Doors	28		
Category 0	No additional acoustic treatment required – standard building assessment provisions apply.		

Table 7: Schedule 1 from the “Mandatory Part 4.4 – buildings in transport noise corridors”.

7.0 DISCUSSION

Based upon the predicted year 2027 road traffic volumes and through 3D traffic noise modelling, road traffic noise impact levels from Cleveland Redland Bay Road at the proposed lots are predicted to be below the SARA and DTMR free-field noise criterion of 60 dB(A) $L_{10\ 18hr}$ at ground level receivers due to the construction of the recommended the 2.5m to 4m high acoustic barriers fronting the road corridor.

Predicted road traffic noise impacts at private open spaces are also within the Council criterion of 55 dB(A) $L_{eq\ 1hr\ (6am - 10pm)}$ at the proposed lots provided the recommended acoustic barriers are constructed.

Road traffic noise levels are predicted to impact habitable rooms at levels above the “*Transport Noise Corridor Category 0*” criterion of 57 dB(A) $L_{A10\ 18hr}$; hence building shell treatments are required in accordance with the Development Code Mandatory Part 4.4. This assessment provides specific Transport Noise Corridor Categories for the proposed lots within 100m of the nearest line marking of Cleveland Redland Bay Road. Determining the specific Category for each habitable room will result in lower levels of acoustic treatments being required compared to applying the blanket Category/s determined through the Queensland Government’s SPP Interactive Mapping System. The revised Noise Category classifications apply to the Building Application stage of the Development.

We note that more detailed road traffic noise QDC MP4.4 assessments can also be undertaken once detailed dwelling designs have been finalised so that specific Noise Categories can be determine for each habitable room (i.e. bedrooms and living areas). The opportunity to undertaken such an assessment would typically be alerted to the owner of the purchased lot by the Certifier prior to dwelling construction.

Under the meaning of “*Transport Noise Reduction*”, the Code states that “*the predicted levels of transport noise will be achieved only when doors, windows and other openings in the relevant parts of the building’s external envelope are closed*”. It is noted that there are requirements under the Building Code of Australia for ventilation that may need to be reviewed if external openings are closed to exclude road noise intrusion.

8.0 CONCLUSIONS

This report is in response to a request by Arnold Development Consultants for an environmental noise assessment of a proposed residential subdivision along Cleveland Redland Bay Road at Thornlands.

This report is a revision to a previous assessment (CRGref: 16057 report dated 17 July 2016) and is required due to amended development plans.

Based upon the assessed subdivision plan, the proposal can be shown to be within acceptable levels of the adopted noise criterion subject to the recommended treatments detailed in Section 6 being incorporated into development.

Report Compiled by:



Matthew Lopez BEng
Consultant

Report Reviewed By:



JAY CARTER BSc
Director

APPENDIX A

Subject Site, Logger Location, Attachments and Recommended Acoustic Barrier Sketch

Figure No. 4: Subject Site and Logger Location (Google Maps).

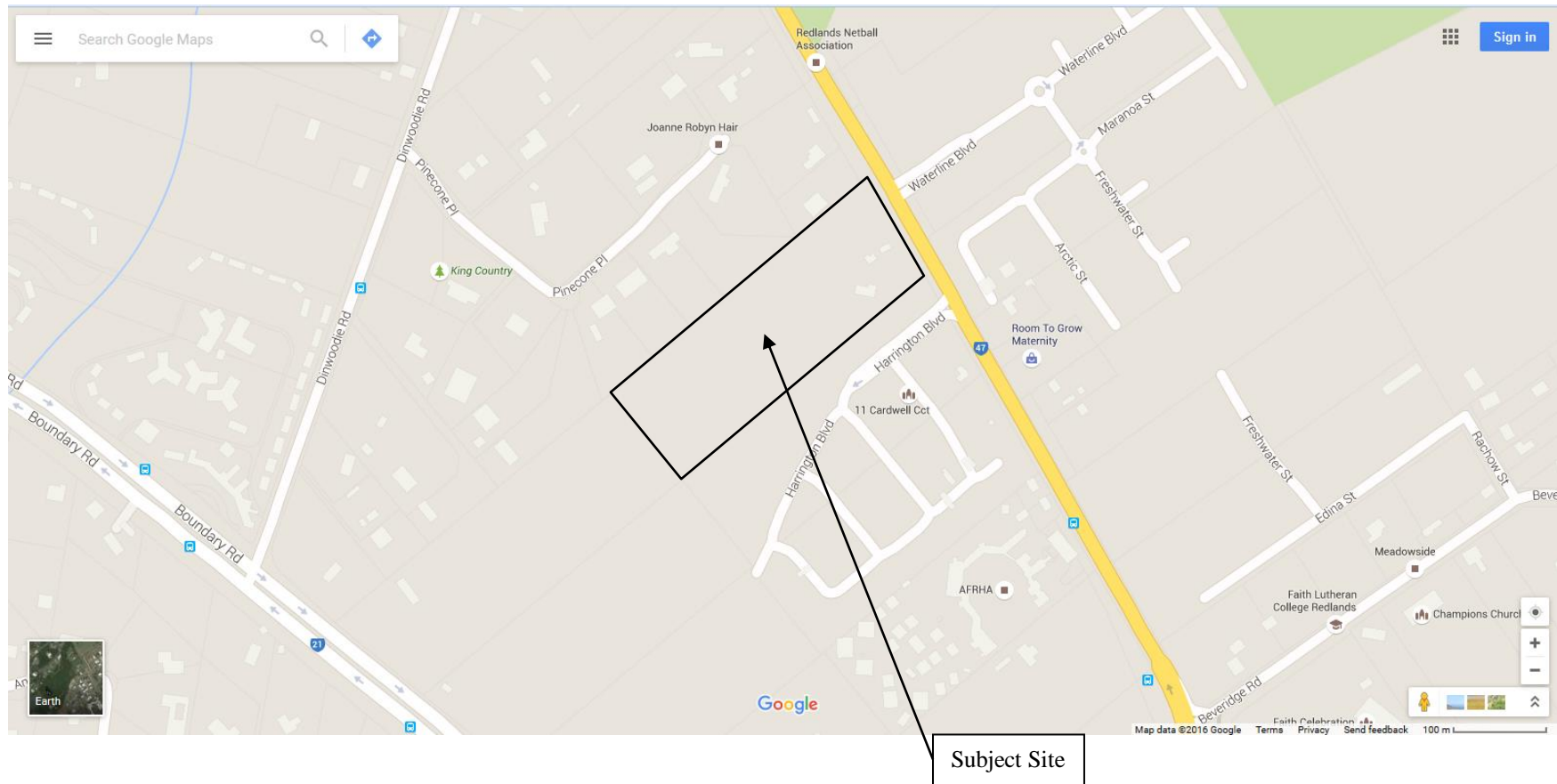


Figure No. 5: Subject Site and Noise Monitoring Location (Google Earth with DNRM QLD Globe Data overlay).



Photograph Sheet 1



Photograph 1: View of “Esperance” barrier fronting Cleveland – Redland Bay Road.



Photograph 2: View of barrier on common boundary of subject site and “Esperance” to the south.



Photograph 3: View looking south with “Esperance” on RHS of photograph.



Photograph 4: View from subject site looking across Cleveland – Redland Bay Road of “Waterline” residential estate.

Attachment A: Results from the Queensland Government's SPP Interactive Mapping System.

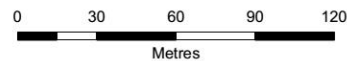


Department of Infrastructure, Local Government and Planning

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State Planning Policy

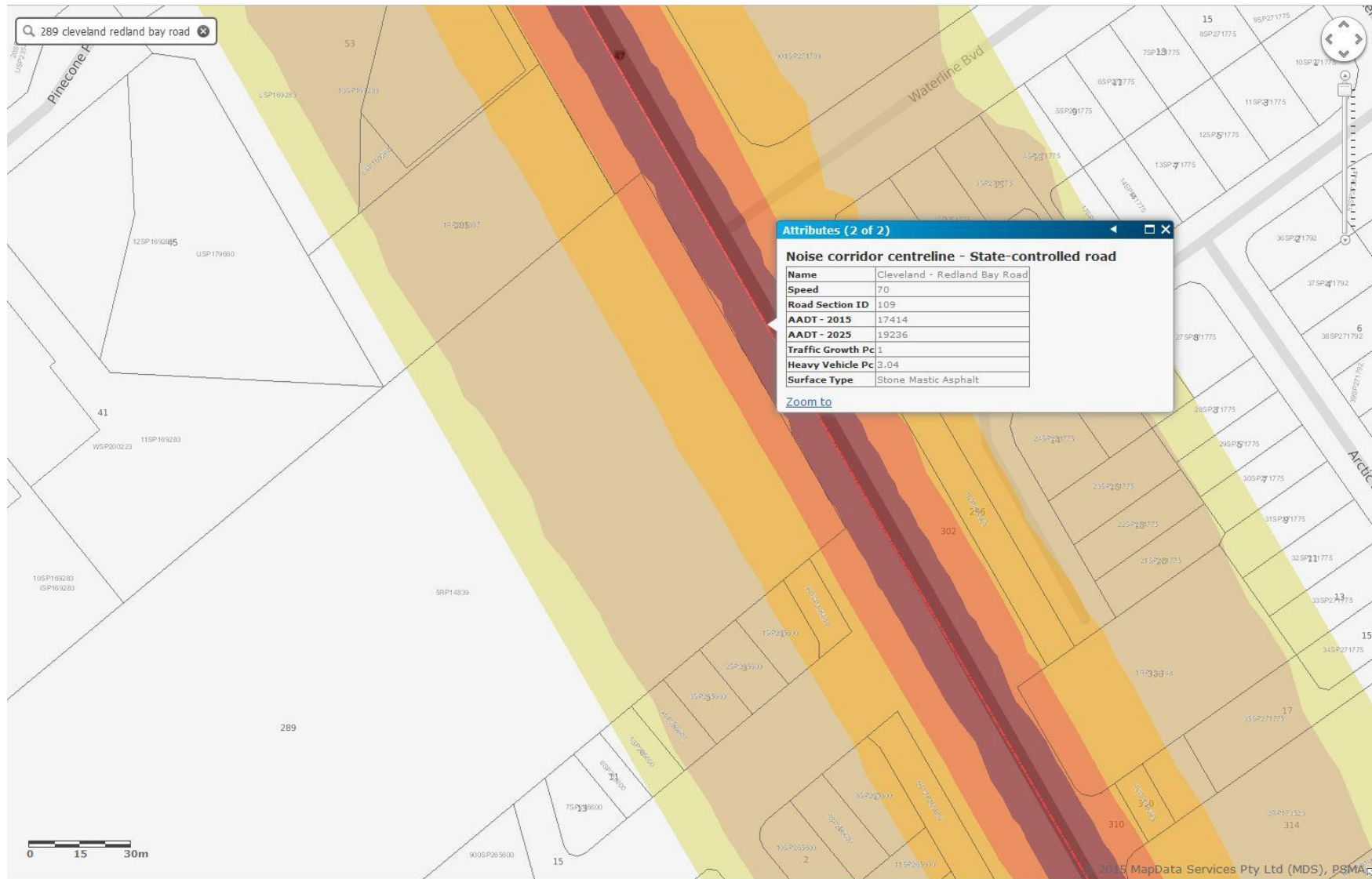
Making or amending a local planning instrument and designating land for community infrastructure



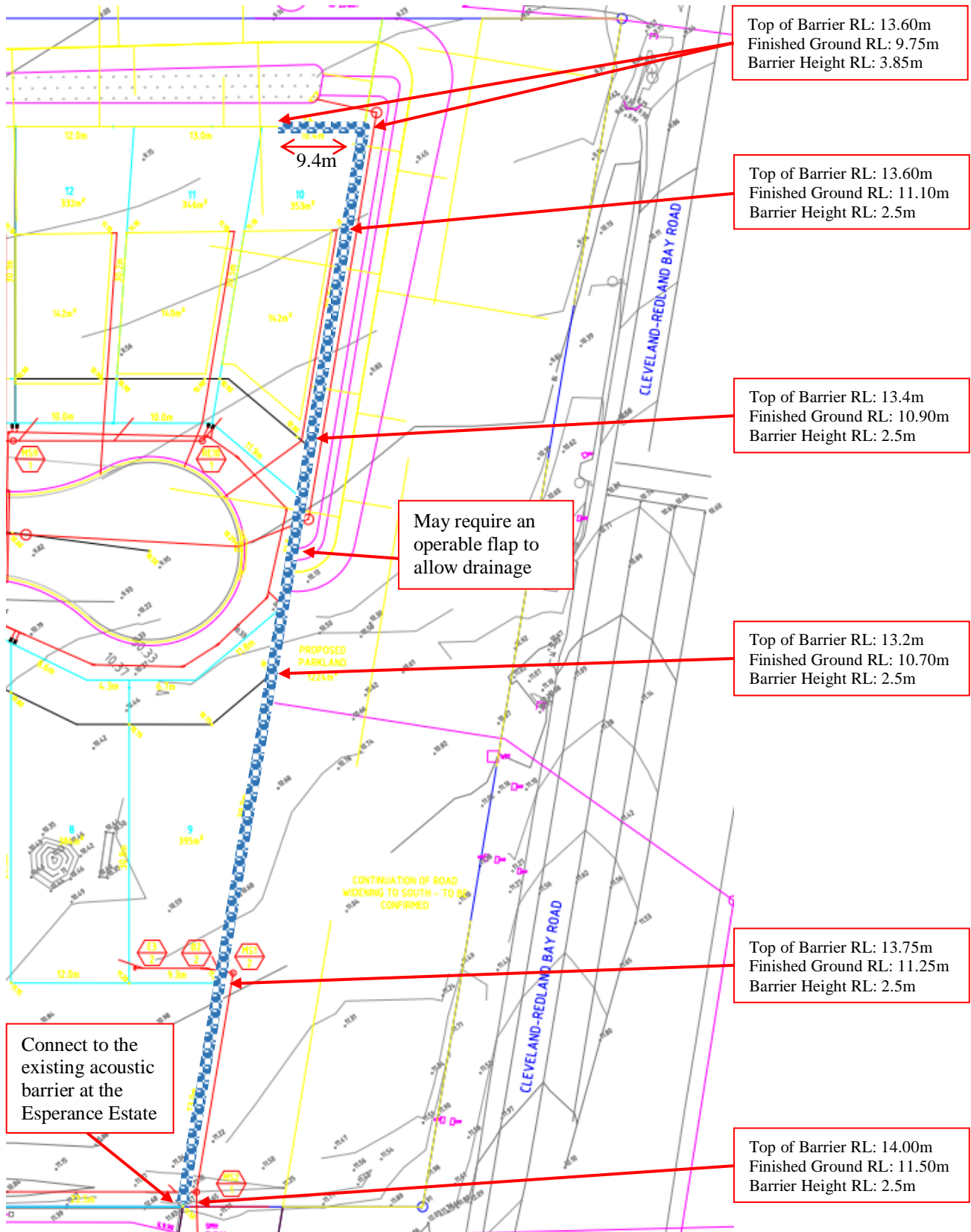
Date: 07/08/2017

Disclaimer: This map has been prepared with due care based on the best available information at the time of publication. However, the State of Queensland (acting through the department) makes no representations, either express or implied, that the map is free from errors, inconsistencies or omissions. Reliance on information contained in this map is the sole responsibility of the user. The State disclaims responsibility for any loss, damage or inconvenience caused as a result of reliance on information or data contained in this map.

Attachment B: Year 2015 and 2025 Traffic Data for the Queensland Government's SPP Interactive Mapping System.



Sketch No.1: Development Layout and Recommended Acoustic Barrier (Not to Scale).

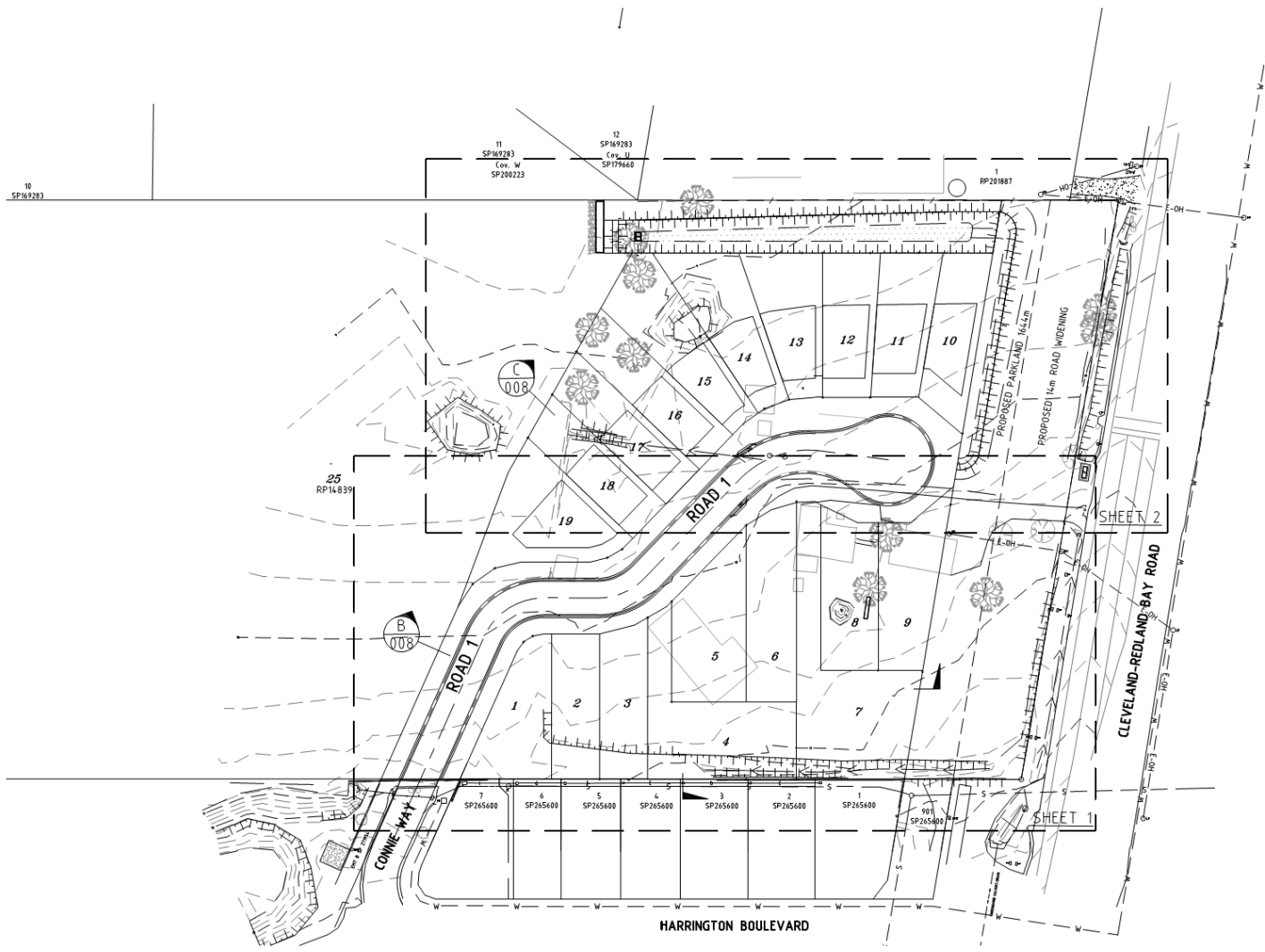


ACOUSTIC BARRIER LEGEND

Acoustic barriers 2.5m to 4m in height (heights presented in the Sketch above) are to be constructed in accordance with DTMRs' MRTS15 "Noise Fences"; and Chapter 7 of DTMRs' "Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise, November 2013"

APPENDIX B

Subdivision Plans

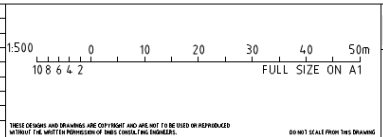


LEGEND	
	EXISTING KERB AND CHANNEL
	EXISTING WATER RETICULATION
	EXISTING SEWERAGE RETICULATION
	EXISTING TELSTRA
	EXISTING OVERHEAD ELECTRICITY
	FINISHED SURFACE CONTOURS
	PROPOSED KERB & CHANNEL
	PROPOSED EDGE RESTRAINT
	EXISTING TELSTRA PIT
	EXISTING SEWERAGE MANHOLE
	EXISTING POWER POLE
	EXISTING FIRE HYDRANT
	EXISTING ELECTRICITY PIT
	EXISTING WATER METER

NOTE

1. FOR DRAWING SET NOTES REFER TO DRAWING 216030-DA-002.

D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL
C	13.03.17	RESPONSE TO COUNCIL INFORMATION REQUEST
B	28.11.16	RESPONSE TO COUNCIL INFORMATION REQUEST
A	01.06.16	FOR COUNCIL APPROVAL



CLIENT
[REDACTED]

PROJECT
PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS
LOT 5 ON RP14839
289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS

HORIZONTAL DATUM
MGA '94

VERTICAL DATUM
AHD (m)

DRAWER
JM

DESIGNED
DS



TITLE
OVERALL SITE LAYOUT PLAN

REVIEWED
DS

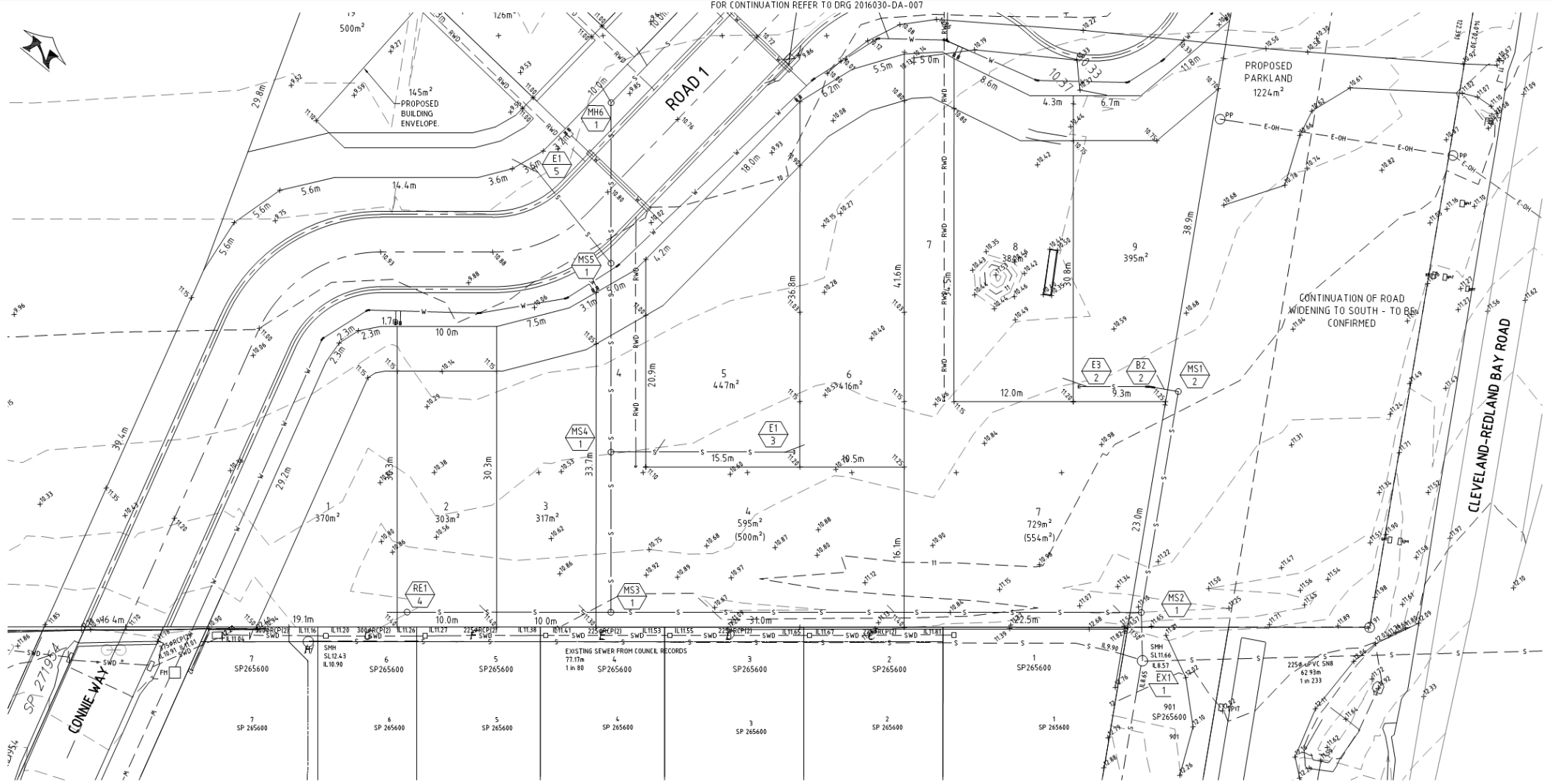
PROJECT IDENTIFICATION
RPEQ#11028 *Deane Storr*

DRAWING No.
2016030-DA-003

DATE
D

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PO BOX 441 HERMAID BEACH QLD 4218
M:0422573524 P:0755720703
E:dane@dnbsconeng.com.au WEB:www.dnbsconeng.com.au



LEGEND

	EXISTING KERB AND CHANNEL
	EXISTING TELSTRA
	EXISTING STORMWATER
	EXISTING WATER RETICULATION
	EXISTING SEWER RETICULATION
	EXISTING SURFACE CONTOURS
	EXISTING OVERHEAD ELECTRICITY
	EXISTING FENCE

	EXISTING WATER METER
	EXISTING FIRE HYDRANT
	EXISTING POWER POLE
	EXISTING LIGHT POLE
	EXISTING STORMWATER MANHOLE
	EXISTING SEWER MANHOLE
	EXISTING ELECTRICITY PIT
	EXISTING TELSTRA PIT
	EXISTING SURFACE LEVEL

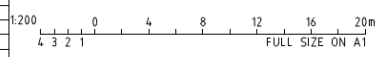
	PROPOSED SEWER MAIN, MANHOLE AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, MAINTENANCE SHAFT AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, TERMINAL MAINTENANCE SHAFT AND LABEL
	PROPOSED SEWER MAIN, RODDING END AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, INLINE BEND AND STRUCTURE LABEL
	PROPOSED FIRE HYDRANT, STOP VALVE, REDUCER & WATER METER

	PROPOSED SLEEPER WALL
	PROPOSED LOW PRESSURE SEWER MAIN, IN-LINE BEND AND STRUCTURE LABEL
	PROPOSED LOW PRESSURE SEWER ISOLATION VALVE
	PROPOSED SEWER RISING MAIN BOUNDARY KIT, REFER SEQ-PSS-1102-1 FOR DETAILS.
	PROPOSED LOW PRESSURE SEWER MAIN FLUSHING POINT

NOTES

- REFER TO DRG 2016030-DA-002 FOR DRAWING SET NOTES.
- ALL LEVELS ARE IN METRES (m) TO AUSTRALIAN HEIGHT DATUM (AHD)

D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL
E	13.03.17	RESPONSE TO COUNCIL INFORMATION REQUEST
B	28.11.16	RESPONSE TO COUNCIL INFORMATION REQUEST
A	01.06.16	FOR COUNCIL APPROVAL

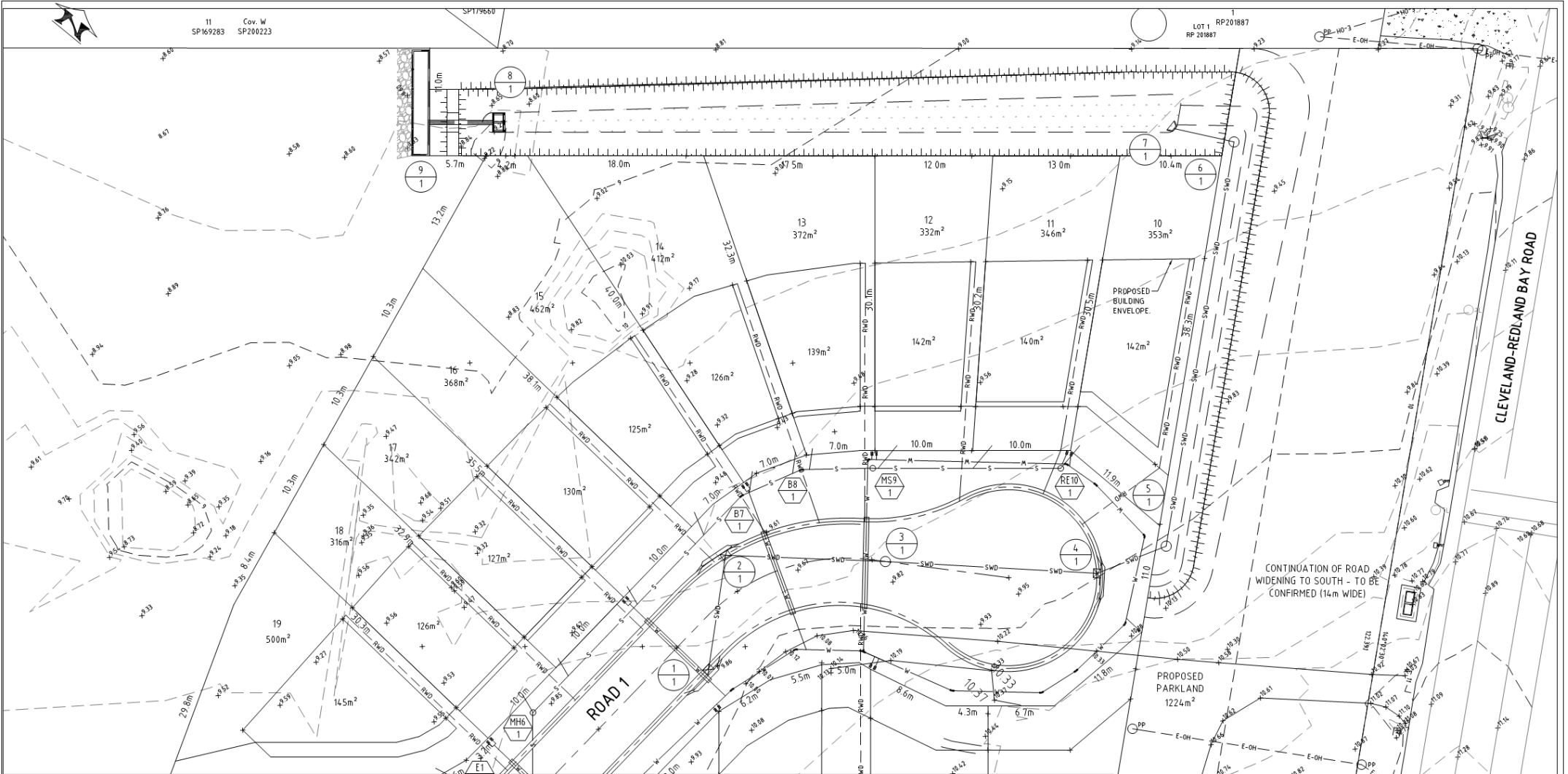


CLIENT	[Redacted]
PROJECT	PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS LOT 5 ON RP14839 289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS

HORIZONTAL DATUM	MGA '94
VERTICAL DATUM	AHD (m)
DRAWER	JM
DESIGNED	DS
PROJECT LOCATION	PO BOX 641 HERONBAY BEACH QLD 4218 M94-22573524 PH 0755710703 E:edines@dnbsconeng.com.au WEB www.dnbsconeng.com.au
REVISIONS	DS



TITLE	SEWER AND WATER RETICULATION PLAN SHEET 1 OF 2
PROJECT IDENTIFICATION	RPEQ#11028 [Signature]
DRAWING NO.	2016030-DA-006
DATE	D



LEGEND

- EXISTING KERB AND CHANNEL
- EXISTING TELSTRA
- EXISTING STORMWATER
- EXISTING WATER RETICULATION
- EXISTING SEWER RETICULATION
- EXISTING SURFACE CONTOURS
- EXISTING OVERHEAD ELECTRICITY
- EXISTING FENCE

- EXISTING WATER METER
- EXISTING FIRE HYDRANT
- EXISTING POWER POLE
- EXISTING LIGHT POLE
- EXISTING STORMWATER MANHOLE
- EXISTING SEWER MANHOLE
- EXISTING ELECTRICITY PIT
- EXISTING TELSTRA PIT
- EXISTING SURFACE LEVEL

- PROPOSED SEWER MAIN, MANHOLE AND STRUCTURE LABEL
- PROPOSED SEWER MAIN, MAINTENANCE SHAFT AND STRUCTURE LABEL
- PROPOSED SEWER MAIN, TERMINAL MAINTENANCE SHAFT AND LABEL
- PROPOSED SEWER MAIN, RODDING END AND STRUCTURE LABEL
- PROPOSED SEWER MAIN, INLINE BEND AND STRUCTURE LABEL
- PROPOSED FIRE HYDRANT, STOP VALVE, REDUCER & WATER METER

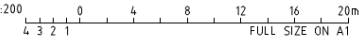
FOR CONTINUATION REFER TO DRG 2016030-DA-006

- PROPOSED SLEEPER WALL
- PROPOSED LOW PRESSURE SEWER MAIN, IN-LINE BEND AND STRUCTURE LABEL
- PROPOSED LOW PRESSURE SEWER ISOLATION VALVE
- PROPOSED SEWER RISING MAIN BOUNDARY KIT. REFER SEQ-PSS-1102-1 FOR DETAILS.
- PROPOSED LOW PRESSURE SEWER MAIN FLUSHING POINT

NOTES

1. REFER TO DRG 2016030-DA-002 FOR DRAWING SET NOTES.
2. ALL LEVELS ARE IN METRES (m) TO AUSTRALIAN HEIGHT DATUM (AHD)

D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL
C	13.03.17	RESPONSE TO COUNCIL INFORMATION REQUEST
B	28.11.16	RESPONSE TO COUNCIL INFORMATION REQUEST
A	01.06.16	FOR COUNCIL APPROVAL

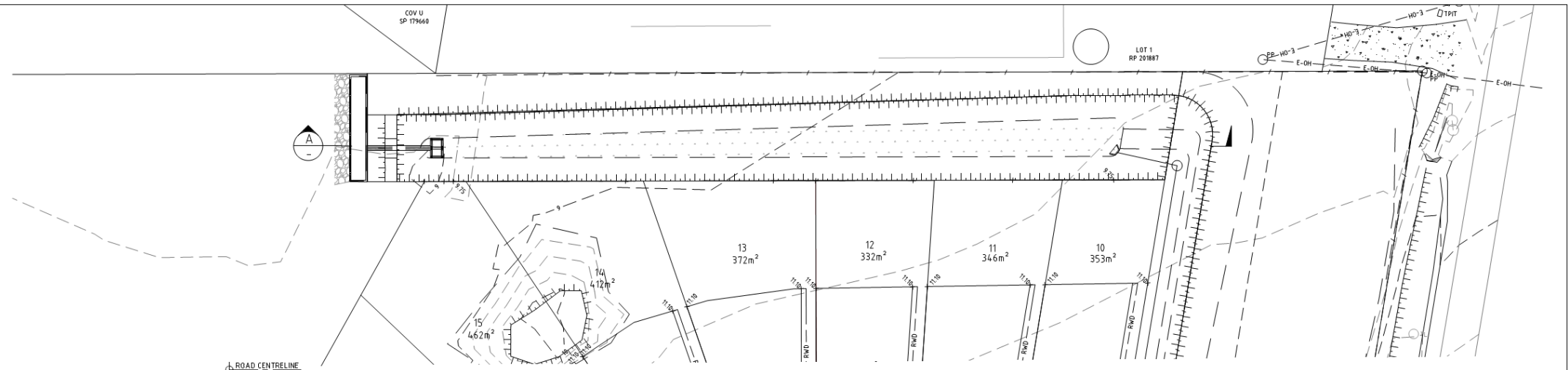


CLIENT	[Redacted]		
PROJECT	PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS LOT 5 ON RP14839 289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS		
HORIZONTAL DATUM	MGA '94		
VERTICAL DATUM	AHD (m)		
DRAWER	DESIGNED	DATE	PROJECT
JM	DS	06.08.17	2016030-DA-002

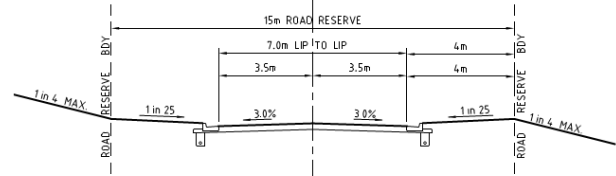
PO BOX 641 HERMAID BEACH QLD 4218
M 94 225 73524 PH 07 557 20703
E danes@dnbsconeng.com.au WEB www.dnbsconeng.com.au

TITLE	SEWER AND WATER RETICULATION PLAN SHEET 2 OF 2		
RPEQ CERTIFICATION	REVIEWED	DRAWING No	APPD
RPEQ#11028 <i>Diana Stoy</i>	DS	2016030-DA-007	D

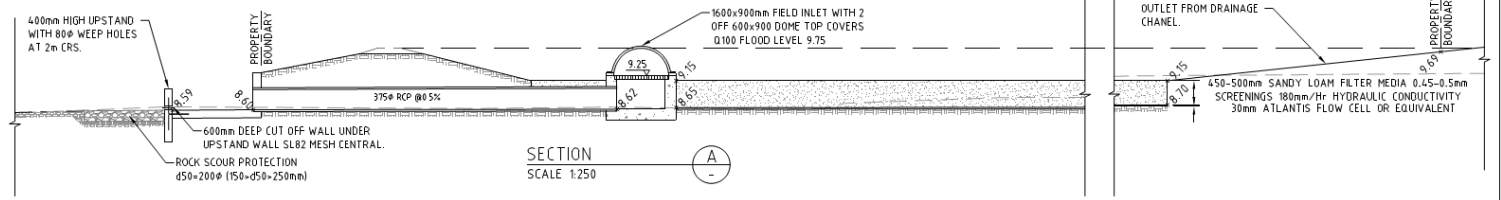
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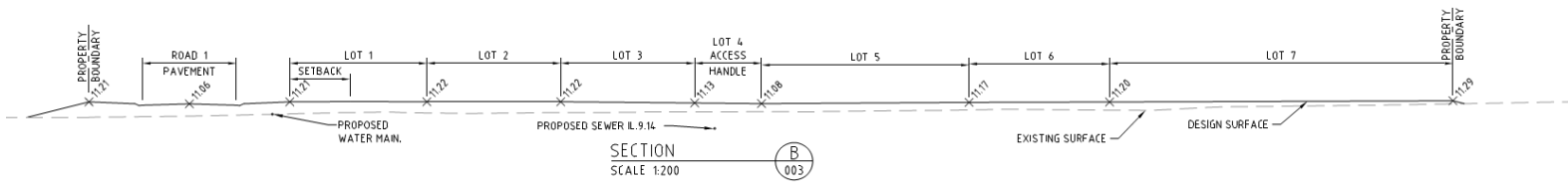
BIO RETENTION BASIN PLAN
SCALE 1:200



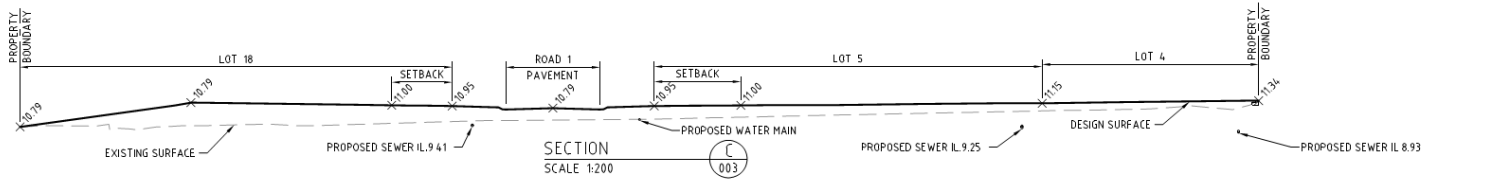
TYPICAL ROAD 1 CROSS-SECTION
7.0m - 6.0m LIP TO LIP RESIDENTIAL ACCESS PLACE
SCALE 1:100



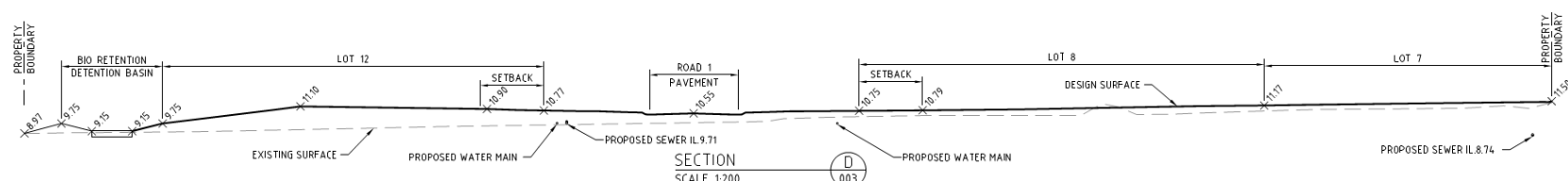
SECTION A
SCALE 1:250



SECTION B
SCALE 1:200

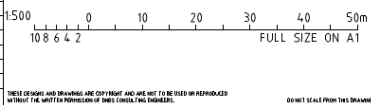


SECTION C
SCALE 1:200



SECTION D
SCALE 1:200

D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL
C	13.03.17	RESPONSE TO COUNCIL INFORMATION REQUEST
B	28.11.16	RESPONSE TO COUNCIL INFORMATION REQUEST
A	01.06.16	FOR COUNCIL APPROVAL



CUSTOMER
[REDACTED]

PROJECT
PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS
LOT 5 ON RP14839
289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS

HORIZONTAL DATUM
MGA '94

VERTICAL DATUM
AHD (m)

DRAWN
JM

DESIGNED
DS

DNBS CONSULTING ENGINEERS

PO BOX 641 MERMAID BEACH QLD 4218
M:0422573524 PH:0755720793
E:dnbs@dnbsconeng.com.au WEB:www.dnbsconeng.com.au

TITLE	OPERATIONAL CONTROL PLAN
REVIEWED	DS
ISSUE CERTIFICATION	RPEQ#11028 <i>[Signature]</i>
DRAWING NO.	2016030-OCP-008
AMC	D

APPENDIX C

Measurement Results and Model Calculations / Predictions

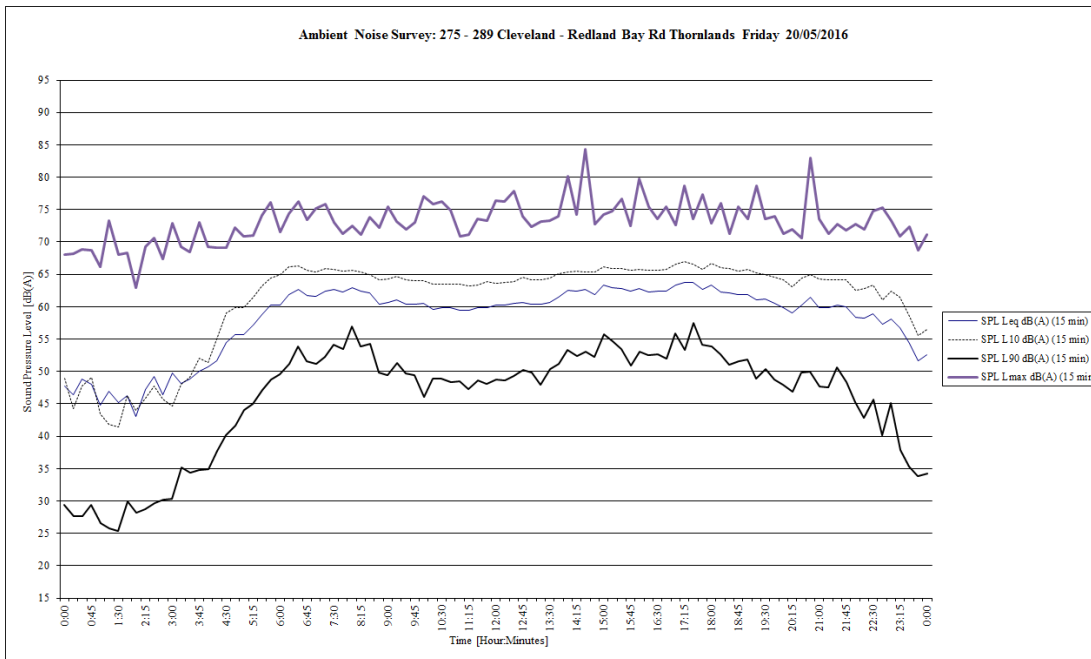
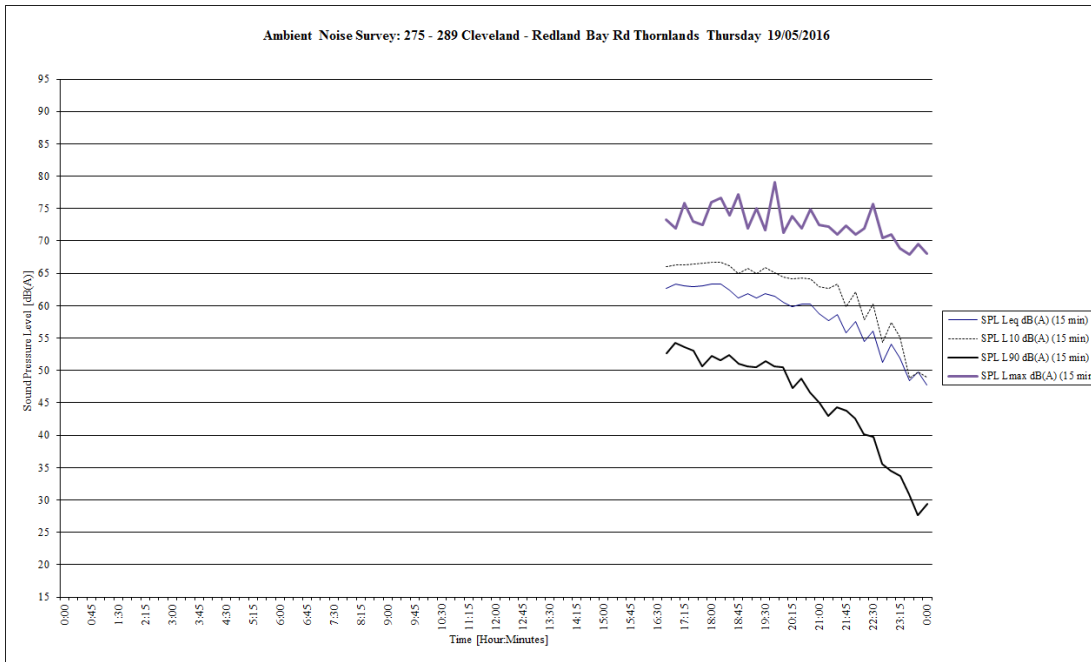
Redland, Queensland
May 2016 Daily Weather Observations

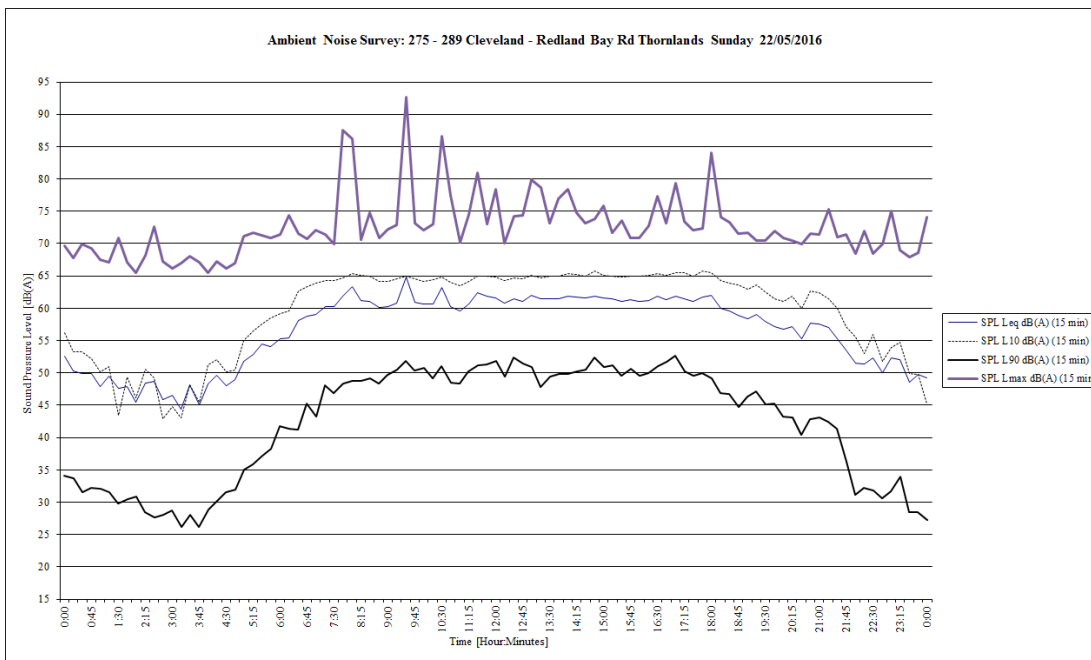
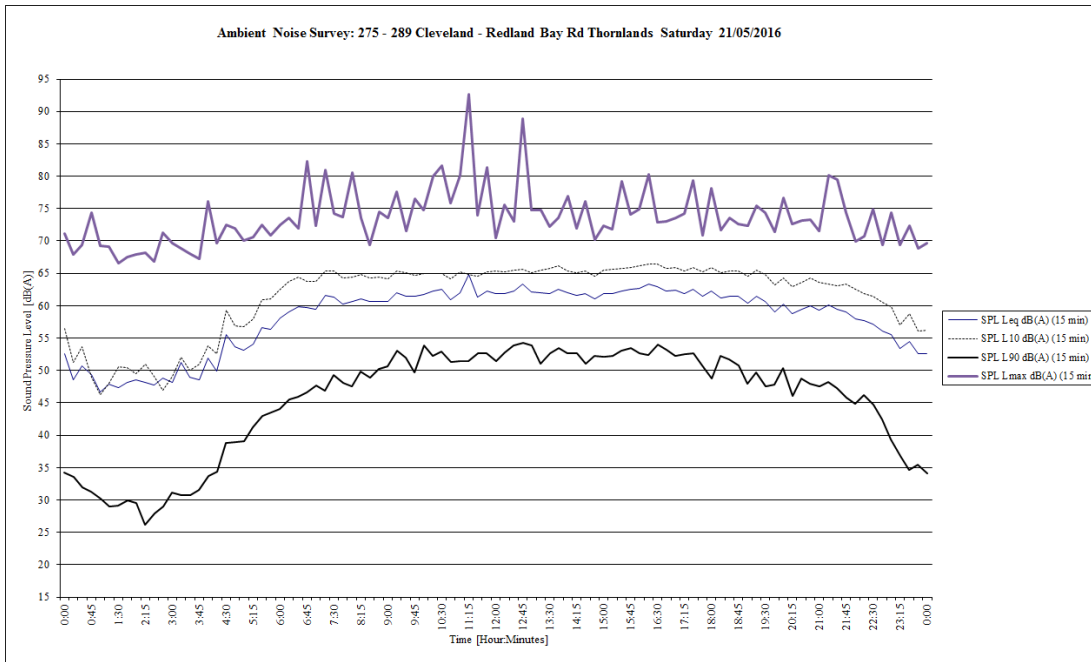


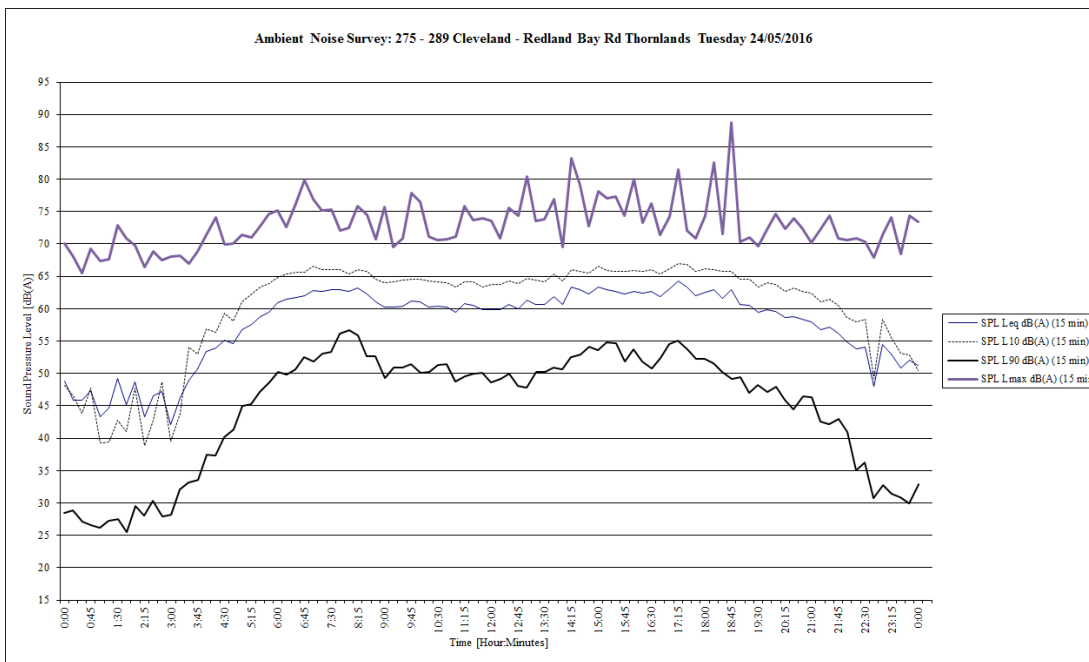
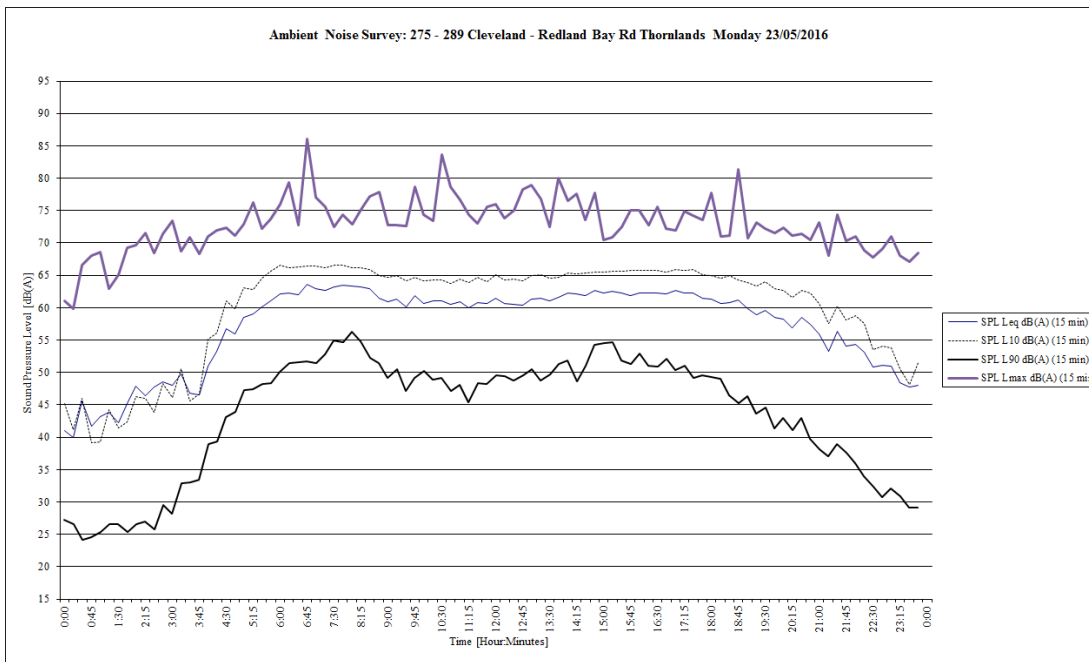
Date	Day	Temps		Rain mm	Evap mm	Sun hours	Max wind gust			9am						3pm					
		Min °C	Max °C				Dirn	Spd km/h	Time local	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa
1	Su	20.9	22.8	1.2			NNE	24	04:08	22.2	94		SE	4		21.9	94		SE	6	
2	Mo	18.4	26.0	7.4			ESE	17	12:12	22.0	94		S	6		24.8	74		ENE	7	
3	Tu	18.7	28.2	6.2			WSW	26	10:59	20.3	94		SW	6		27.8	49		W	6	
4	We	16.0	26.4	0.2			ESE	26	16:25	22.0	58		SSW	11		24.9	46		E	13	
5	Th	14.8	26.1	0			ESE	22	11:18	22.5	70		S	11		24.7	59		ENE	9	
6	Fr	15.2	26.7	0			ENE	22	14:37	20.8	76		SW	7		24.3	64		E	9	
7	Sa	15.8	26.1	0			ESE	24	13:23	22.4	74		SSW	6		24.6	58		ESE	9	
8	Su	15.0	26.9	0			E	20	14:40	22.9	70		SSE	7		24.8	66		E	9	
9	Mo	17.1	26.4	0			N	31	14:18	22.9	81		WNW	6		25.1	68		N	17	
10	Tu	20.7	27.7	0			W	33	13:45	24.5	70		NNW	6		26.9	54		WNW	15	
11	We	16.9	24.5	0			SSW	24	09:47	19.5	60		SW	11		23.2	32		E	6	
12	Th	10.2	25.8	0			WSW	39	10:13	18.2	39		WSW	13		25.6	25		WSW	11	
13	Fr	12.9	25.4	0			ESE	20	14:38	19.9	51		SW	9		23.9	57		E	11	
14	Sa	13.4	25.7	0			ENE	20	12:46	20.5	72		SSW	6		24.1	53		ENE	9	
15	Su	13.2	25.5	0			NE	22	14:21	19.4	77		SW	9		23.8	49		NNE	15	
16	Mo	12.8	25.6	0			NNE	19	14:19	19.6	66		SW	7		23.6	51		NE	11	
17	Tu	13.1	25.5	0			N	20	11:51	19.7	79		WSW	7		23.7	61		NNE	11	
18	We	14.1	25.4	0.2			NNE	26	13:48	20.1	79		WSW	6		24.4	56		NNE	11	
19	Th	14.2	27.3	0			WSW	20	10:32	20.1	77		WSW	11		23.5	67		NNE	6	
20	Fr	14.7	26.7	0			WSW	22	05:37	19.5	48		SW	11		24.9	51		E	9	
21	Sa	14.9	25.8	0			ESE	37	12:57	21.6	63		SSW	13		23.6	64		SE	20	
22	Su	16.9	25.4	0			NE	22	13:09	21.9	67		SE	9		23.9	58		E	7	
23	Mo	14.2	25.7	0			NNW	24	12:56	19.3	78		SW	11		23.8	61		N	13	
24	Tu	14.5	25.5	0			SE	31	09:53	21.6	60		WSW	6		23.4	43		ESE	9	
25	We	11.3	23.9	0			SW	30	06:43	16.8	39		SW	11		22.8	32		E	7	
26	Th	10.1		0						17.8	52		W	2		24.2	64		N	19	
Statistics for the first 26 days of May 2016																					
Mean		15.0	25.9							20.7	68			8		24.3	56			10	
Lowest		10.1	22.8							16.8	39		W	2		21.9	25		#	6	
Highest		20.9	28.2	7.4			WSW	39		24.5	94		#	13		27.8	94		SE	20	
Total				15.2																	

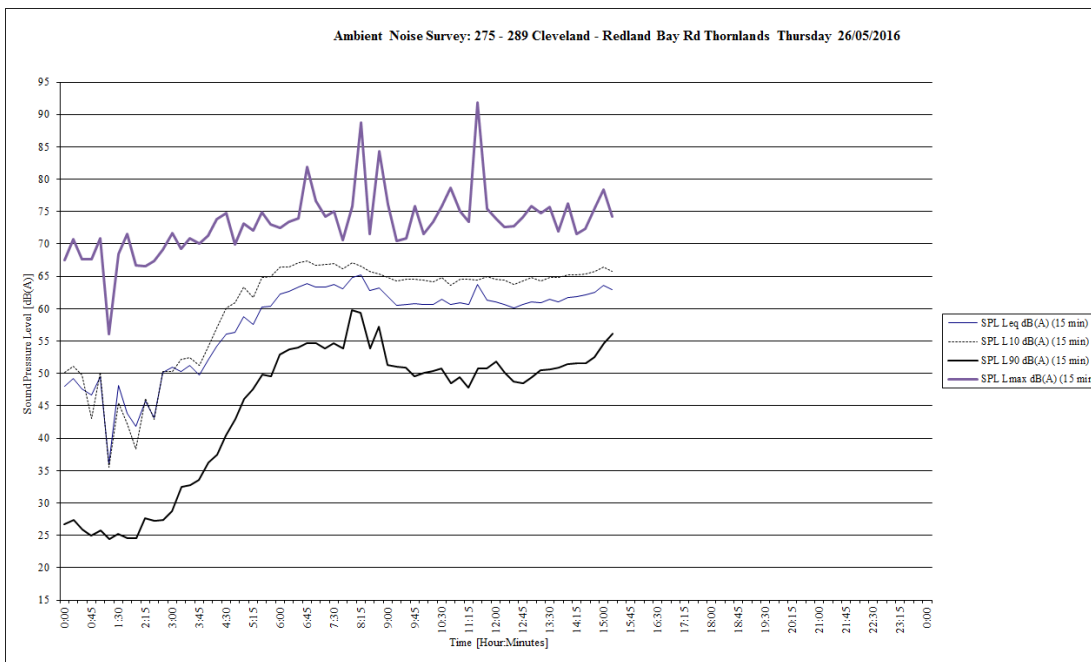
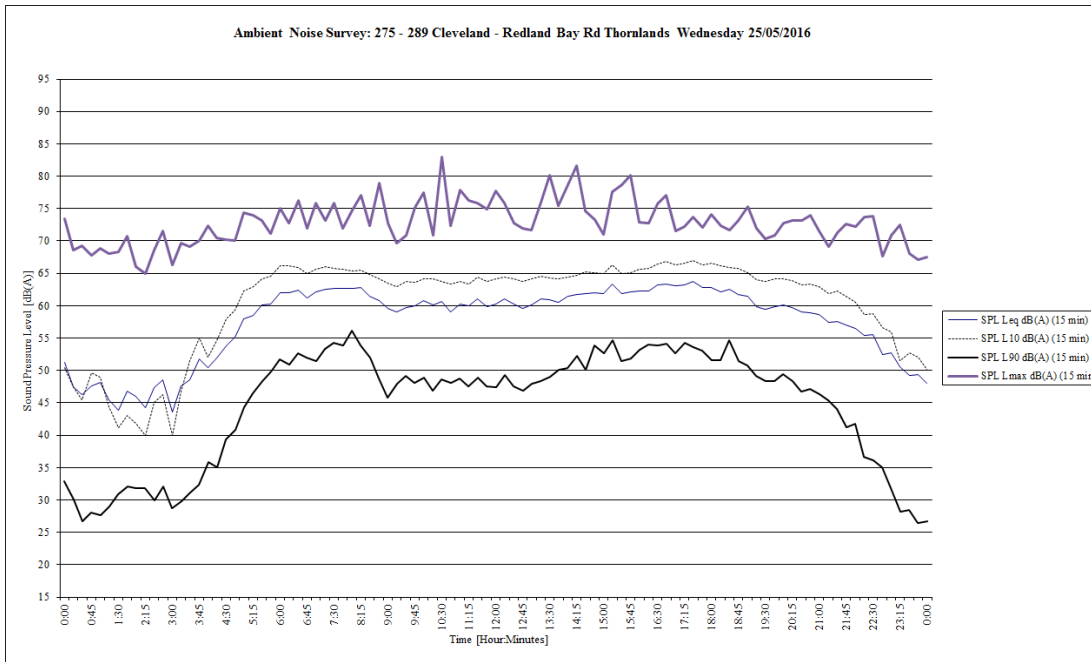
Observations were drawn from Redland (Alexandra Hills) (station 140007)

IDCJDW4155.201605 Prepared at 06:27 GMT on 26 May 2016
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Users of this product are deemed to have read the information and accepted the conditions described in the notes at <http://www.bom.gov.au/climate/dwo/IDCJDW0000.pdf>









MODEL VERIFICATION POINT CALCULATIONS

Pen3D2000 V 1.10.0

Project Code:16057a

Project Description:Noise assessment of Cleveland Redland Bay Rd Subdivision

File:G:\Users\Matty\CRGNAS\2016\16057 Residential Subdivision 289 301 Cleveland Redland Bay Rd Thornlands

RTN\16057a_existing aug17.PEN

Monday 07 Aug, 2017 at 11:45:00

CoRTN Calculations

All road segments included. Segmentation angle: 1degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))
monitor'	527223.5	6950289.0	1.4	63.6 free-field

YEAR 2027 NO BARRIER FREE-FIELD POINT CALCULATIONS

File:G:\Users\Matty\CRGNAS\2016\16057 Residential Subdivision 289 301 Cleveland Redland Bay Rd Thornlands

RTN\16057a_ultimate free-field final aug17.PEN

Monday 07 Aug, 2017 at 14:21:14

CoRTN Calculations

All road segments included. Segmentation angle: 1degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))
1	527210.5	6950126.7	1.8	52.2
2	527217.5	6950134	1.8	52.9
3	527224.3	6950140.8	1.8	53.5
4	527254	6950152.5	1.8	56.4
5	527229.1	6950166.6	1.8	55.5
6	527232.9	6950178.3	1.8	56.7
7	527269.7	6950171.6	1.8	61
8	527246.7	6950187.8	1.8	59
9	527254.9	6950196	1.8	60.9
10	527228.9	6950241.7	1.8	61.7
11	527221.4	6950235.2	1.8	60.1
12	527212.6	6950227.6	1.8	58.4
13	527203.8	6950220	1.8	56.9
14	527197.2	6950209.5	1.8	55.7
15	527202.1	6950196.3	1.8	55.2
16	527202.5	6950187	1.8	54.7
17	527201.6	6950177.2	1.8	54.2
18	527200.8	6950166.9	1.8	53.6
19	527198.3	6950156.9	1.8	53
1	527216.9	6950107.4	1.5	51.5
2	527226.4	6950116.8	1.5	52.1
3	527233.4	6950123.2	1.5	52.6
4	527257.7	6950141.9	1.5	54.8
5	527237.2	6950146.6	1.5	54.2
6	527247.5	6950155.4	1.5	55.8
7	527276.1	6950157.1	1.5	59
8	527257.2	6950168.8	1.5	58.3
9	527265.4	6950177	1.5	60.5
10	527225.4	6950244.2	1.5	60.8
11	527217.2	6950236.7	1.5	58.7
12	527207.2	6950229.2	1.5	55.8
13	527197.5	6950220.7	1.5	54.2
14	527187.8	6950209.3	1.5	53.3
15	527184.3	6950196.5	1.5	52.5
16	527184.6	6950186.3	1.5	52.4
17	527183.6	6950176.3	1.5	52
18	527182.8	6950165.9	1.5	51.4
19	527183	6950154.7	1.5	50.9
1	527210.5	6950126.7	4.6	54.3
2	527217.5	6950134	4.6	55.1
3	527224.3	6950140.8	4.6	55.8
4	527254	6950152.5	4.6	59
5	527229.1	6950166.6	4.6	57.8
6	527232.9	6950178.3	4.6	58.9
7	527269.7	6950171.7	4.6	63
8	527246.7	6950187.8	4.6	61.1
9	527254.9	6950196	4.6	62.8
10	527228.9	6950241.7	4.6	63.1
11	527221.4	6950235.2	4.6	61.6
12	527212.6	6950227.6	4.6	60.2
13	527203.8	6950220	4.6	58.9
14	527197.2	6950209.5	4.6	57.7
15	527202.1	6950196.3	4.6	57.4
16	527202.5	6950187	4.6	56.9
17	527201.6	6950177.2	4.6	56.3
18	527200.8	6950166.9	4.6	55.8
19	527198.3	6950156.9	4.6	55.1

YEAR 2027 ACOUSTIC BARRIER FREE-FIELD POINT CALCULATIONS

File:G:\Users\Matty\CRGNAS\2016\16057 Residential Subdivision 289 301 Cleveland Redland Bay Rd Thornlands RTN\16057a_ultimate free-field final aug17 barrier.PEN

Monday 07 Aug, 2017 at 14:07:23

CoRTN Calculations

All road segments included. Segmentation angle: 1 degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))
1	527210.5	6950126.7	1.8	51.2
2	527217.5	6950134	1.8	51.7
3	527224.3	6950140.8	1.8	52.1
4	527254	6950152.5	1.8	53.9
5	527229.1	6950166.6	1.8	53.5
6	527232.9	6950178.3	1.8	54.3
7	527269.7	6950171.6	1.8	55.9
8	527246.7	6950187.8	1.8	55.5
9	527254.9	6950196	1.8	55.8
10	527228.9	6950241.7	1.8	55.7
11	527221.4	6950235.2	1.8	56.4
12	527212.6	6950227.6	1.8	56.2
13	527203.8	6950220	1.8	55.3
14	527197.2	6950209.5	1.8	54.3
15	527202.1	6950196.3	1.8	53.7
16	527202.5	6950187	1.8	53.2
17	527201.6	6950177.2	1.8	52.8
18	527200.8	6950166.9	1.8	52.4
19	527198.3	6950156.9	1.8	51.9
1	527216.9	6950107.4	1.5	50.8
2	527226.4	6950116.8	1.5	51.2
3	527233.4	6950123.2	1.5	51.4
4	527257.7	6950141.9	1.5	52.4
5	527237.2	6950146.6	1.5	52.5
6	527247.5	6950155.4	1.5	53.5
7	527276.1	6950157.1	1.5	54.2
8	527257.2	6950168.8	1.5	54.8
9	527265.4	6950177	1.5	55.1
10	527225.4	6950244.2	1.5	53
11	527217.2	6950236.7	1.5	55.4
12	527207.2	6950229.2	1.5	53.7
13	527197.5	6950220.7	1.5	52.5
14	527187.8	6950209.3	1.5	52.1
15	527184.3	6950196.5	1.5	51.8
16	527184.6	6950186.3	1.5	51.7
17	527183.6	6950176.3	1.5	51.4
18	527182.8	6950165.9	1.5	50.9
19	527183	6950154.7	1.5	50.5
1	527210.5	6950126.7	4.6	53.4
2	527217.5	6950134	4.6	54.2
3	527224.3	6950140.8	4.6	54.9
4	527254	6950152.5	4.6	58.8
5	527229.1	6950166.6	4.6	57.1
6	527232.9	6950178.3	4.6	58.5
7	527269.7	6950171.7	4.6	63
8	527246.7	6950187.8	4.6	60.9
9	527254.9	6950196	4.6	62.8
10	527228.9	6950241.7	4.6	63.1
11	527221.4	6950235.2	4.6	61.6
12	527212.6	6950227.6	4.6	59.9
13	527203.8	6950220	4.6	58.4
14	527197.2	6950209.5	4.6	57.2
15	527202.1	6950196.3	4.6	56.7
16	527202.5	6950187	4.6	56.1
17	527201.6	6950177.2	4.6	55.5
18	527200.8	6950166.9	4.6	54.9
19	527198.3	6950156.9	4.6	54.2

YEAR 2027 ACOUSTIC BARRIER FAÇADE CORRECTED POINT CALCULATIONS

File:G:\Users\Matty\CRGNAS\2016\16057 Residential Subdivision 289 301 Cleveland Redland Bay Rd Thornlands
RTN\16057a_ultimate facade final aug17 barrier.PEN

Monday 07 Aug, 2017 at 14:16:25

CoRTN Calculations

All road segments included. Segmentation angle: 1degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))
1	527210.5	6950126.7	1.8	52.7
2	527217.5	6950134	1.8	53.2
3	527224.3	6950140.8	1.8	53.6
4	527254	6950152.5	1.8	55.4
5	527229.1	6950166.6	1.8	55
6	527232.9	6950178.3	1.8	55.8
7	527269.7	6950171.6	1.8	57.4
8	527246.7	6950187.8	1.8	57
9	527254.9	6950196	1.8	57.3
10	527228.9	6950241.7	1.8	57.2
11	527221.4	6950235.2	1.8	57.9
12	527212.6	6950227.6	1.8	57.7
13	527203.8	6950220	1.8	56.8
14	527197.2	6950209.5	1.8	55.8
15	527202.1	6950196.3	1.8	55.2
16	527202.5	6950187	1.8	54.7
17	527201.6	6950177.2	1.8	54.3
18	527200.8	6950166.9	1.8	53.9
19	527198.3	6950156.9	1.8	53.4
1	527216.9	6950107.4	1.5	52.3
2	527226.4	6950116.8	1.5	52.7
3	527233.4	6950123.2	1.5	52.9
4	527257.7	6950141.9	1.5	53.9
5	527237.2	6950146.6	1.5	54
6	527247.5	6950155.4	1.5	55
7	527276.1	6950157.1	1.5	55.7
8	527257.2	6950168.8	1.5	56.3
9	527265.4	6950177	1.5	56.6
10	527225.4	6950244.2	1.5	54.5
11	527217.2	6950236.7	1.5	56.9
12	527207.2	6950229.2	1.5	55.2
13	527197.5	6950220.7	1.5	54
14	527187.8	6950209.3	1.5	53.6
15	527184.3	6950196.5	1.5	53.3
16	527184.6	6950186.3	1.5	53.2
17	527183.6	6950176.3	1.5	52.9
18	527182.8	6950165.9	1.5	52.4
19	527183	6950154.7	1.5	52
1	527210.5	6950126.7	4.6	54.9
2	527217.5	6950134	4.6	55.7
3	527224.3	6950140.8	4.6	56.4
4	527254	6950152.5	4.6	60.3
5	527229.1	6950166.6	4.6	58.6
6	527232.9	6950178.3	4.6	60
7	527269.7	6950171.7	4.6	64.5
8	527246.7	6950187.8	4.6	62.4
9	527254.9	6950196	4.6	64.3
10	527228.9	6950241.7	4.6	64.6
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16	527202.5	6950187	4.6	57.6
17	527201.6	6950177.2	4.6	57
18	527200.8	6950166.9	4.6	56.4
19	527198.3	6950156.9	4.6	55.7

SITE BASED STORMWATER MANAGEMENT PLAN AND PRELIMINARY ENGINEERING SERVICES REPORT

PLANS AND DOCUMENTS
referred to in the
DEVELOPMENT APPROVAL



Approval no: SDA-0916-033946

Date: 25 August 2017

Proposed 22 Lot Residential Subdivision
Lot 5 on RP14839
289-301 Cleveland-Redland Bay Road, Thornlands

Prepared for [REDACTED]

August 2017

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"No bull Solutions to your Civil Engineering and Stormwater Problems!"

Table of Contents

1	INTRODUCTION	3
1.1	BACKGROUND	3
1.2	OBJECTIVES	3
1.3	SCOPE	4
1.4	DESCRIPTION OF THE SUBJECT SITE	4
1.4.1	<i>Location</i>	4
1.4.2	<i>Landuse and Vegetation</i>	5
1.4.3	<i>Topography, Stormwater Conveyance and Regional Flood Constraints</i>	5
1.4.4	<i>Rainfall</i>	5
1.5	DESCRIPTION OF THE DEVELOPMENT.....	6
1.6	SERVICE REQUIREMENTS.....	6
2	PRE- & POST-DEVELOPMENT HYDROLOGY.....	7
3	STORMWATER MANAGEMENT – QUANTITY CONTROLS	8
3.1	PERFORMANCE OF OSD	8
3.1.1	<i>Required Detention Volume & Outlet Structure</i>	8
4	STORMWATER MANAGEMENT – QUALITY CONTROLS.....	10
4.1	CONSTRUCTION CONTROLS	10
4.2	OPERATIONAL CONTROLS	12
4.2.1	<i>Flush Kerbs</i>	12
4.2.2	<i>Bioretention Systems</i>	12
4.2.3	<i>Rainwater Tanks</i>	13
4.2.4	<i>Gross Pollutant Traps (GPTs)</i>	13
5	WATER QUALITY ASSESSMENT.....	14
5.1	POLLUTANTS OF CONCERN	14
5.2	SURFACE RUNOFF WATER QUALITY	14
5.3	RECEIVING WATER QUALITY DATA	14
5.4	WATER QUALITY OBJECTIVES	15
5.5	MUSIC MODELLING PARAMETERS	15
5.5.1	<i>Model Parameter Definition</i>	15
5.5.2	<i>Bioretention System Parameter Definition</i>	16
5.6	MUSIC RESULTS.....	16
6	BIORETENTION SYSTEM MAINTENANCE MANUAL AND PLANT SELECTION REQUIREMENTS	18
6.1	POST CONSTRUCTION MAINTENANCE	18
6.2	PLANT SELECTION REQUIREMENTS.....	19
6.2.1	<i>Bioretention Planting</i>	19
6.3	LONG TERM MAINTENANCE REQUIREMENTS	20
6.3.1	<i>Filter Media Performance</i>	21
6.4	FILTER MEDIA AMELIORATION.....	22
6.5	EQUIPMENT NEEDS	22
6.6	SYSTEM INSPECTION.....	22
6.7	MAINTENANCE COSTS	22
6.8	WASTE DISPOSAL/ENVIRONMENTAL CONSIDERATIONS.....	24
6.9	SAFETY	24
7	MANAGEMENT PLAN.....	25
7.1	MONITORING AND MAINTENANCE PROGRAM.....	25
7.1.1	<i>CONSTRUCTION PHASE MONITORING PROGRAM</i>	25
7.2	INVESTIGATION INDICATORS	25
7.3	RESPONSIBILITIES AND TIMMING	26
8	CONCLUSIONS	27
9	APPENDICES	28

1 INTRODUCTION

1.1 Background

DNBS Consulting Engineers has been engaged by Mark Winfield to undertake a Site Based Stormwater Management Plan (SBSMP) in support of a DA (Development Application) for a proposed 19 lot Residential Subdivision at 289-301 Cleveland-Redland Bay Road, Thornlands (the subject site) Lot 5 on RP14839.

Specifically, this version of the report has been prepared in response to RCC information request/email dated 25/7/17.

The information required the following items be addressed for the new site layout:

1. Sewerage servicing plan for the site.
2. Stormwater servicing plan.
3. Earthworks plan including sections, locations and heights of any retaining structures.

In response to the above items a preliminary engineering drawing set has been provided. A Sewerage servicing plan has been shown with longsections detailing that all proposed allotments can be serviced with grades in accordance with the RCC development guidelines.

A Stormwater Plan details a proposed pit and pipe layout for road one and an open channel that will route high flows above Q2 to the proposed bioretention/detention basin, through the proposed park. Levels have been included to show that site grading can be achieved and that all stormwater pipes will achieve a gravity outlet with proposed site earthworks.

A preliminary site grading/earthworks plan has been shown which details roofwater from all allotments being routed to road 1 and all proposed allotments being serviced by gravity sewerage reticulation at minimum grades as specified by RCC. This requires an import of fill of approximately 8500m³. There are no retaining walls proposed for this development and all earthworks profiling is achievable with batters inside the subject site. The rear of allotments 15-19 (outside the proposed building envelope) will be kept as green space (and batter down to the natural level) and this 0.91ha catchment will sheet flow to the proposed reserve to the north west of the site's developable area. This catchment will not be required to be treated for stormwater quantity or quality and will not be considered further in this report. The rear of proposed allotments 10-14 will sheet flow to the bioretention/detention basin in a similar manner.

This assessment has been prepared in accordance with the Redland City Council (RCC) Planning Scheme, The MUSIC Modelling Guidelines for South East Queensland (2009) and the Queensland Urban Drainage Manual (QUDM2).

1.2 Objectives

The objective of this SBSMP is to:

- *Minimise the quantity of pollutants such as sediment, litter, nutrients and oil entering Redland's waterways and stormwater drains;*
- *Minimise and prevent environmental harm to Redland's waterways and associated ecosystems;*
- *Provide an effective stormwater management system that balances environmental, social and economic interests within the Redland community and incorporates water quality controls;*

- *Ensure stormwater is managed to minimise the impact of flooding; and*
- *Minimise environmental nuisance or harm from land-disturbing activities.*

These objectives will be achieved through the implementation of:

- *Management strategies designed to minimise water pollution from the development of the subject site;*
- *Management strategies to maintain pre-development peak discharges at the existing legal point of discharge;*
- *Specific construction phase controls to minimise erosion and control sediment loss; and*
- *Specific operational phase controls to minimise sediment and nutrient export from the subject site.*

1.3 Scope

Specifically, this report details the following:

1. *Water Quality issues including:*
 - a. *an estimate of sediment and nutrient transport from the subject site; and*
 - b. *pollutant reduction targets for runoff exiting the site.*
2. *Water Quantity issues including:*
 - a. *determination of pre and post development discharge rates*
 - b. *reduction of post development flows to predevelopment levels.*
3. Stormwater Management Controls for the:
 - a. *construction; and*
 - b. *operational phases.*

To minimise the impact of the proposed development on the external environment the proponent shall implement this SBSMP.

1.4 Description of the Subject Site

1.4.1 Location

The developable portion of the subject site (1.05ha) is located 50m north-west of the intersection with Harington Road and Cleveland Redland Bay Road. There is a 0.91ha catchment to the rear of proposed allotments 15-19 which will be kept as green space, sheet flow to the north-west and bypass the bioretention/detention basin. The remainder of the site will be dedicated to RCC as park. Refer to Figure 1.1 for site locality details.



Figure 1.1 Site Locality Plan

1.4.2 Landuse and Vegetation

The existing site consists of a large residential allotment, with an existing dwelling and a number of other auxiliary buildings/sheds etc. The developable portion of the site will be taken as 10% impervious as per aerial photogrammetry which confirms the vast majority of the site (developable portion) is covered by moderate grass cover with some smaller trees and shrubs.

The post development site will be taken as 60% fraction impervious as appropriate for residential allotments and as per QUDM Table 4.05.1. The 0.91ha bypass stormwater catchment to the rear of proposed allotments 15-19 will continue to sheet flow towards the north west towards the conservation area which is being donated to RCC as reserve.

1.4.3 Topography, Stormwater Conveyance and Regional Flood Constraints

For the pre-developed case, the subject site (developable portion) falls from the eastern corner (R.L. 11.40 AHD) to the western corner (R.L. 8.6), adjacent to the boundary with Lot 11 on SP 16928, at an average grade of 2%. Lot 11 is heavily vegetated along its common boundary with the subject site and the portion immediately adjacent to the subject site acts as an environmental/drainage covenant area.

The developable portion of the site is outside the influence from regional or localised drainage channel flood levels. Flow from the subject heads northwest in the heavily vegetated covenant area and then turns north east under Cleveland-Redland Bay road and into Pinklands Bush Reserve, eventually reaching the estuarine reaches of Erapah Creek and Moreton Bay.

The predeveloped (developable portion) of the subject site exists as a single catchment discharging a sheet flow and mixed flow paths towards the north-west. Following a site investigation, it has been confirmed that runoff travels and sheet flow for approximately 50m before condensing into mixed flow paths and rivulets. The time of concentration for the predevelopment scenario will be assessed using the kinematic wave equation for the first 50m of sheet flow time, and average stream velocity for the remaining 130m as per QUDM section 4.06.6.

For the post development scenario the time of concentration has been assessed using a combination of the minimum 5 minutes for the first allotment as per QUDM and 90m of kerb and channel flow at 0.5% as per QUDM Figure 4.10.

The remainder of the site not being developed will be dedicated to RCC as parklands and flows and runoff from these areas will remain unchanged as part of the development and will not be considered further in this report.

1.4.4 Rainfall

The climate of Redlands is considered sub-tropical having relatively warm summers, mild winters and a medium rainfall average. As part of this SBSWMP, DNBS Consulting Engineers undertook a review of relevant climate information obtained from the Bureau of Meteorology. Six minute time step rainfall data was provided for the site at the Redlands RHS BOM Site (as appropriate for Redlands area and as specified in the MUSIC modelling guidelines for South-East Queensland) and detailed assessment was undertaken of the daily rainfall data available. The assessment was completed, and as per MUSIC modelling guidelines for South-East Queensland (2009) rainfall data for Redlands RHS BOM site between 1997 and 2006 were selected as appropriate rainfall years for use in subsequent non-point source pollutant export modelling. Relevant rainfall statistics derived for Redlands RHS (RCC) were as follows:

- Mean rainfall 1051 mm/year
- Dry Year (10th percentile) 806 mm/year
- Wet Year (90th percentile) 1623 mm/year

1.5 Description of the Development

The developable area of the site (1.05ha) consists of a 19 lot residential subdivision which is comprised of:

- 19 residential lots;
- A 0.91ha bypass (greenspace pervious) stormwater catchment to the rear of lots 15-19.
- a bioretention/detention basin that is situated along the site's northern boundary;
- a flow spread device 1.6m wide that returns discharge from the site to natural sheet flows prior to the discharge towards the adjacent Lot 11 to the north-west.

Refer to Appendix A for further details on the proposed development layout.

1.6 Service Requirements

A 150mm diameter water reticulation main exists in Harrington Boulevard and Connie way as well as a 450mm diameter water reticulation main in Cleveland-Redland Bay Road. To service the development the existing water main in Connie way will be extended from the end of line treatment throughout the development proposed Road 1. There currently exists one water property service and meter servicing the subject site that will be made redundant and disposed offsite.

A 225mm diameter sewerage reticulation main exists within the rear allotment sewer/stormwater drainage easement of the allotments adjacent to the subject site along Harrington Boulevard and the adjacent park to the south. A new 150mm diameter sewer main will be constructed to connect to the existing manhole in lot 901 SP265600 adjacent to the subject site. The developable area of the site with the new proposed earthworks can be serviced by gravity sewer at grades that comply with RCC guidelines. The design of this earthworks profile requires the import of about 8500m³ of good quality fill material. For further details refer to Appendix A of this report (Preliminary Engineering Drawings).

Power and telecommunications is available to the site from electricity and telecommunications infrastructure in Cleveland-Redland Bay Road. No impediment to the provision of electrical or telecommunications services to the proposed development is anticipated.

2 PRE- & POST-DEVELOPMENT HYDROLOGY

The natural hydrology of the site has been assessed in accordance with QUDM 2 Section 4. Times of concentration calculations for both pre and post development scenarios are contained in Table 2.1. Summaries of the rationale flow (static) hydrological calculations are contained in Table 2.2 and Table 2.3 for pre- and post-development (un-mitigated) scenarios respectively. The pre-development site (10% impervious) acts as a single catchment of 1.05ha. The post-development site (60% impervious) acts as a single catchment of 1.05ha. The internal site catchment A can be split up into A1 (the developable portion of the site including building envelopes and roads) and A2 (the pervious area to the rear of the building envelopes of Lots 10-14 which sheet flows directly to the proposed bioretention/detention basin), however catchment A can be analysed as one catchment for the purpose of this report because it is mainly concerned with the action of the proposed detention/bioretention basin. There are no external catchments that influence the subject site.

Table 2.1 Times of Concentration

<u>Catchment</u>	<u>tc (min)</u>	<u>Length/fall (m)</u>	<u>Method</u>	<u>channel/ pipe length/ fall time</u>
A (pre) 1.05ha	12	50m@2% (9min) Kinematic Wave	Kinematic Wave Eq plus stream flow	130m@4%@0.7m/s 3min stream flow
A (post) 1.05ha	8	90m length @ 0.5%grade Kerb and Channel flow time	Table 4.10 plus time to first pit	3min/5min

Table 2.2 Pre-Development Hydrology

Catch. ID	FI	Tc	Ac (ha)	I ₁₀₀ (mm/hr)	C	Q ₁₀₀ (m ³ /s)	I ₂₀ (mm/hr)	C	Q ₂₀ (m ³ /s)	I ₁₀ (mm/hr)	C	Q ₁₀ (m ³ /s)	I ₅ (mm/hr)	C	Q ₅ (m ³ /s)	I ₂ (mm/hr)	C	Q ₂ (m ³ /s)	I ₁ (mm/hr)	C	Q _{3-month} (m ³ /s)
A	0.10	12	1.05	218.00	0.82	0.52	171.00	0.72	0.36	150.00	0.69	0.30	136.00	0.65	0.26	110.00	0.58	0.19	86.00	0.55	0.07

Table 2.3 Post-Development Hydrology

Catch. ID	FI	Tc	Ac (ha)	I ₁₀₀ (mm/hr)	C	Q ₁₀₀ (m ³ /s)	I ₂₀ (mm/hr)	C	Q ₂₀ (m ³ /s)	I ₁₀ (mm/hr)	C	Q ₁₀ (m ³ /s)	I ₅ (mm/hr)	C	Q ₅ (m ³ /s)	I ₂ (mm/hr)	C	Q ₂ (m ³ /s)	I ₁ (mm/hr)	C	Q _{3-month} (m ³ /s)
A	0.60	8	1.05	256.00	0.96	0.72	201.00	0.84	0.49	177.00	0.80	0.41	160.00	0.76	0.35	130.00	0.68	0.26	102.00	0.64	0.08

Comparison of the pre- and post-development, unmitigated hydrology indicates there will be a 38.5% increase in Q100 peak discharge from the subject site. The flows calculated above will be used to check the accuracy of the dynamic (illsax) stormwater calculations in the following section. It is anticipated that the dynamic calculations will give a good indication of overlapping hydrographs and flow rates for pre and post development scenarios at the proposed flow spread device which will discharge mitigated (to at or below predevelopment levels) sheet flows towards the adjacent Lot 11 to the north-west.

3 STORMWATER MANAGEMENT – QUANTITY CONTROLS

3.1 Performance of OSD

To satisfy the objective of no increase in pre-development peak discharge, Drains (Ilsax) dynamic stormwater models have been constructed to determine the required detention volume. The models compare Standard ARI (Average Recurrence Interval) hydrographs for a range of storm durations at the proposed flow spread device.

A sensitivity analysis has been conducted (Refer Table 3.2) for pervious area depression storage between 10mm (adopted) and 2mm, with the 10mm pervious area depression storage calculations more closely representing those from the rational method for both pre and post development scenarios. The 10mm pervious area depression storage calculations for peak runoff rates are generally within 20% of the peak runoff rates predicted by the rational method and so are considered reasonable for adoption in detention volume calculations as per QUDM and advice from Grant Wetheridge of Catchment and Creeks Pty Ltd.

The Ilsax model Antecedent Moisture Condition has been specified using soil type 3, which is appropriate for areas that may have slow infiltration rates (and layers which impeded the movement of water), that is high clay content. This assumption has been confirmed via a site visit, preliminary geotechnical investigations carried out by the client and previous knowledge of the surrounding area.

For the purposes of dynamic modelling the subject site (developed portion) will be taken as catchment A (1.05ha) area which includes the proposed bioretention/detention basin.

For the subject site pre-development scenario, the critical storm duration was found to 0.5 hours for the Q100 storms and 1hrs for the Q20, Q10 and Q2 storms. Critical Storm durations for the post developed scenario were found to 0.5 hours for all storms up to and including the critical Q100 storm. Copies of the Drains models will be made available for review if requested by RCC.

3.1.1 Required Detention Volume & Outlet Structure

Results from modelling indicate that a bioretention/detention basin with the storage height relationship shown in table 3.1 and an outlet arrangement with a 375mm diameter pipe at 0.33% grade and upstream I.L. of 8.62, a 1.6mx0.9m outlet pit with two 600mmx900mm dome top covers and a 2.4m wide weir at R.L. 9.65m AHD, will be capable of mitigating post development flows to predevelopment levels.

No other onsite detention will be required on the site. For further details refer to Appendix A Preliminary Engineering Drawings).

A summary of the modelling results for all storm events are contained in Table 3.2. Results of the modelling indicate the proposed detention basin and outlet arrangement is capable of maintaining the pre-development peak discharges for all storm events up to and including the critical Q100 year ARI event.

Table 3.1 Basin Storage vs Height Relationship

Stage Height m (AHD)	Storage Area
8.62	2
9.24	2
9.25	265
9.75	610

Table 3.2 Comparison of Rational and Dynamic (Drains/Ilisax) Calculations

Catch A	Pre-Development 10mm pervious storage (Drains)	Pre-Development (Rational)	Compare % (10mm/Rational)	Post-Development 10mm pervious storage (Drains)	Post-Development (Rational)	Compare% (10mm/Rational)
Q100	0.518m ³ /s	0.52m ³ /s	99.6	0.656m ³ /s	0.72m ³ /s	91.1
Q20	0.411m ³ /s	0.36m ³ /s	114.2	0.553m ³ /s	0.49m ³ /s	111
Q10	0.341m ³ /s	0.30m ³ /s	113.6	0.477m ³ /s	0.41m ³ /s	115
Q2	0.216m ³ /s	0.19m ³ /s	113.6	0.309m ³ /s	0.26m ³ /s	118

Table 3.3 Comparison of Pre- vs. Post-Development Q₁₀₀ Discharge

	Pre-Development (Drains)	Post-Development (unmitigated) (Drains)	Post Development (mitigated) (Drains)	Pipe Flow	Weir Flow	MaxStage Height
Q100	0.518m ³ /s	0.656m ³ /s	0.414m ³ /s	0.286m ³ /s	0.128m ³ /s	9.75
Q20	0.411m ³ /s	0.553m ³ /s	0.269m ³ /s	0.269m ³ /s	-	9.64
Q10	0.341m ³ /s	0.477m ³ /s	0.253m ³ /s	0.253m ³ /s	-	9.55
Q2	0.216m ³ /s	0.309m ³ /s	0.217m ³ /s	0.217m ³ /s	-	9.36

4 STORMWATER MANAGEMENT – QUALITY CONTROLS

Personnel with appropriate qualifications in soil and water quality management must supervise implementation of the approved works during construction. Soil and water management practices must be constantly monitored, reviewed and modified in order to correct any deficiencies. Any amendments to the approved documents during construction are to be discussed and approved the superintendent prior to implementation of the amended practices.

4.1 Construction Controls

During the construction phase of the development the following sediment and erosion control devices and stormwater management controls will be implemented on the site. Developed in accordance with IEAust Guidelines and Gold Coast City Council Land Development Guidelines the location of control devices is presented in Appendix B. Due to the nature of the development and topography of the site, the necessary erosion and sediment control measures will be minor.

4.1.1 Sediment Basin Requirements

Sedimentation basins are generally required where:

- The disturbed area is greater than 1 hectare;
- The disturbed solids are dispersive; and/or
- Where there is a need to control runoff suspended solids/turbidity.

Since the disturbed area on the subject site at any one time will be less than a hectare, the subject site does not meet any of the above criteria and therefore a fully designed sediment basin will not be required during the construction phase of the development. However, a token sediment basin will be located at the downstream end of the development using the earthworks for the operational phase bioretention/detention basin.

4.1.2 Pre-Construction

Sediment erosion controls will be developed as construction progresses through each development stage. Sediment and Erosion controls are illustrated in Appendix B.

Before construction activities begin, the following sediment and erosion control measures will be implemented to minimise disturbance and ensure that the performance criteria for water quality are met:

- Designation and marking of transport routes across undisturbed portions of the site to ensure minimal disturbance;
- Maintain open space areas in a vegetated state to reduce soil disturbance and provide filter strip treatment of runoff;
- Install sediment fence around the boundary of the proposed open space areas and as indicated in Appendix B;
- Install shake down grids and construction exits to remove sediment from vehicles prior to exiting the site; and
- Site personnel informed of the erosion and sediment controls.

4.1.3 During Construction

Measures to mitigate water quality impacts during the construction will include:

- Sediment fences to be erected at the base of all batters to prevent sediment laden stormwater from flowing onto road surfaces;
- Grass filter strips to be placed along all road verges;
- Sediment fences to be erected around soil stockpiles;
- Regular inspections as soon as practicable after storm events to check and maintain controls; and
- Sediment to be removed from fences and basins when controls are 40% full and at the completion of construction. All material to be re-used or stored on-site in a controlled manner or taken off-site for re-use or disposal at a licensed waste disposal facility.

4.2 Operational Controls

Considering the landuse for the operational phase of the site and its characteristics, and the range of available SQIDs that can operate within the constraints of the site, this study has developed an overall concept that will satisfy the requirements of downstream environmental protection and satisfy the RCC Water Quality Objectives. Figure 4.2 shows a schematic representation (MUSIC screen dump) of the proposed sub-catchment elements and treatment train, while the layout of the SQIDs is illustrated as Appendix A (Operational Control Plan).

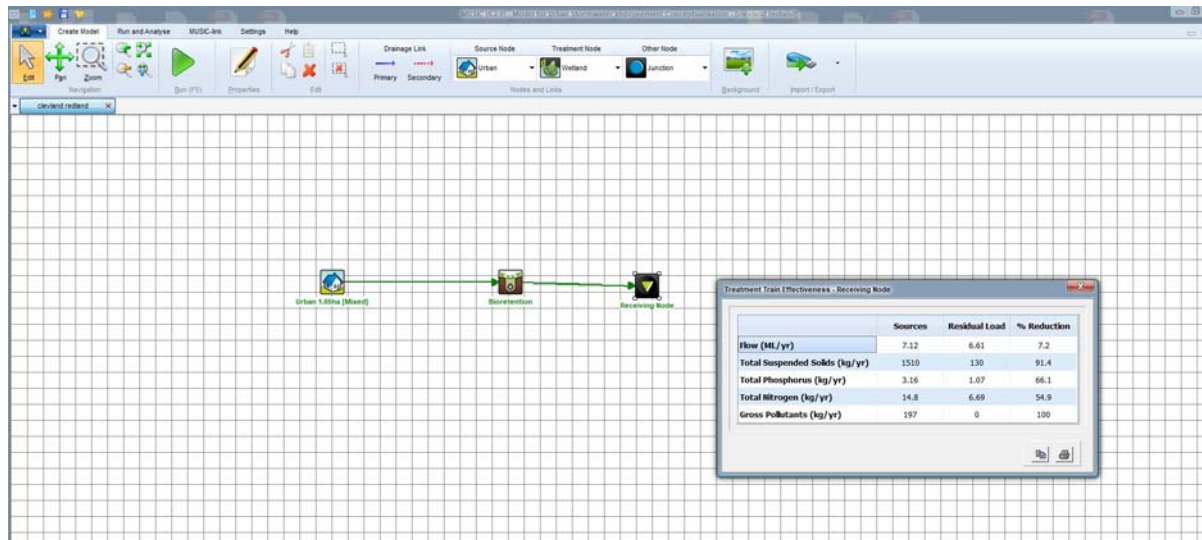


Figure 4.2 Proposed Stormwater Treatment Train (MUSIC Screen Dump)

4.2.1 Flush Kerbs

It is recommended that the hardstand/roads and landscaped areas be graded such that all runoff is directed towards the proposed bioretention/detention basin. The topography of the site has meant that the road directly adjacent to the proposed bioretention basin will sheet flow from the rear of allotments 10-14. Flush kerbs will not be required for use in this case as the proposed bioretention basin is not adjacent to road reserve. For further details refer to Appendix A (Operational Control Plan).

4.2.2 Bioretention Systems

Bioretention systems operate by filtering runoff through a soil media prior to discharge into the drainage system. These systems remove pollutants through a number of processes, including:

- Sedimentation in the extended detention storage;
- Filtration by the filter media;
- Nutrient uptake by bio-films;
- Nutrient adsorption and pollutant decomposition by soil bacteria; and
- Adsorption of metals and nutrients by filter particles (Somes & Crosby, 2007).

Bioretention systems are reported to operate best where input is derived from direct rainfall and sheet flow from surrounding allotments in a small catchment. Water captured in the ponding area should be no more than 30 cm deep for a maximum of 4 days to prevent anaerobic conditions, plant death and insect breeding. A typical cross section of a bioretention system illustrating the various layers is included as Figure 4.3. A combined bioretention/detention basin will be constructed adjacent to the rear of proposed lots 10-14 along the northern boundary of the subject site. All batters for the proposed basin construction

are contained within the subject site and no retaining walls will be required.

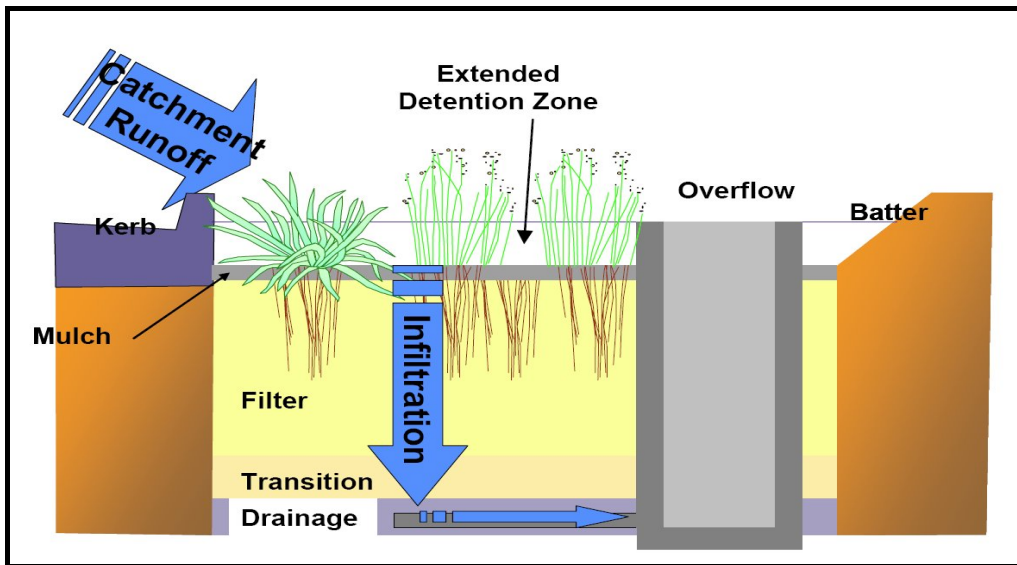


Figure 4.3 Schematic Bioretention System Design

4.2.3 Rainwater Tanks

Non-potable re-use of harvested rainwater reduces pollutant loads exiting the site and entering the receiving waters. The Queensland Development Code for Residential Buildings no longer requires the installation of Rainwater Tanks; however it is still regarded as stormwater best management practice, especially on sites where potential reuse demands are high. After preliminary MUSIC modelling to determine if the reduction in size of other SQIDs (bioretention area) as a result of the action of Rainwater Tanks was cost effective, it is the decision of the developer for the subject site not to include Rainwater Reuse Tanks in this proposal.

4.2.4 Gross Pollutant Traps (GPTs)

Gross Pollutant Traps are devices which are generally able to remove trash (litter), oil (hydrocarbons) and suspended sediment from stormwater. CDS (Continuous Deflective Separation) systems are a type of Gross Pollutant Trap that allow for the collection of Nutrients such as Nitrogen and Phosphorus as well as litter, hydrocarbons and suspended sediment. No GPTs are proposed for the subject site as site traffic volumes and litter loads will be relatively small.

For further details of treatment devices and their layout refer to Appendix A (Operational Control Plan).

5 WATER QUALITY ASSESSMENT

5.1 Pollutants of Concern

The conversion of undisturbed or cleared land into a residential land use has the potential to affect many water quality parameters within stormwater. For residential developments, the following pollutants have been identified as the minimum key performance indicators:

- Suspended Solids (sediment),
- Metals,
- Hydrocarbons (during construction), and.
- Litter.

This report will concentrate on the potential increase in pollutant values as a result of the proposed development, and in turn the required treatment to mitigate potential increases. There is no facility to model metals and hydrocarbons within MUSIC. Therefore, suspended solids, nutrients and litter will be the focus of the water quality modelling. The stormwater treatment measures recommended as part of this development represent BMPs (Best Management Practices) and therefore will remove a significant portion of the other pollutants that can't be represented by MUSIC.

5.2 Surface Runoff Water Quality

A review of all available information for the region found that there is no data available to define stormwater quality for the subject site catchment. Prior to construction on the site the developer will commission a series of data collection exercises, subject to the occurrence of suitable rainfall events, to define stormwater quality. This will comprise collection of water samples from the site at site discharge points following:

- storm events of greater than 25 mm; and
- smaller rainfall events.

Samples will be analysed for suspended solids and all physical water quality parameters, with the results being used as water quality indicators for construction phase monitoring.

5.3 Receiving Water Quality Data

Water quality data for the Estuarine Reaches of Erapah Creek has been sourced from the RCC Planning Scheme. The following statements about the water quality of the Erapah Creek are made:

- Concentrations of Dissolved Oxygen, pH, and the concentration of nitrogen and phosphorus regularly complied with the ANZECC (1992) guidelines.
- Concentrations of Faecal Coli forms were within NH&MRC guidelines for primary contact recreation.
- Concentrations of nutrients increased during wet weather periods as a result of run-off from the surrounding catchments. Organic nitrogen associated with sediment particles and nitrate plus nitrite dissolved in water were the major types of nutrients contained in the runoff.

5.4 Water QUALITY objectives

The analysis of water quality data within the Eprapah Creek catchment indicates that the system is generally healthy but is showing some signs of stress. The quality of water within the local waterway may be impacted on by the proposed development. To ensure the environmental values of the downstream receiving waters are maintained, the following pollutant reduction targets have been set for the post-development scenario.

Table 5.1 Pollutant Reduction Targets

Pollutant	Target
Total Suspended Solids (TSS)	80% reduction in average annual load of pollutants leaving the developed unmitigated scenario.
Total Phosphorous (TP)	60% reduction in average annual load of pollutants leaving the developed unmitigated scenario.
Total Nitrogen (TN)	45% reduction in average annual load of pollutants leaving the developed unmitigated scenario.
Gross Pollutants (GP)	90% Reduction in Gross Pollutants such as Litter

5.5 Music modelling parameters

5.5.1 Model Parameter Definition

The MUSIC modelling parameters used to generate runoff are based on the data published by the MUSIC modelling guidelines for South East Queensland. Unmitigated Developed and Mitigated Developed scenarios have been modelled based on the following assumptions:

- Due to the fact that the effect of a single residential node (subdivision) and the influence of rainwater tanks is **not** being modelled, a single urban residential node has been used to represent the proposed subdivision;
- Due to the catchments being relatively small in size, limiting the distance required for flood wave propagation to travel through the catchments, link routing has not be used for the generation of the model.
- Stochastic modelling has been utilised to confirm performance under random-generation conditions.

Table 5.2 Source Node Pollutant Values Applied to MUSIC

Residential - Urban	Total Suspended Solids (log mg/L)		Total Phosphorous (log mg/L)		Total Nitrogen (log mg/L)	
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Storm Flow Concentration	2.18	0.39	-0.47	0.32	0.26	0.23
Base Flow Concentration	1.0	0.34	-0.97	0.31	0.20	0.20

An urban source node with the relevant parameters (for residential land) was used to represent the MUSIC catchment applied in the model as only a single urban residential node (subdivision) was being modelled. The storm flow parameters, standard deviations and base flow parameters were taken from the MUSIC Modelling Guidelines for South-East Queensland 2009.

5.5.2 Bioretention System Parameter Definition

The proposed bioretention system has been modelled in MUSIC with the following characteristics:

Table 6.3 Bioretention Parameters Applied to MUSIC Model

Storage Properties			Infiltration Properties			
Extended Detention Depth (m)	Surface Area (m ²)	Seepage Loss (mm/hr)	Filter Area (m ²)	Filter Depth (m)	Filter Median Particle Diameter (mm)	Saturated Hydraulic Conductivity (mm/hr)
0.10	265	0	208	0.45	0.45	180

5.6 Music results

The post-development (mitigated) MUSIC model has been simulated with 10 years of 6-minute interval rainfall data for Gold Coast (north) between 1990 and 1999. Results of the MUSIC modelling are summarised in Table 5.5.

Table 5.5 Treatment Train Effectiveness

Pollutant	Source (kg/yr)	Residual SW360 (kg/yr)	Reduction %
TSS	1510	130	91.4
TP	3.16	1.07	66.1
TN	14.8	6.69	54.9
GP	197	0	100

NOTE: All simulations have been run with pollutant export estimation set to "stochastic generation".

The results indicate the target removal efficiencies for all pollutants are achieved. A screen capture of the MUSIC modelling results (showing the Treatment Train Effectiveness) is included as Figures 5.1.

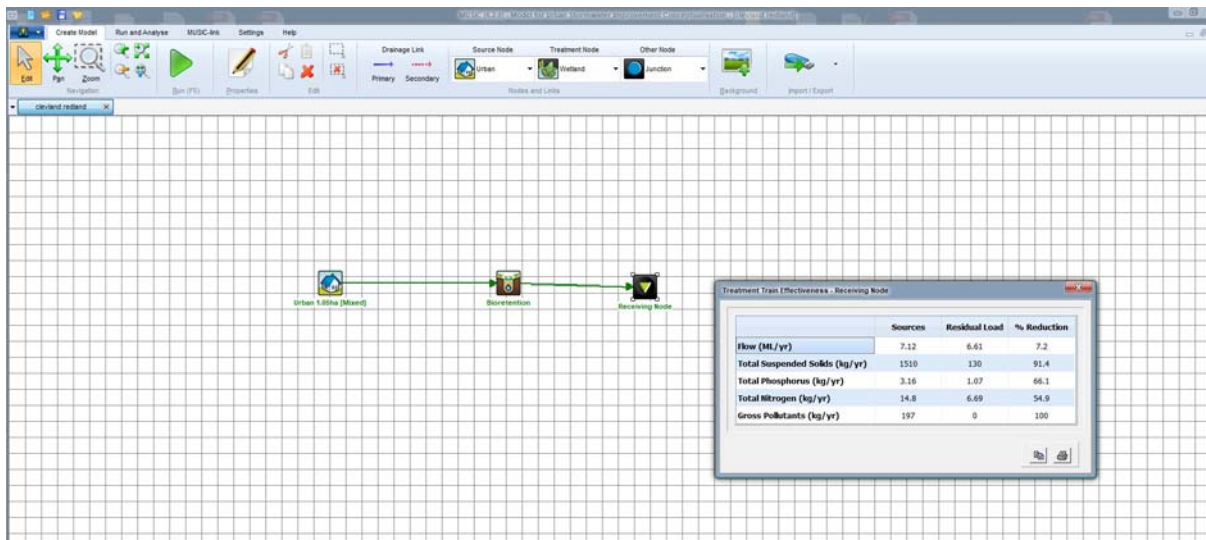


Figure 5.1 Treatment Train Effectiveness of Proposed (Equivalent) Bioretention SQIDs

6 BIORETENTION SYSTEM MAINTENANCE MANUAL AND PLANT SELECTION REQUIREMENTS

It is important to note that bioretention systems, like most WSUD elements that employ soil and vegetation based treatment processes, require approximately two growing seasons (i.e. two years) before the vegetation in the systems has reached its design condition. During this period, regular watering and removal of weeds will be necessary. Vegetation is crucial to maintaining the porosity of the filter media and a strong healthy growth of vegetation is necessary to ensure system performance. Therefore, the most intensive period of maintenance is during the plant establishment period (first two years) when weed removal and replanting may be required.

6.1 Post construction maintenance

The period immediately following construction is crucial for the successful establishment of the bioretention system. To ensure successful plant establishment, weed control measures and regular watering are required.

Weed Control - Surface mulching of the bioretention system with organic material like tanbark, should not be undertaken. Most organic mulch floats and runoff typically causes this material to be washed away with the risk of blockage of drains occurring. Rather, high planting densities should be adopted and application of a biodegradable erosion control matting or a 50 to 75mm thick layer of stone mulch. Stone aggregate should be screened and contain no fine material. 100% of the particles should be in the size range 5 – 13mm. Stone may be of granite or basalt origin and should be clean and sound to help combat weed invasion. Application of a seedless hydro-mulch can also provide short term erosion and weed control prior to planting with nursery stock.

Watering - The frequency of watering to achieve successful plant establishment is dependent upon rainfall, maturity of planting stock and the water holding capacity of the soil. The following watering program is should be adopted:

- Week 1-2 3 visits/ week
- Week 3-6 2 visits/ week
- Week 7-12 1 visit/ week

After this initial three month period, watering may still be required, particularly during the first winter (dry period). Watering requirements to sustain healthy vegetation should be determined during ongoing maintenance site visits.

Scouring and sediment deposition that occurs throughout the establishment period needs to be monitored and addressed through replanting and re-construction of the system. Plant losses of 10 – 15% could be expected during the post-construction period.

6.2 Plant Selection Requirements

6.2.1 Bioretention Planting

Wetland plants should be ordered by the relevant contractor well in advance of the expected planting period with final dispatch to the site arranged to coincide with the scheduled planting time.

Topsoil used in the wetland should be of a reasonable agricultural quality without excessive clay, peat or sand content and have a minimum 5 % organic content. The topsoil should be spread evenly over the wetland zone to a depth of 150 mm and be lightly compacted.

At the time of planting, water levels should be at or near the soil surface. Planting will be conducted according to the following density table. Plants should be planted to 40 - 60 mm depth in the topsoil and be well firmed so that they are less prone to uprooting and do not float out when water levels are raised.

Table 6.1: Planting Density for Wetland Zones.

Zone		Minimum Planting Density (plants/sqm)
1	Deep water (>1.0m)	2
2	Shallow water (<1.0m)	4
3	Water-line/Edge	4
4	Adjacent shrubs/trees	2

Species List

The species list provided in Table 6.2 shall be utilised as the basis for the selection of species for the proposed bioretention basin.

Table 6.2: Suitable Species for Wetland Planting

Zone	Botanical name:	Common name:	Wetland (W) or Bioretention System (B)	Depth Range:
1. Deep water (>1.0m)	<i>Nymphaea violacea</i>	Native Waterlily	W	1-3m
	<i>Nymphoides indica</i>	Water Snowflake	W	1-2m
	<i>Ottelia ovalifolia</i>	Swamp Lily	W	1-2m
2. Shallow water (<1.0m)	<i>Eleocharis dulcis</i>	Spike-rush	W	0-1m
	<i>Baumea articulata</i>	Jointed Twigrush	W	0-1m
	<i>Schoenoplectus mucronatus</i>	Clubrush	W	0-1m
	<i>Schoenoplectus validus</i>	River Clubrush	W	0-1m
3. Water-line/Edge	<i>Cyperus polystachyos</i>	Common Sedge	W/B	< 0.2m
	<i>Juncus usitatus</i>	Common Rush	W/B	< 0.2m
	<i>Lomandra hystrix</i>	Mat Rush	W/B	n/a
	<i>Lomandra longifolia</i>	Mat Rush	W/B	n/a
	<i>Persicaria decipiens</i>	Slender Knotweed	W/B	< 0.2m
	<i>Philydrum lanuginosum</i>	Woolly Frogmouth	W/B	< 0.2m
4. Adjacent shrubs/trees	<i>Acmena smithii</i>	Creek Lilly Pilly	W/B	n/a
	<i>Allocasuarina littoralis</i>	Black Sheoak	W/B	n/a
	<i>Callistemon viminalis</i>	Weeping Bottlebrush	W/B	n/a
	<i>Corymbia intermedia</i>	Pink Bloodwood	W/B	n/a
	<i>Euclayptus tereticornis</i>	Forest Red Gum	W/B	n/a
	<i>Hibiscus diversifolius</i>	Swamp Hibiscus	W/B	n/a
	<i>Lophostemon suaveolens</i>	Swamp Box	W/B	n/a
	<i>Lophostemon confertus</i>	Brush Box	W/B	n/a
	<i>Melaleuca quinquinervia</i>	Broad-leaved Paperbark	W/B	n/a
	<i>Melaleuca irbyana</i>	Bushhouse Paperbark	W/B	n/a
	<i>Melastoma affine</i>	Blue Tongue	W/B	n/a
	<i>Syzygium australe</i>	Scrub Cherry	W/B	n/a
	<i>Waterhousia floribunda</i>	Weeping Lilly Pilly	W/B	n/a

Plant Aftercare

Immediately after planting water levels in the wetland should be raised to 50 - 100 mm above the soil surface to optimise conditions for the wetland plants and suppress weed growth. The water level should not be raised above the height of the plant shoots as the plants require an intake of oxygen through the emergent shoots. As the wetland plants grow, the water level in the wetland should be gradually raised. The water level in the proposed Wetland may need to be raised with water from an external source during periods of little or no rainfall. After rainfall events the water level in the wetland may be too high and water may be required to be pumped out of the wetland to prevent drowning the plants.

6.3 Long term maintenance requirements

Long term maintenance is required to ensure the bioretention system continues to perform its required function and to ensure the aesthetics of the system are maintained. Removal of litter from the bioretention system should be undertaken on a regular basis (weekly at a minimum), and could form part of the regular cleaning routine for the development. This is to maintain the aesthetic appeal of the system, rather than for operational purposes. Maintenance of the bioretention system will involve:

- clearing of the inlet zone - required whenever sufficient coarse sediments have accumulated in the infiltration area;
- removal of debris and plant litter from the bioretention system - required based on accumulation to unacceptable levels. Care must be taken to schedule periodic removal operations at times when vegetation may be routinely shedding leaves and foliage;
- desilting of infiltration areas - this will be driven by monitoring of silt depth. It is expected that desilting will be required approximately every 2 - 3 years;
- treatment/removal of diseased trees and shrubs – to be performed as required;
- inspection after rainfall events to repair eroded areas – as required after storm events; and
- pruning of trees and shrubs to maintain the appearance of the treatment system.

Resetting (i.e. complete reconstruction) of the bioretention system will be required if the system fails to drain adequately after tilling of the surface or failure of the infiltration test. Maintenance should only occur after a reasonably rain free period when the soil in the bioretention system is dry. Inspections are also recommended following large storm events to check for scour and other damage.

6.3.1 Filter Media Performance

The material can be of siliceous or calcareous origin and will preferably be a “washed sand” i.e. one that has been mined and processed. Natural soils or topsoils are not recommended due to their variable physical characteristics and potential to contain weed seeds (Somes & Crosby, 2007). It is crucial that soils have a saturated hydraulic conductivity in the range of 100 – 200mm/h. Hydraulic conductivities higher than this will not allow adequate time in the filter for pollutant uptake and hydraulic conductivities below this range are more susceptible to clogging over time. Hydraulic conductivity testing should be conducted to ensure the material has an appropriate hydraulic conductivity prior to accepting the material (Somes & Crosby, 2007).

To determine whether a soil is suitable, the following tests are to be undertaken on any soil prior to its delivery:

- Saturated Hydraulic Conductivity
- Particle size distribution (PSD)

Saturated hydraulic conductivity is the critical performance factor and materials that fall outside the desired grading envelope may be appropriate. If a material drains at the appropriate rate and falls outside the desired grading envelope, its appropriateness should be reviewed by a suitably qualified soil scientist. Any sample not meeting the hydraulic conductivity specification is not to be used and another sample is to be provided for testing (Somes & Crosby, 2007).

For a functional system, in-situ infiltration testing should be undertaken every 5 to 10 years to confirm the infiltration rate of the media. If the infiltration rate is below 50mm/h, the filter media should be replaced (Somes & Crosby, 2007).

6.4 Filter media amelioration

The horticultural properties of the filter media need to be assessed prior to the initial planting and on an ongoing basis as re-planting is required. The testing of horticultural properties is required to ensure the soil will not inhibit plant growth. As a minimum the following should be defined prior to the material being used:

- pH: desired range of 5.5 to 7.5. The rate of addition will need to be defined by a soils laboratory.
- Electrical conductivity (< 0.17mS/cm).
- Total Salts (<500ppm) (Somes & Crosby, 2007).

If the soil does not possess these attributes, the top layer (75mm) of the filter media will need to be ameliorated prior to planting. This includes addition of a range of fertilisers and trace elements and mixing into the top 75mm of the filter prior to planting. It is important to note that the addition of nutrients is a one-off occurrence and is extremely important to the successful establishment of the plants. Nutrients, i.e. phosphorus (P) and nitrogen (N), should be added at a rate of 19 grams and 26 grams of P and N, respectively per square meter of the filter surface (Somes & Crosby, 2007).

6.5 Equipment needs

The RCC (Gold Coast City Council) maintenance staff can undertake removal of litter from the bioretention system by hand.

RCC maintenance staff can perform vegetation maintenance of the bioretention system by hand.

Desilting and resetting of the filter media will require the use of a small excavator due to the quantity of material involved.

6.6 System inspection

During the implementation period of the bioretention system, inspection is required after the first major storm event (>100 mm over 24-hours). Ongoing monthly inspections are necessary to evaluate conditions, identify operational problems, and to establish the on-going maintenance schedule in accordance with the Bioretention System Operation and Maintenance Activities and Frequencies (Table 6.3).

6.7 Maintenance costs

The cost of removing litter from the bioretention system will be negligible as it will be the responsibility of the RCC maintenance staff who will be maintaining the site in the off maintenance period of the development. Vegetation maintenance is expected to take approximately 2 hours at approximately \$50-\$60 per hour, including removal and disposal of any wastes.

Costs associated with the excavation and resetting of the filter media are based on the following assumptions.

- Excavation & supply of new filter media \$55/m³

- Resetting of vegetation \$25/m²
- Total Volume (208m² at 0.45m depth) 94m³
 - Cost \$10,400

Therefore, assuming the filter media will be replaced every 5 years, the annual maintenance costs are summarised in Table 6.4.

Table 6.3 Recommended Maintenance Activities and Frequencies

Activity	Frequency	Comment
Aesthetics		
Litter & Organics removal	As required, typical range 12 to 18 visits per year.	Highly variable depending on landscape site.
Sediment removal	As required, would only be expected every 2-3 years or if new sediment source present in catchment, e.g. construction works.	Construction on any adjacent properties should be monitored and builders asked to desilt the bioretention system if affected.
Vegetation		
Weed Control	6 to 8 visits per year.	More spraying will be required for areas with poor mulch cover.
Replanting	5% per year after first two years of maintenance.	The replanting regime assumes plants will be replaced progressively.
Mulching	Top up annually if required.	Mulch should require minimal top up if installed correctly. Ensure levels are not modified from design.
Damage	Repair accidental and deliberate damage as required.	Will vary from site to site, less than 10% of construction cost per annum.
Inspections		
Functional elements	Every 5 to 10 years inspection of drainage elements is undertaken.	This should be similar to scope outlined in WSUD Engineering Procedures: Stormwater.
Landscape	A quick inspection is to be undertaken during weed control visits. More detailed inspections of landscape should be undertaken every 18 – 24 months.	A review of the aesthetics and physical condition.
Infiltration	Every 5 to 10 years, in situ infiltration test should be undertaken.	Representative in-situ infiltration tests should be taken across the site to confirm infiltration rate. If the infiltration rate is below 50mm/h, the filter should be replaced.

Table 6.4 Summary of Bioretention System Annual Maintenance Costs

	Interval	Cost	Annual Cost
Vegetation Maintenance	3months	\$120	\$500
Vegetation Replacement	5 years	\$5200	\$1040
Media Replacement	5 years	\$5200	\$1040
Miscellaneous Costs*	1 year	\$1000	\$1000
TOTAL	-	-	\$3580

*Note: A cost for unforeseen works such as repairs due to vandalism etc has been included in this cost assessment. This cost estimate compares well with the Land and Water Constructions *Review of Street Scale WSUD in Melbourne – Study Findings*, which reported maintenance estimates of \$8.76/m² to \$13.25/m².

6.8 Waste disposal/Environmental Considerations

Waste products collected in the bioretention system should be removed and disposed of by RCC maintenance staff, similar to any other stormwater treatment device that is being dedicated as a council asset.

6.9 Safety

Public safety during maintenance will be the responsibility of the RCC (following the commencement of the off-maintenance period) or contactor appointed to perform the maintenance works by RCC. During excavation and replacement of the filter media, public safety is to be addressed through the provision of warning signs and safety barricades to avoid any possible injury to passers-by. Before being commissioned to maintain the system, it should be verified the contractor (if not being performed by RCC employees) has the appropriate levels of public liability insurance.

Occupational safety of the contractors remains their responsibility.

7 MANAGEMENT PLAN

To minimise the impact of the proposed changes on the external environment the proponent shall implement this SMP. This SMP shall be amended as required in response to the Monitoring and Maintenance Program described herein to avoid significant and/or sustained deterioration in existing water quality of waterways downstream, when operational works are approved.

7.1 MONITORING AND MAINTENANCE PROGRAM

7.1.1 CONSTRUCTION PHASE MONITORING PROGRAM

Monitoring during the construction phase will be conducted to determine the impact of activities on the subject site only. Runoff from the subject site will be monitored monthly during construction on an event basis for storm events in excess of 25 mm within a 24 hour period.

Parameters:	TSS, TN, TP, Turbidity, pH and DO.
Frequency:	Monthly and following single rain events in excess of 25 mm per day during the construction phase.
Monitoring Procedures:	Sampling by the proponent in accordance with procedures set out in the Environmental Protection Authority's Water Quality Sampling Manual. Analysis by RCC Scientific Staff. Alternatively calibrated probes may be used.
Reporting:	Monthly reports are to be submitted to RCC for review upon request, typically at Survey Sealing Stage.

7.2 INVESTIGATION INDICATORS

The following indicators are used to identify if the objectives of the SMP are being met:

1. Visible evidence of deterioration of downstream drainage that is directly attributable to the site;
2. Visible significant erosion; and/or
3. Failure of control measures.

The triggering of an investigation indicator will require the following remedial actions:

1. Locate source of water quality deterioration;
2. Prevent continuing deterioration with temporary controls;
3. Repair existing controls, construct additional controls or modify procedures to prevent future deterioration in water quality;
4. If, after new operation commences, there is a significant deterioration in water quality, the management plan and strategies will be reviewed in consultation with RCC.

7.3 RESPONSIBILITIES AND TIMMING

Table 7.1. Responsibilities and Timing

Item	Responsibility	Timing/Deadline
Operational Works Design	Appointed Consultant	TBA
Control Implementation	Owner/contractor	TBA
Water Quality Monitoring & Reporting	Appointed Consultant – commissioned by developer	Monthly and following single rain events in excess of 25 mm per day during the construction phase. Following 3 rain events in the operational phase
Control Maintenance	Contractor under supervision of engineer	Continuous until off-maintenance
Supervision on an as needs basis	Appointed Consultant	During Construction Phase.
Corrective action	Owner/contractor under direction of Appointed Consultant	Continuous until off-maintenance
SWM Compliance Certification	DNBS Consulting Engineers	At Completion of Works

Where requested by the approving agency, DNBS Consulting Engineers may agree to provide certification of the SMP provided the contractor and appointed consultant furnish the required information.

8 CONCLUSIONS

This study has reviewed the hydrology and hydraulics of the site for pre- and post-development scenarios and investigated the impact of the proposed development on downstream properties and receiving waters.

Based on this study the following conclusions have been drawn:

- Peak discharges for all storms between the Q2 and the Q100 ARI critical storm are maintained from the site. Therefore the proposed development and its stormwater detention system will not adversely impact the existing stormwater drainage network, the vegetated/environmental covenant area to the north west of the site, or the downstream properties.
- Onsite detention will be required and provided above the proposed 208m² bioretention basin as shown in Appendix A. This is necessary to maintain the pre-development peak discharge from the site. No additional detention will be required on the subject site. All batters for the proposed basin are contained within the subject site and no retaining walls will be required for its construction or the proposed allotments;
- The proposed site earthworks allow for all of the proposed allotments to be serviced by gravity sewer.
- The RCC pollutant reduction targets specified for the post-development scenario are achieved for all pollutants.

In summary, flooding of downstream properties and the integrity of receiving water bodies will not be adversely impacted as a result of this development provided the mitigation measures described herein are implemented.

Appendix A

Preliminary Engineering Drawing Set

PROPOSED RESIDENTIAL SUBDIVISION CIVIL WORKS

289-301 CLEVELAND-REDLAND-BAY ROAD, THORNLANDS

DRAWING NUMBER	DRAWING TITLE
2016030-DA-001	DRAWING SCHEDULE AND LOCALITY PLAN
2016030-DA-002	DRAWING SET NOTES
2016030-DA-003	OVERALL SITE LAYOUT PLAN AND STORMWATER CATCHMENT PLAN
2016030-DA-004	EXISTING FEATURES AND DEMOLITION PLAN SHEET 1 OF 2
2016030-DA-005	EXISTING FEATURES AND DEMOLITION PLAN SHEET 2 OF 2
2016030-DA-006	PRELIMINARY ENGINEERING SERVICES PLAN SHEET 1 OF 2
2016030-DA-007	PRELIMINARY ENGINEERING SERVICES PLAN SHEET 2 OF 2
2016030-DA-008	SITE SECTIONS AND DETAILS SHEET
2016030-DA-009	SEDIMENT AND EROSION CONTROL PLAN AND DETAILS SHEET
2016030-DA-010	SEWER LONGITUDINAL SECTIONS SHEET

PROPERTY DESCRIPTION:

LOT 5 ON RP14839

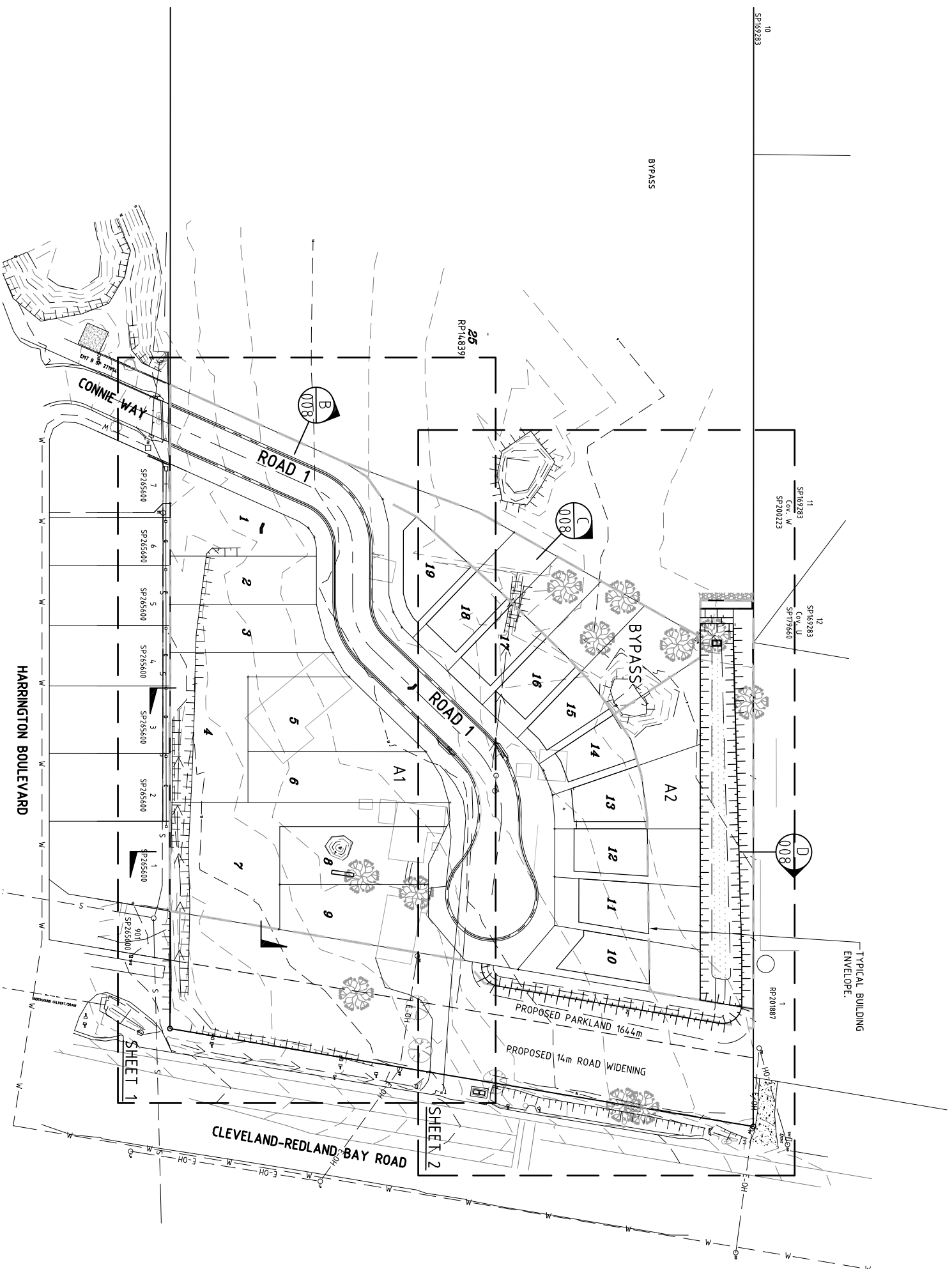
PERMANENT SURVEY MARK DETAILS

PSM186621 RL12.345m AHD
TBM SCREW IN TRAFFIC ISLAND RL 13.29m AHD
CLEVELAND-REDLAND BAY ROAD, THORNLANDS



LOCALITY PLAN
N.T.S

REVISIONS		DRAWING DATA		DRAWING INFORMATION		DRAWING TITLE	
D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL					
C	13.03.17	RESPONSE TO COUNCIL INFORMATION REQUEST					
B	28.11.16	RESPONSE TO COUNCIL INFORMATION REQUEST					
A	01.06.16	FOR COUNCIL APPROVAL					
AMENDMENT DESCRIPTION		HORIZONTAL DATUM		VERTICAL DATUM		TITLE	
		MGA '94		AHD (m)		DRAWING SCHEDULE AND LOCALITY PLAN	
		PROJECT		DRAWER		PROJECT GENERATION	
		PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS		JM		RP14839	
		LOT 5 ON RP14839		DESIGNER		DRAWING No	
		289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS		DS		2016030-DA-001	
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		DO NOT SCALE FROM THIS DRAWING		REVIEWED		DATE	
				DS		2016030-DA-001	
						D	



LEGEND

— — — — —	EXISTING KERB AND CHANNEL
— — — — —	EXISTING WATER RETICULATION
— S — — —	EXISTING SEWERAGE RETICULATION
— T — — —	EXISTING TELSTRA
— E-OH — — —	EXISTING OVERHEAD ELECTRICITY
— S50 — — —	FINISHED SURFACE CONTOURS
=====	PROPOSED KERB & CHANNEL
=====	PROPOSED EDGE RESTRAINT
□	EXISTING TELSTRA PIT
○ SHH	EXISTING SEWERAGE MANHOLE
○ PP	EXISTING POWER POLE
○ FH	EXISTING FIRE HYDRANT
□ EPHL	EXISTING ELECTRICITY PIT
□ WM	EXISTING WATER METER

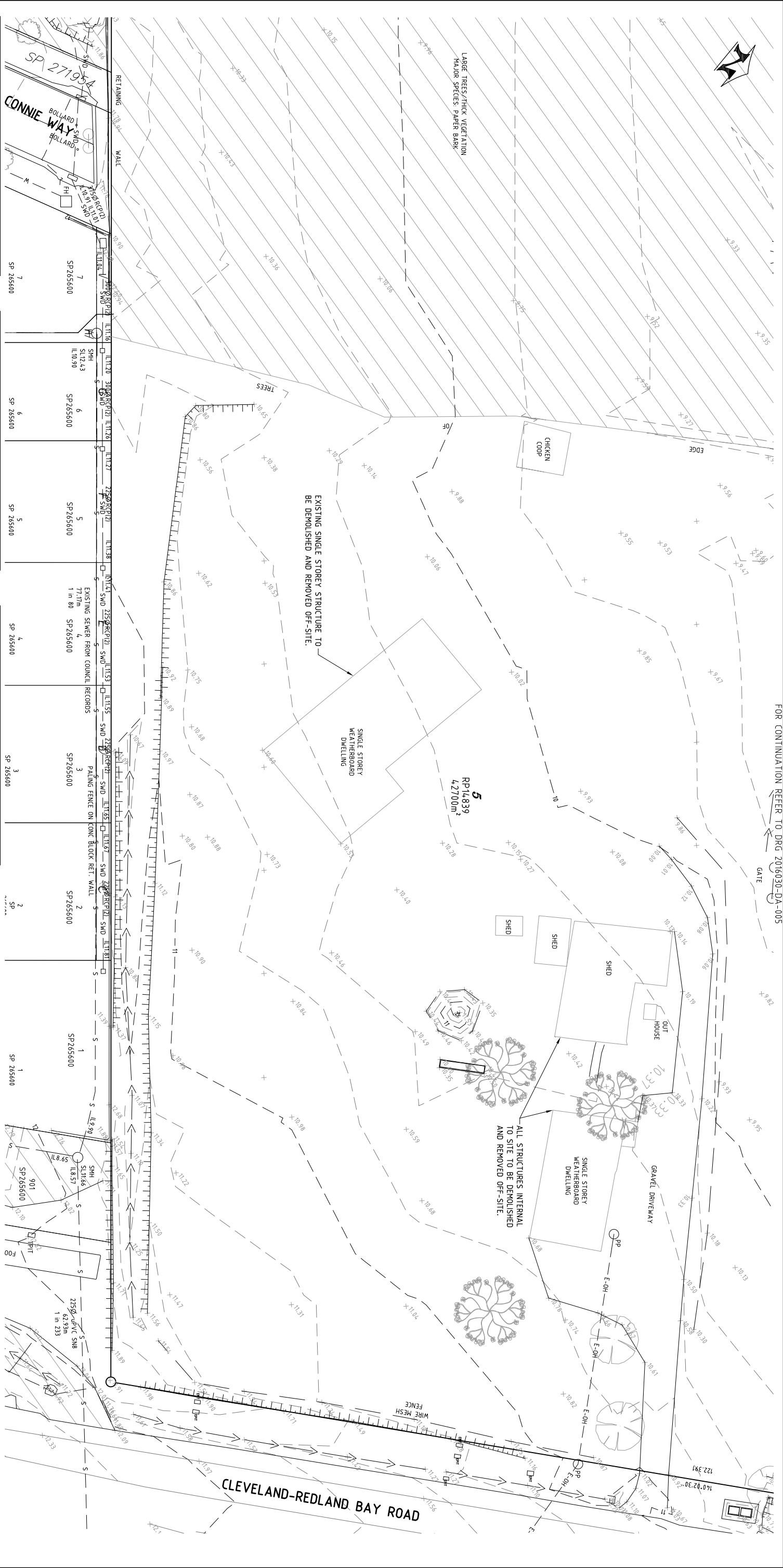
NOTE

1. FOR DRAWING SET NOTES REFER TO DRAWING 216030-DA-002.

CATCHMENT TABLE

CATCHMENT	AREA (ha)
A1	0.879
A2	0.171
BYPASS	0.910

D 06/08/17 LAYOUT AMENDED FOR COUNCIL APPROVAL C 13/03/17 RESPONSE TO COUNCIL INFORMATION REQUEST B 28/11/16 RESPONSE TO COUNCIL INFORMATION REQUEST A 01/06/16 FOR COUNCIL APPROVAL	HARRINGTON BOULEVARD ROAD 1 CONNIE WAY CLEVELAND-REDLAND BAY ROAD SHEET 1 SHEET 2	HORIZONTAL DATUM MGA 94 VERTICAL DATUM AHD (m)	DRAWN BY JM CHECKED BY DS	PROJECT PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS LOT 5 ON RP14839 289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS
1500 108 6 4 2 0 10 20 30 40 50m FULL SIZE ON A1	CLIENT PROJECT PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS LOT 5 ON RP14839 289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS	DRAWN BY JM CHECKED BY DS	REVISIONS DS	TITLE OVERALL SITE LAYOUT PLAN
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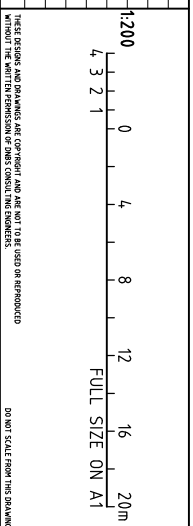


LEGEND	
	EXISTING KERB AND CHANNEL
	EXISTING TELSTRA
	EXISTING STORMWATER
	EXISTING WATER RETICULATION
	EXISTING SEWER RETICULATION
	EXISTING SURFACE CONTOURS
	EXISTING OVERHEAD ELECTRICITY
	EXISTING FENCE

	EXISTING WATER METER
	EXISTING FIRE HYDRANT
	EXISTING POWER POLE
	EXISTING LIGHT POLE
	EXISTING STORMWATER MANHOLE
	EXISTING SEWER MANHOLE
	EXISTING ELECTRICITY PIT
	EXISTING TELSTRA PIT
	EXISTING SURFACE LEVEL

- NOTES**
- REFER TO DRG 2016030-OPW-002 FOR DRAWING SET NOTES.
 - ALL LEVELS ARE IN METRES (m) TO AUSTRALIAN HEIGHT DATUM (AHD).

<p>PROJECT: PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS LOT 5 ON RP14839 289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS</p>		<p>HORIZONTAL DATUM: MGA 94</p>	<p>VERTICAL DATUM: AHD (m)</p>	<p>DATE: JM</p>	<p>DESIGN: DS</p>	<p>REVIEWED: DS</p>	<p>PROJECT GENERATION: RP03#1028</p>	<p>DRAWING NO: 2016030-OPW-004</p>	<p>DATE: D</p>
<p>CLIENT: [REDACTED]</p>		<p>DNBS CONSULTING ENGINEERS P.O. BOX 641 MERRAID BEACH QLD 4218 M:0422573524, P:0755720703 E:dnbs@dnbsconsulting.com.au, W:www.dnbsconsulting.com.au</p>							
<p>PROJECT DESCRIPTION: A 010616 FOR COUNCIL APPROVAL</p>		<p>TITLE: EXISTING FEATURES AND DEMOLITION PLAN SHEET 1 OF 2</p>							





11 Gov. W
SP169283 SP200223

12
SP089833
SP179660
SP179660

HOUSE

SHED

WATER TANK
LOT 1 RP201887
RP 201887

BP-H0-3

E-OH

E-OH

E-OH

E-OH

E-OH

E-OH

E-OH

E-OH

E-OH

E-OH

LARGE TREES/THICK VEGETATION
MAYOR SPECIES: PAPERS BARK

5
RP14839
4,270m²

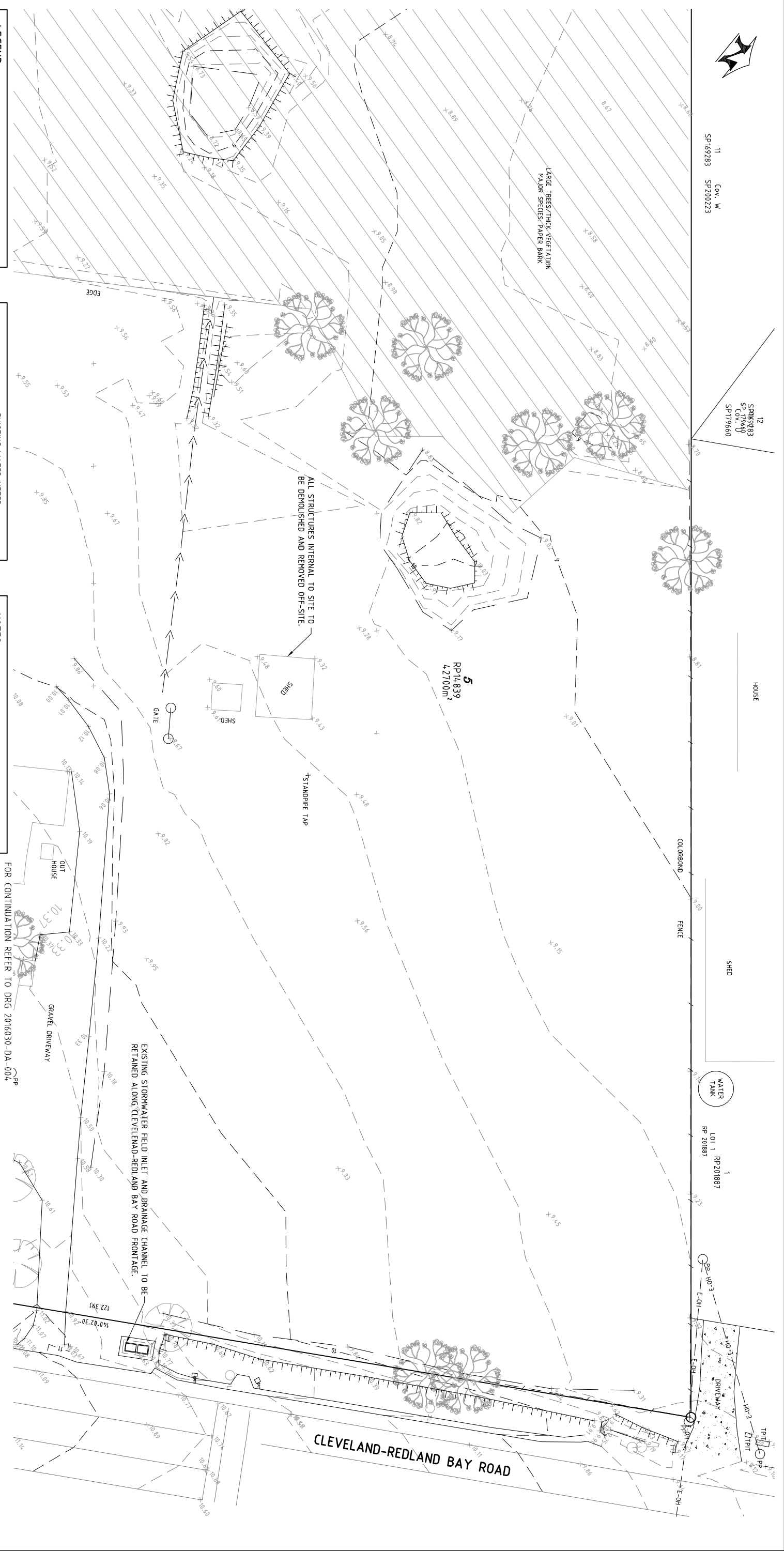
ALL STRUCTURES INTERNAL TO SITE TO
BE DEMOLISHED AND REMOVED OFF-SITE.

STANDPIPE TAP

EXISTING STORMWATER INLET AND DRAINAGE CHANNEL TO BE
RETAINED ALONG CLEVELAND-REDLAND BAY ROAD FRONTAGE.

FOR CONTINUATION REFER TO DRG 2016030-DA-004

CLEVELAND-REDLAND BAY ROAD



LEGEND

	EXISTING KERB AND CHANNEL
	EXISTING TELSTRA
	EXISTING STORMWATER
	EXISTING WATER RETICULATION
	EXISTING SEWER RETICULATION
	EXISTING SURFACE CONTOURS
	EXISTING OVERHEAD ELECTRICITY
	EXISTING FENCE

	EXISTING WATER METER
	EXISTING FIRE HYDRANT
	EXISTING POWER POLE
	EXISTING LIGHT POLE
	EXISTING STORMWATER MANHOLE
	EXISTING SEWER MANHOLE
	EXISTING ELECTRICITY PIT
	EXISTING TELSTRA PIT
	EXISTING SURFACE LEVEL

NOTES

1. REFER TO DRG 2016030-OPW-002 FOR DRAWING SET NOTES.
2. ALL LEVELS ARE IN METRES (m) TO AUSTRALIAN HEIGHT DATUM (AHD).



D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL
C	13.03.17	RESPONSE TO COUNCIL INFORMATION REQUEST
B	28.11.16	RESPONSE TO COUNCIL INFORMATION REQUEST
A	01.06.16	FOR COUNCIL APPROVAL

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DRAWN SCALE FROM THIS DRAWING

CLIENT
MARK WINFIELD

PROJECT
**PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS
LOT 5 ON RP14839
289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS**

HORIZONTAL DATUM	MGA 94
VERTICAL DATUM	AHD (m)
DRAWN	JM
DESIGNED	DS

DNBS
CONSULTING ENGINEERS

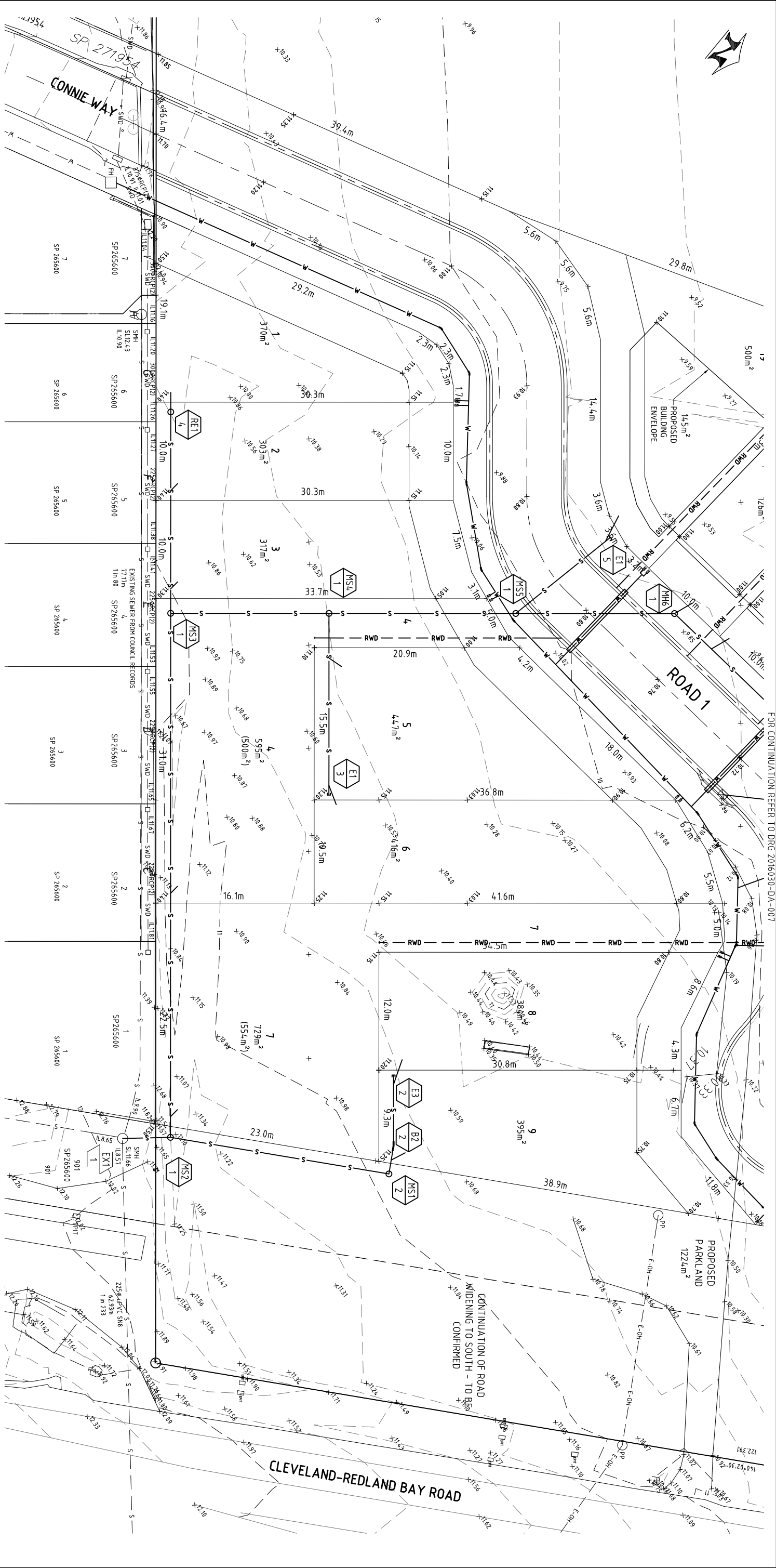
P.O. BOX 641 HERALD BEACH QLD 4218
M:0422573524, PH:0755127073
E:dnbs@dnbsconsulting.com.au WEB:www.dnbsconsulting.com.au

TITLE
**EXISTING FEATURES AND
DEMOLITION PLAN SHEET 2 OF 2**

PROJECT REFERENCE
RPE0#1028

DRAWING No
2016030-OPW-005

DATE
D



LEGEND

	EXISTING KERB AND CHANNEL
	EXISTING TELSTRA
	EXISTING STORMWATER
	EXISTING WATER RETICULATION
	EXISTING SEWER RETICULATION
	EXISTING SURFACE CONTOURS
	EXISTING OVERHEAD ELECTRICITY
	EXISTING FENCE

	EXISTING WATER METER
	EXISTING FIRE HYDRANT
	EXISTING POWER POLE
	EXISTING LIGHT POLE
	EXISTING STORMWATER MANHOLE
	EXISTING SEWER MANHOLE
	EXISTING ELECTRICITY PIT
	EXISTING TELSTRA PIT
	EXISTING SURFACE LEVEL

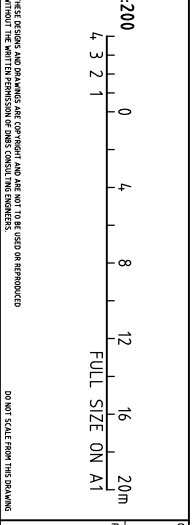
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	PROPOSED SEWER MAIN, MAINTENANCE SHAFT AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, TERMINAL MAINTENANCE SHAFT AND LABEL
	PROPOSED SEWER MAIN, ROODING END AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, INLINE BEND AND STRUCTURE LABEL
	PROPOSED FIRE HYDRANT, STOP VALVE, REDUCER & WATER METER

	PROPOSED LOW PRESSURE SEWER MAIN, IN-LINE BEND AND STRUCTURE LABEL
	PROPOSED LOW PRESSURE SEWER ISOLATION VALVE
	PROPOSED SEWER RISING MAIN BOUNDARY KIT REFER SEQ-PSS-1102-1 FOR DETAILS.
	PROPOSED LOW PRESSURE SEWER MAIN FLUSHING POINT

NOTES

- REFER TO DRG 2016030-DA-002 FOR DRAWING SET NOTES.
- ALL LEVELS ARE IN METRES (m) TO AUSTRALIAN HEIGHT DATUM (AHD)

A	01/06/16	FOR COUNCIL APPROVAL
B	28/11/16	FOR COUNCIL APPROVAL
C	13/03/17	RESPONSE TO COUNCIL INFORMATION REQUEST
D	06/08/17	LAYOUT AMENDED FOR COUNCIL APPROVAL



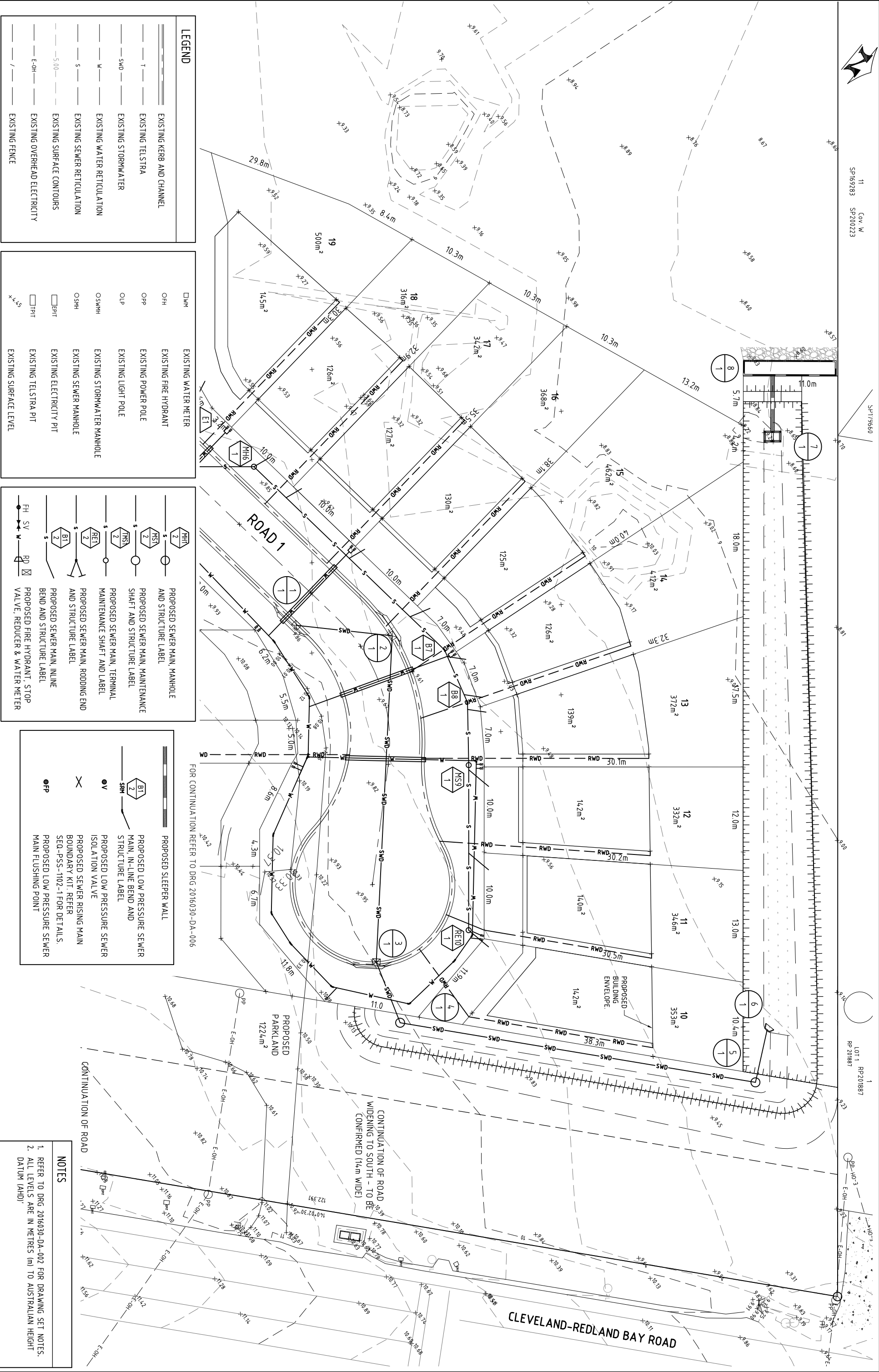
PROJECT
 PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS
 LOT 5 ON RP14839
 289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS

HORIZONTAL DATUM	MGDA 94
VERTICAL DATUM	AHD (m)
DRAWER	JM
DESIGNED	DS



REVIEWED	DS
PROJECT REFERENCE	PP03#1028
DRAWING NO	2016030-DA-006
DATE	2016030-DA-006
APP'D	D

TITLE
 PRELIMINARY ENGINEERING SERVICES
 PLAN SHEET 1 OF 2



LEGEND

	EXISTING KERB AND CHANNEL
	EXISTING TELSTRA
	EXISTING STORMWATER
	EXISTING WATER RETICULATION
	EXISTING SEWER RETICULATION
	EXISTING SURFACE CONTOURS
	EXISTING OVERHEAD ELECTRICITY
	EXISTING FENCE

	EXISTING WATER METER
	EXISTING FIRE HYDRANT
	EXISTING POWER POLE
	EXISTING LIGHT POLE
	EXISTING STORMWATER MANHOLE
	EXISTING SEWER MANHOLE
	EXISTING ELECTRICITY PIT
	EXISTING TELSTRA PIT
	EXISTING SURFACE LEVEL

	PROPOSED SEWER MAIN, MANHOLE AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, MAINTENANCE SHAFT AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, TERMINAL MAINTENANCE SHAFT AND LABEL
	PROPOSED SEWER MAIN, RODDING END AND STRUCTURE LABEL
	PROPOSED SEWER MAIN, IN-LINE BEND AND STRUCTURE LABEL
	PROPOSED FIRE HYDRANT, STOP VALVE, REDUCER & WATER METER

	PROPOSED SLEEPER WALL
	PROPOSED LOW PRESSURE SEWER MAIN, IN-LINE BEND AND STRUCTURE LABEL
	PROPOSED LOW PRESSURE SEWER ISOLATION VALVE
	PROPOSED SEWER RISING MAIN BOUNDARY KIT REFER
	PROPOSED LOW PRESSURE SEWER MAIN FLUSHING POINT

NOTES

- REFER TO DRG 2016030-DA-002 FOR DRAWING SET NOTES.
- ALL LEVELS ARE IN METRES (m) TO AUSTRALIAN HEIGHT DATUM (AHD)

D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL
C	13.03.17	RESPONSE TO COUNCIL INFORMATION REQUEST
B	28.11.16	RESPONSE TO COUNCIL INFORMATION REQUEST
A	01.06.16	FOR COUNCIL APPROVAL

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS

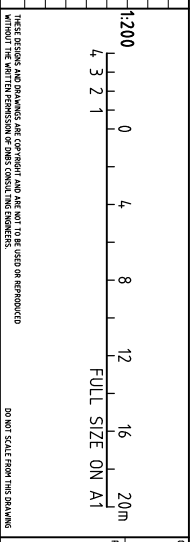
LOT 5 ON RP14839

289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS

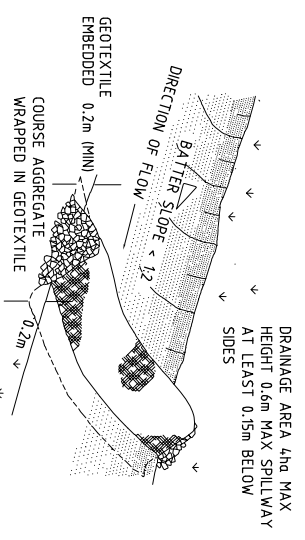
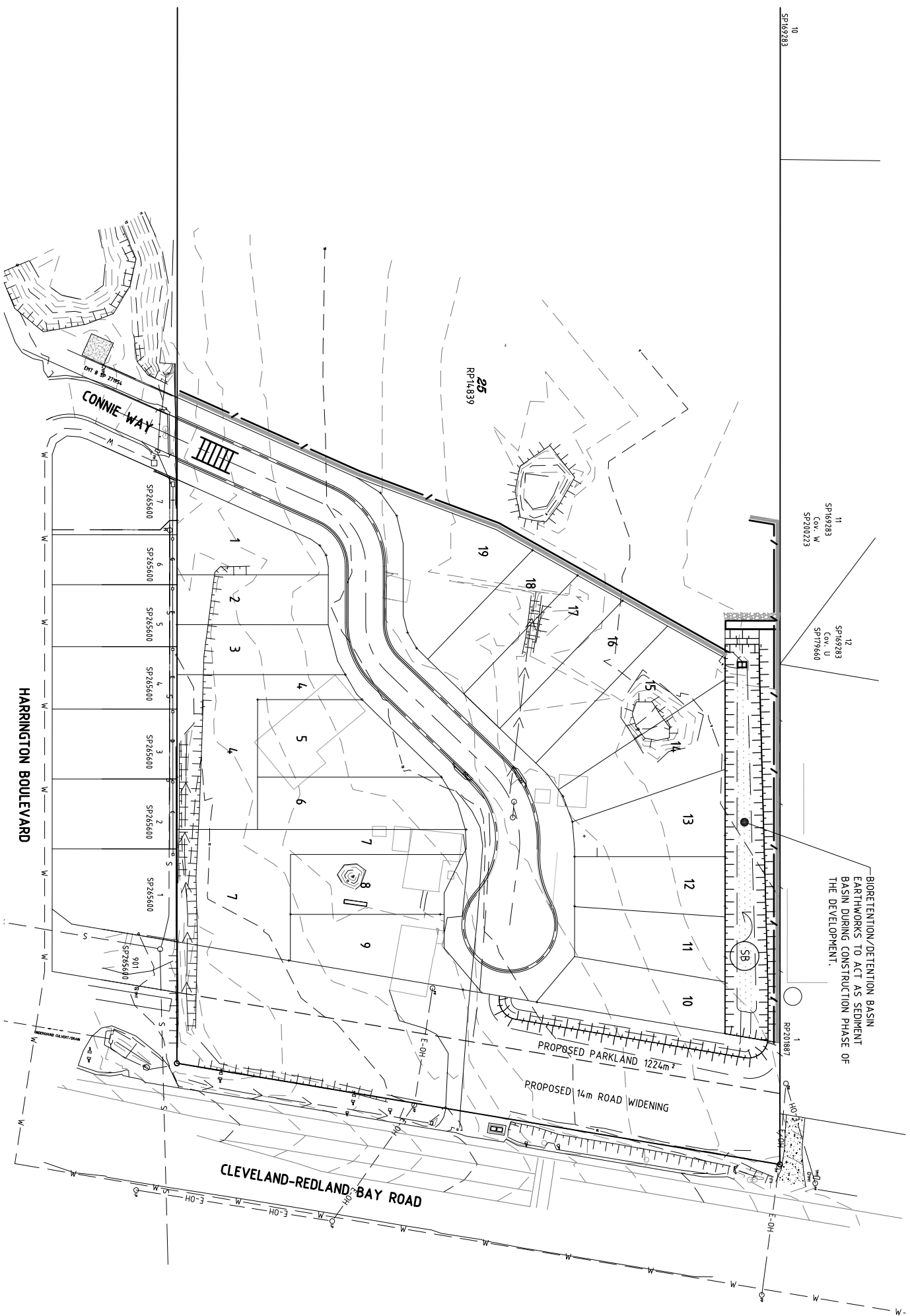
DATE	DESIGNED	REVIEWED
JM	DS	DS

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M:042257552, P:075572703
E:dane@dnbsconeng.com.au W:www.dnbsconeng.com.au

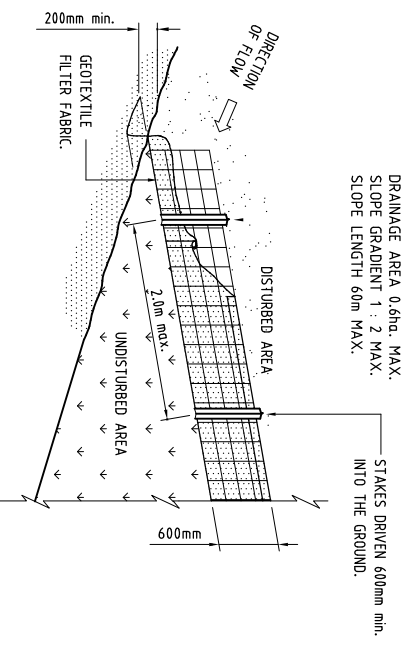
TITLE	DATE
PRELIMINARY ENGINEERING SERVICES	2016030-DA-007
PLAN SHEET 2 OF 2	DRWING NO
	2016030-DA-007
	APP'D
	D



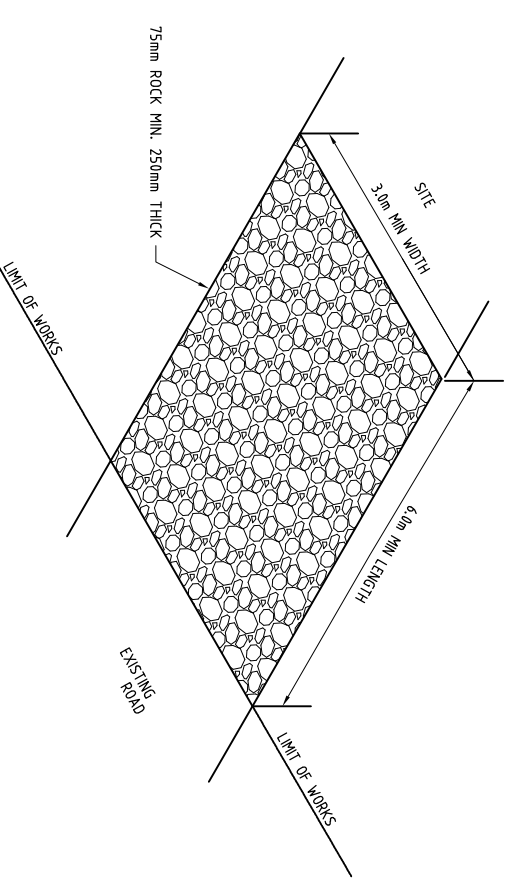
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ROCK CHECK DAM
SCALE N.T.S.



GEOTEXTILE SEDIMENT FENCE
SCALE N.T.S.

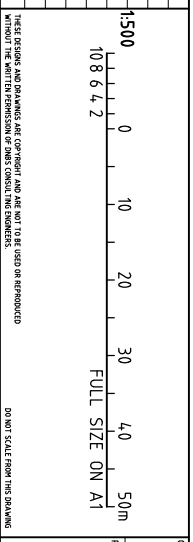


SHAKE-DOWN AREA
N.T.S.

LEGEND	
	EXISTING KERB AND CHANNEL
	EXISTING WATER RETICULATION
	EXISTING SEWERAGE RETICULATION
	EXISTING TELSTRA
	EXISTING OVERHEAD ELECTRICITY
	FINISHED SURFACE CONTOURS
	PROPOSED KERB & CHANNEL
	PROPOSED EDGE RESTRAINT
	MULCH BUND BEHIND SEDIMENT FENCE
	SILT FENCE
	CHECK DAM
	VEHICLE SHAKE DOWN
	DIRECTION OF OVERLAND FLOW
	SEDIMENT BASIN

NOTE
1. FOR DRAWING SET NOTES REFER TO DRAWING 216030-DA-002.

D	06/08/17	LAYOUT AMENDED FOR COUNCIL APPROVAL
C	13/03/17	RESPONSE TO COUNCIL INFORMATION REQUEST
B	28/11/16	RESPONSE TO COUNCIL INFORMATION REQUEST
A	01/06/16	FOR COUNCIL APPROVAL



CLIENT: [REDACTED]
PROJECT: PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS
LOT 5 ON RP14839
289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS

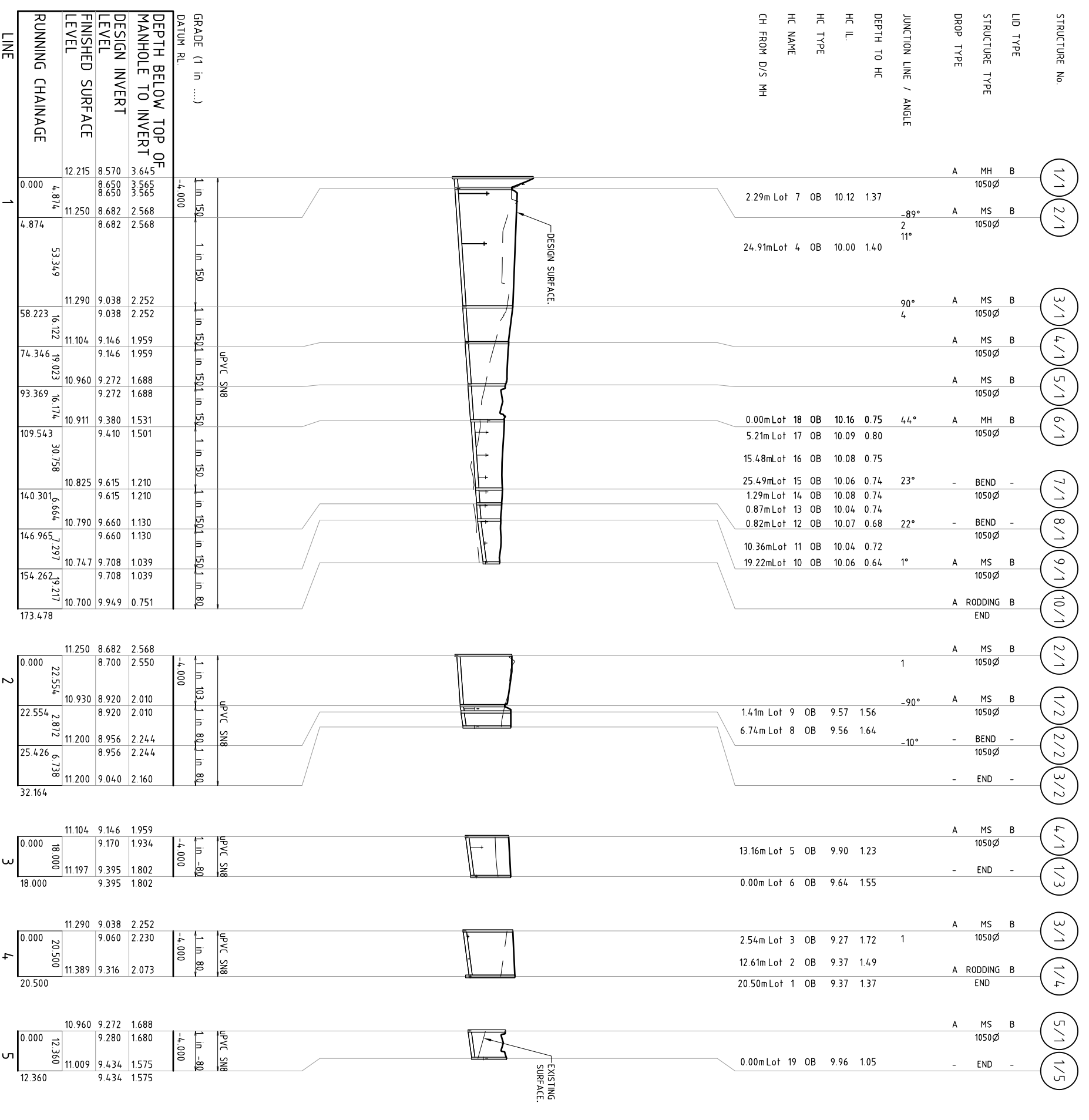
HORIZONTAL DATUM	MGA 94
VERTICAL DATUM	AHD (m)
DRAWN BY	JM
DESIGNED BY	DS

DNBS CONSULTING ENGINEERS
PO BOX 641 MERRAID BEACH QLD 4218
M:0422573524, PH:0755727073
E:dnbs@dnbsconsulting.com.au, WEB:www.dnbsconsulting.com.au

TITLE: SEDIMENT AND EROSION CONTROL PLAN AND DETAILS SHEET
PROJECT REFERENCE: RPE0#1028
DRAWING NO: 2016030-DA-009
DATE: [REDACTED]

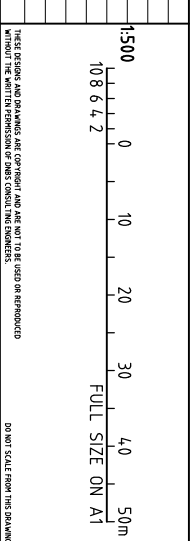
NOTES

1. MINIMUM SEWER GRADE OF 1 IN 150 HAS BEEN ADOPTED FROM WSAA RATHER THAN GRADES AS PER RCC GUIDELINES DUE TO THE FLATNESS OF THE SITE AND THE NEED TO MINIMISE THE IMPORT OF FILL.



PROJECT PROPOSED RESIDENTIAL SUBDIVISION - CIVIL WORKS LOT 5 ON RP14839 289-301 CLEVELAND-REDLAND BAY ROAD, THORNLANDS		HORIZONTAL DATUM MGA 94	
DRAWN BY JM		VERTICAL DATUM AHD (m)	
DESIGNED DS		CHECKED DS	
P.O. BOX 641 MERRAID BEACH QLD 4218 M:0422573524, PH:0755720703 E: diane@dnbs.com.au, WEB: www.dnbs.com.au		REVISIONS DS	
TITLE SEWER LONGITUDINAL SECTIONS SHEET		DRAWING NO. 2016030-DA-010	

D	06.08.17	LAYOUT AMENDED FOR COUNCIL APPROVAL
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A	01.06.16	FOR COUNCIL APPROVAL



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Our reference: SDA-0916-033946
Council reference: ROL006084

Attachment 5— Applicant written agreement to amended concurrence agency response

Our reference: SDA-0916-033946
Council reference: ROL006084

Attn: [REDACTED]

Written agreement for the Department of Infrastructure, Local Government and Planning to provide a changed concurrence agency response

(Given under section 290(1) of the *Sustainable Planning Act 2009*)

Street address: 289-301 Redland Bay Road, Thornlands QLD 4164
Real property description: Lot 5 on RP14839
Assessment manager reference: ROL006084
Local government area: Redland City Council

As the applicant of the above development application, I hereby agree to the changed concurrence agency response provided to me in the notice dated 25 August 2017.

Name of applicant:

[REDACTED]
Australian Innovation Centre Pty Ltd

Signature of applicant:

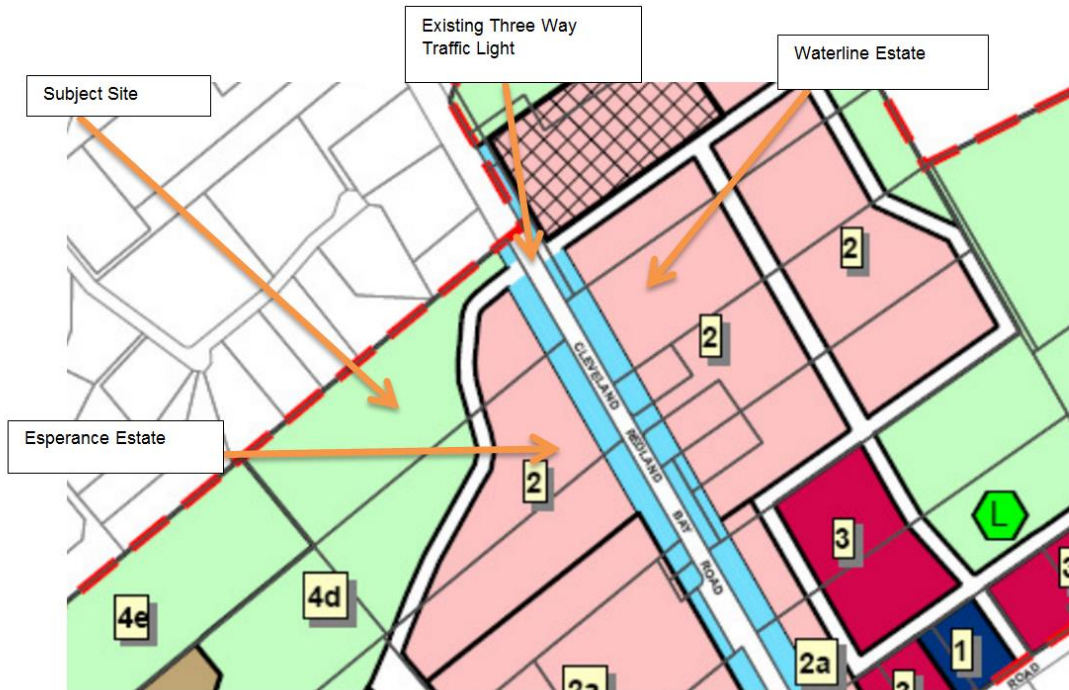
[REDACTED]

Date:

25/8/2017

Attachment 8

South East Thornlands Overlay Map



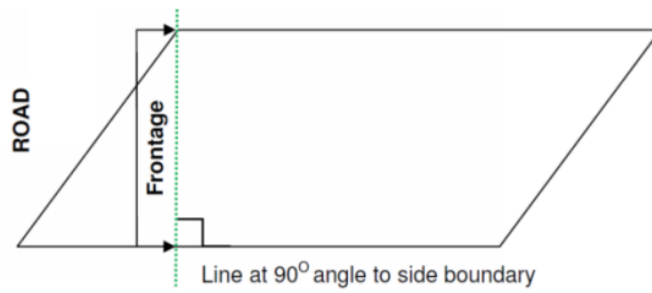
Aerial Map - Intersection



Attachment 9 Non Standard Lot

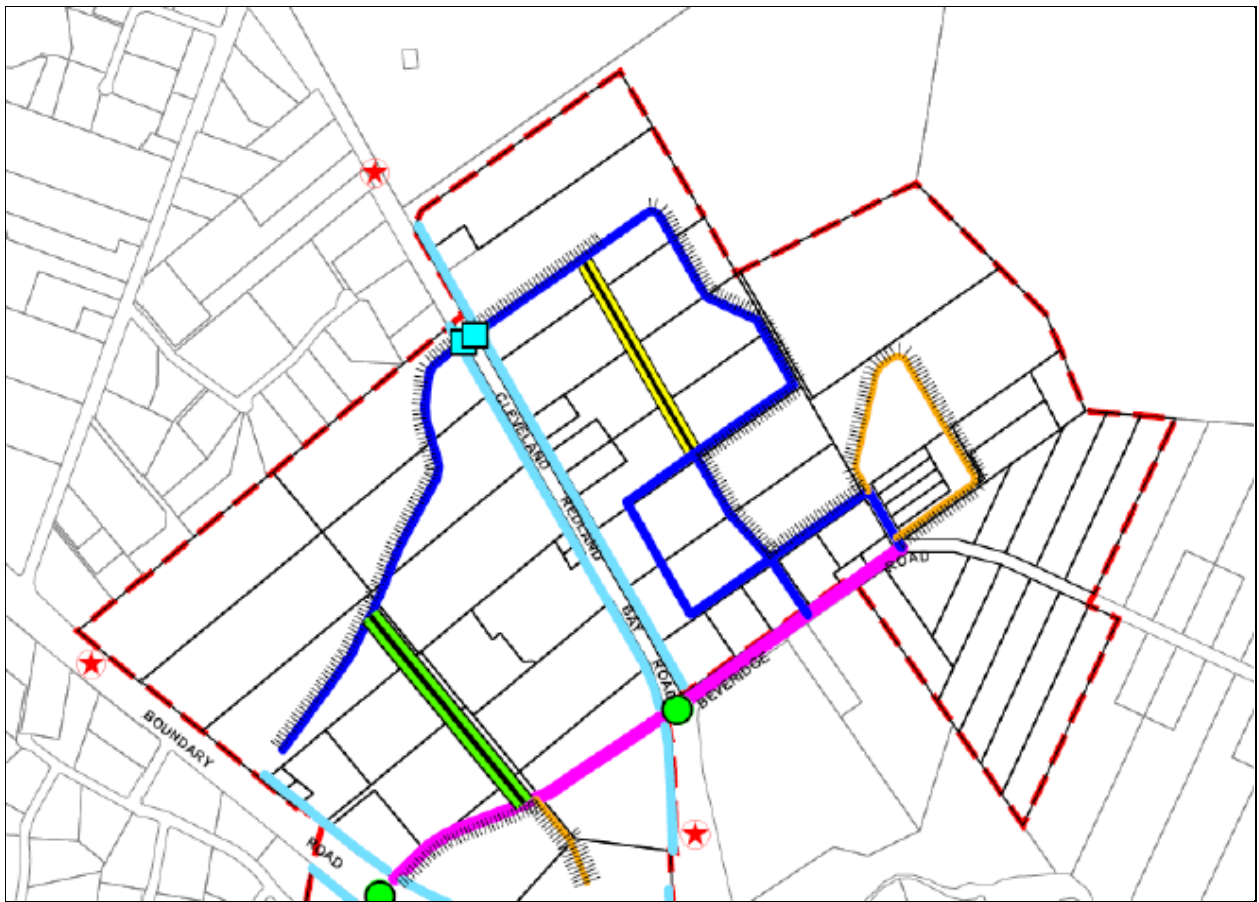
Diagram 5 – Measuring frontage – non-standard lot

Where the front boundary is not at 90o to the side Boundaries



Attachment 10– Map 2 - Road Movement Network Plan

South East Thornlands Structure Plan Overlay





HERBERT
SMITH
FREEHILLS

[Redacted]
Thomson Geer
rnelms@tglaw.com.au

[Redacted]
HopgoodGanim
t.buckley@hopgoodganim.com.au

[Redacted]
eturk@bigpond.net.au

17 January 2018
Matter 82658178
By Email

Dear All

Australian Innovation Centre Pty Ltd v Redland City Council & Turk & Chief Executive, Department of Infrastructure, Local Government and Planning – Planning & Environment Court Appeal No. 4515 of 2017

Pursuant to paragraph 1 of the Order of His Honour Judge Jones dated 8 December 2017, our client's position in the appeal is that from the perspective of impacts on the State-controlled road (Redland Bay Road):

1. the application the subject of the appeal can be approved, subject to conditions; and
2. alternatively, an amended application which provides for access to Redland Bay Road by forming the fourth leg of the Waterline Boulevard/Redland Bay Road intersection can be approved, subject to conditions about the necessary works required to be delivered (at no cost to the State).

Subject to our client's view on the Respondent's position in the appeal (to be notified by 31 January 2018), our client intends to seek an order from the Court at the review on 2 February 2018 that permits our client to be excused from participating in the substantive appeal.

However, our client will notify its position on any proposed change to the application the subject of the appeal, and will provide conditions of approval for any final order approving the development.

Yours sincerely

[Redacted]
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