Revised Preliminary Engineering Report for

Major Project Application No. MP09-0166 for Altitude Aspire, Terranora

Submitted to
Metricon (QLD) Pty Ltd
November 2010

Prepared by
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Director General's Environmental Assessment Requirements

DOCUMENT CONTROL RECORD

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Report Details:

Title:	**Department of Planning test of Adequacy response to Environmental Assessment**
Author(s):	B. Lees
Status:	Issue 1 DRAFT
Client:	Metricon Qld Pty Limited
Application No:	09_0166
Synopsis:	This report forms part of revised details to the Department of Planning (DOP) Test of Adequacy Response for a proposed 317 lot development designated as Altitude Aspire as part of the overall proposed development of land identified in Tweed Shire's Residential Development Strategy as `Area E' located at Terranora NSW. The report establishes the basis on which the development may be serviced with the relevant infrastructure and defines the design procedure to be incorporated in general compliance of the Director General's Environmental Assessment Requirements

Attachment 1 **Director General's Environmental Assessment Requirements (DGR)** Section 75F of the Environmental Planning and Assessment Act 1979
Application Number
09_0166
Project
317-lot residential subdivision at the southern end of Fraser Drive, Terranora (known as Altitude Aspire), and provision of infrastructure and dedication of open space areas. Key elements of the project include: • opening and construction of all proposed roads; • construction of a temporary intersection to Fraser Drive; • provision of underground services (water, sewer, stormwater, power and telephone); • bulk earthworks to establish final landforms.
Location
Lot 1 DP 304649, Lot 1 DP 175235, Lot 1 DP 781687, Lot 2 DP 778727, Lot 1 DP 781697, Lot 1 DP 169490, and Lots 40 and 43 DP 254416 at the southern end of Fraser Drive, Terranora, Tweed LGA
Proponent
Metricon QLD Pty Ltd

Executive Summary

Bradlees Civil Consulting was commissioned by Metricon QLD Pty Ltd to prepare a response to Department of Planning (NSW) Director General's Environmental Requirements (DGR) in May 2010, for the proposed development of land designated as Area E in the Tweed Shire's Residential Development Strategy. The Director General of the Department of Planning issued DGR's on 23 November 2009.

Our original report dated May 2010 specifically addressed DGR's related to the civil engineering component of the development which incorporated the proposed earthworks, roadworks and services infrastructure for the site.

This revised report provides additional detail as indentified in the Department of Planning Test of Adequacy response to the Environmental Assessment (EA) previously submitted.

Listed below is a brief summary for each of the DGR's addressed in this revised report:-

DGR 2.5
"Demonstrate that slope sensitive building design initiatives have been considered in the subdivision design to ensure there is a suitable access gradient and minimal cut and fill."

The existing topography of the site is generally steep with slopes of 20% to over 25% grading into two defined gullies, one running south-north along the centre of Area E and a second gully within the Altitude Aspire site also running south-north. Preliminary earthworks volume calculations for the proposed works within the Altitude Aspire site have indicated a balanced cut to fill with no borrow / spoil material off site. As a consequence of the proposed earthworks and the existing steep topography, it is expected that approximately 18% of the site will require earthworks at greater than 5.0m in depth. However this is predominantly within the Central Open Drain area where the natural gully has been raised.

A network of low to medium height retaining structures (1.2m to 1.8m) throughout the subdivision is proposed to achieve a design allotment grading of 5% to 15%. A high retaining structure (up to 3.0m) is proposed for the site boundary along Fraser Drive and along the southern boundary of lots adjacent to Parkes Lane.

In accordance with Council's design guidelines and specifications the proposed roads infrastructure has been designed to ensure grade limits are maintained (generally 11%-13% with 16%max), and access gradients to allotments have been set to a maximum 1:4 grade. The road layout as proposed emphasises the north-south aspect of the lots in accordance with recommendations by development and building guidelines and maximises the visual aspect of the allotments with views towards the Terranora Broadwater.

DGR 2.6

"Provide details of any staging (for the subject site and the overall Terranora E area) that demonstrates the lots will be released in an orderly and co-ordinated manner, including the release of allotments for sale, the installation of services and infrastructure."

The proposed staging for the development of the site incorporates the systematic installation of all services and infrastructure as required for each stage, allowing for accessibility and a practical release of allotments into the market.

A temporary access to service the development is proposed at the south eastern corner of the site via Fraser Drive. Construction of the Broadwater Parkway (northern access - ultimate phase) is to be constructed concurrently with the stage 7 works subject to acquisition of private property adjacent to Fraser Drive. Upon completion of this stage the temporary access near Parkes Lane will be closed and redeveloped into lots as per the ultimate plan.

DGR 4.1

"Identify existing capacity of and requirements for the provision of all appropriate devices and infrastructure including sewerage, water, stormwater, electricity, waste disposal, telecommunications, gas, open space roads and transport, pedestrian and cycle friendly infrastructure, community facilities and social infrastructure and State infrastructure. Undertake consultation with relevant agencies and provide evidence of this consultation. Identify and describe staging, if any, of proposed infrastructure works."

Extensive studies have been undertaken on behalf of Tweed Shire Council identifying the infrastructure requirements for the overall development of Terranora Area E.

Council' s Local Environmental Study (LES) by Parson Brinckerhoff (PB) (March 2004) identified the major sources of water supply to the Area E as being a 600dia Duroby main to the north of the site as fed from the North Tumbulgum Reservoir, and a secondary 150mm main along Terranora Rd to the south. A study by GHD (GHD 1999) attributed the capacities of these two sources as 3000EP and 1000 EP respectively (Parson 2004).

For the ultimate servicing of Area E, the PB report proposed a new 3ML reservoir for construction as part of the Altitude development (adjacent to Terranora Road and Mahers Lane) which will provide the internal reticulation of Area E. Supply to this 3ML reservoir will be via a pipe connection to the existing 600mm dia Duroby pipeline along Mahers Lane. Due to the `uncontrolled' alignment of the existing 600mm dia Duroby Main, provision has been made for the relocation of this trunk main via the construction of a new 600mm dia trunk main along the proposed Broadwater Parkway alignment. The decommissioned main would be plugged and left in place to ensure minimal disturbance within Environmental Zone.

The PB report proposes an interim water supply strategy for the development of the Altitude Aspire which consists of a temporary connection to the 600dia main (including

PRV as required) and a co-current connection to an existing 100dia main on Fraser Drive to service the higher level allotments.

However, Council's most recent advice (refer DGR 4.2) via emails dated 14th October 2010 and 25th November 2010 indicates that they are currently investigating alternative strategies to service the proposed Altitude Aspire Development.

Such alternatives include potentially a 2ML reservoir at Chambers Reservoir of which one third (1/3) capacity would be for Altitude Aspire and balance for future densification within the existing chambers zone.

Council's email advises that the topography would require a booster pump station for the upper levels and several pressure reducing valves for the lower levels and that it would be necessary for the reservoir to be built as a priority with the first stage as Chambers Reservoir is already fully committed with its current zone.

The Banora Point Sewerage Study Report (TSC Sept 1999) identifies the requirement for a Terranora Regional Pump Station in the development of Area E. Until such time as the ultimate pump station is constructed, an interim proposal for sewer reticulation allows stages 1-6 of Altitude Aspire to discharge into a temporary pump station located in the north-eastern corner of the site. An interim 150mm sewer rising main is to be laid within an easement as shown, which will discharge flows into the existing gravity sewer network along Fraser Drive.

However, Council has recently advised via emails dated 14th October 2010 and 25th November 2010, that whilst the alternative connection point is still the Banora Point Waste Water Treatment Plant (BPWWTP) there maybe earlier stage connection points with temporary rising mains injecting into existing pump station rising mains. The extreme situation may require a new sewer rising main to the BPWWTP inlet works – an extra 2km of main in a crowded corridor.

Council advises these options a currently being further investigated to get a clear strategy for the way forward. Further analysis of these strategies will be required to confirm the extent of works necessary.

Stormwater treatment and management systems are to be implemented in accordance with recommendations by Gilbert & Sutherland – hydraulics consultants. Treatment and Management of stormwater conveyance, including roofwater collection, is proposed via a suitable piped network system within the subdivision, with outlets to treatment basins located at the low point of the Altitude Aspire development adjacent to Broadwater Parkway and treated prior to discharge to SEPP14 wetlands. Upstream catchments, external to Altitude Aspire development, are conveyed through the site (via the Central Open Drain) without the need to pass through the treatment basin.

The Tweed Area E Local Environmental Study (Parsons Brinckerhoff March 2004) identifies the development requirements for Gas, Electrical and Telecommunications. All

relevant service providers will determine existing capacity of respective networks and supply design proposals in accordance with Councils standards at construction certificate phase. It is envisaged preliminary services will be obtained from both Fraser Drive and via Terranora Road corridors.

The road layout emphasises the north south aspect of the lots in accordance with recommendations of development and building guidelines.

These key elements underpin the basis of the subdivision layout design as follows:-

a) Tweed Shire Council (TSC) requirement that all access be provided via Broadwater Parkway.

b) All internal roads will, as a consequence of (a) above access the site, from the lowest areas of the site.

c) Access to the higher areas of the site will of necessity have to cross the central drainage channel.

d) The road layout design has adopted the principles of TSC new urbanism for connectivity throughout the development.

e) The maximum road grade provided is 16%.

f) Balanced cut and fill earthworks, so that no import of material along existing roads from external to the site is necessary.

g) Provide a range of lot grades and sizes to facilitate a variety of house design and residential product for marketing purposes.

DGR 4.2
"Provide an assessment of how the provision for services and infrastructure required at both a State and local level will be managed (refer to submissions from agencies at Attachment 4)
Consult with relevant agencies and include an outline of the program of works for such services and infrastructure, and provide estimates of cost, timing of works, and sources of funding."

Consultation with TSC occurred on several occasions as follows:-

(a) 17th March 2010 – meeting Bradlees Civil Consulting and TSC Water Unit to discuss strategies for both ultimate and temporary servicing of water and sewer.

(b) 19th March 2010 – Email from TSC to Bradlees Civil Consulting advising of trunk water main hydraulics grade line details.

(c) 26 March 2010 – DAP Meeting with TSC officers to discuss a range of matters including water and sewer servicing. TSC advised contrary to earlier advice to Bradlees on 17 March 2010 the offer of temporary water supply from the existing 600mm dia trunk main was withdrawn because of vulnerability to failure. Council advised the only satisfactory option was construction of the 3ML reservoir and pump station in the first instance.

Ultimate and temporary servicing for sewer were canvassed. Temporary strategies included local temporary pump station and rising main to existing gravity systems although, these temporary strategies would require further investigation.

(d) 8 April 2010 – Meeting at TSC with Council Officers to discuss further, issues related to Broadwater Parkway and land acquisition. Issues related to water and sewer confirmed Council's position advised in DAP meeting on 26 March 2010.

(e) 4 May 2010 – Email TSC to Bradlees Civil Consulting regarding preliminary analysis of receiving sewer system for an interim sewer supply to Fraser Drive.

(f) 7 June 2010 – Email from Bradlees Civil Consulting to TSC regarding Water and Sewer Servicing requesting an update in relation to previous meetings.

(g) 14 October 2010 – Email from TSC to Bradlees Civil Consulting advising of Council's current investigations to find suitable interim service solutions for water and sewer.

The investigations are ongoing and outcomes are yet to be advised, however, possible solutions canvassed include:-

- 2ML reservoir at Chambers Reservoir of which one third (1/3) capacity would be for Altitude Aspire and balance for future densification within the Chambers Zone.
- Booster pump station for upper levels of site and several pressure reducing valves for the lower levels.
- Possible temporary sewer rising main injecting into existing pressure sewerage mains with the extreme situation of a new sewer rising main to Banora Point WWTP inlet works.
- Existing gravity sewer sections still require further assessment.

(h) 25 November 2010 – Email from TSC to Bradlees Stand Alone Sewer and Water Strategy.
This email is in response to a meeting with Council officers on 24 November 2010 at which issues related to Broadwater Parkway alignment and servicing for water and sewer were discussed. Council tabled some strategies related to water and sewer servicing which were consistent with previous strategies outlined in paragraph (g) above and included some sketch drawings for "Stand Alone" strategies.
Further analysis of these strategies will be required to confirm the extent of works necessary.

(i) 1st December 2010 – Meeting at TSC with Council officers.
This meeting was convened to further discuss Broadwater Parkway alignment. A preliminary alignment from Council's design unit was tabled for discussion showing a staggered intersection arrangement with Fraser Drive and Amaroo Drive. This intersection arrangement is shown indicatively on our sketch drawing SK2753 (Appendix II).

There are no State services or infrastructure.

The Proponent anticipates construction to start within six (6) months of receiving approval and ongoing construction subject to market demands.

Preliminary Project Development costs have been provided in the amount of $22,122,684 excl GST. Sources of funding will be a combination of commercial lending arrangements and Section 94 Contributions.

DGR 5.11

"Provide an assessment of how the future permanent alignment of Broadwater Parkway and Fraser Drive is anticipated to work in terms of timing, payment and constraints (refer to Tweed Shire Council's comments on Infrastructure, Roads and Access in Attachment 4)."

Designated as a Neighbourhood Connector, the Broadwater Parkway provides the primary access to the northern section of the Area E development and connects Mahers Lane (western boundary) to Fraser Drive (eastern boundary) weaving along the northern boundary of Area E. The alignment and profile of the Parkway is in accordance with the required 60kph design speed environment and endeavours to integrate with the existing topography while avoiding its impact into the Environmental Protection Zone (SEPP 14) to the north of the Site. Based on the latest discussions with Council on 1st December 2010, a staggered intersection arrangement with Fraser Dve and Amaroo Dve is shown indicatively on our sketch drawing SK2753 which is consistent with preliminary design layout from Council's design unit.

DGR 5.13

"Investigate the opportunity for road alignments to follow existing land contours. The objective is to minimise cut and fill, preserve the integrity of the existing topography, and take advantage of existing overland drainage opportunities."

Various allotment and road layouts have been investigated by Metricon P/L to determine a suitable yet functional road network within the steep site.

These key elements underpin the basis of the subdivision layout design as follows:-

a) Tweed Shire Council (TSC) requirement that all access be provided via Broadwater Parkway.

b) All internal roads will, as a consequence of (a) above access the site, from the lowest areas of the site.

c) Access to the higher areas of the site will of necessity have to cross the central drainage channel.

d) The road layout design has adopted the principles of TSC new urbanism for connectivity throughout the development.

e) The maximum road grade provided is 16%.

f) Balanced cut and fill earthworks, so that no import of material along existing roads from external to the site is necessary.

g) Provide a range of lot grades and sizes to facilitate a variety of house design and residential product for marketing purposes.

DGR 5.14

"Ensure public access to and along the adjacent SEPP 14 wetland and Terranora Broadwater is not compromised, and provide new opportunities for controlled public access and disabled access where appropriate."

The proposal for the Broadwater Parkway is to incorporate various opportunities for public access and connectivity to the SEPP14 Wetland Area. Reference is made to plans prepared by project landscape architects Form Landscape Architecture showing proposed parking, cycle paths and pedestrian pathways.

DGR 7.1

"Provide a detailed site survey showing existing and proposed contours, levels and quantities of cut and fill earthworks, and provide details of the source of fill including types of material and soils."

Detailed site survey plans showing existing and proposed contours are provided and indicate the extent of earthworks for the site.

Earthworks volume calculations indicate a cut volume of approximately 521,800 cubic metres and a fill volume of approximately 496,100 cubic metres. Allowing for volume losses during the earthwork operation it is anticipated there will be a balance of earthworks for the site and no material will be imported.

Due to the topography, it is expected approximately 18% of the site will require earthworks at greater than 5m depth, however this is predominantly within the central open drain where the natural gully has been raised.

The regional geology of the site comprises the Neranleigh Fernvale Beds, which are capped by the Lamington Volcanics.

Generally the local geology comprises red brown volcanic clay soil of typically high plasticity on the eastern and western areas of the site with a sparse covering of basalt boulders and cobbles across the surface in most areas.

Underlying the volcanic clay soils are silty clay soils with alluvium materials located in the flat, lower sections of the site predominantly of moist, stiff and very stiff, silty clay soils of high plasticity. Acid sulphate soils are present within the lower central floodplain area below RL 5.0m AHD.

DGR9.1

"Address the issue of provision of a sustainable water supply for the development site. Ensure there is adequate water supply for the development. If an alternative other than town water supply is proposed then provide an assessment of the water requirements. The assessment should include Water Management Plans detailing how a sustainable and efficient water supply can be sourced and implemented with minimal reliance on accessing valuable surface and groundwater resources."

The Tweed Area E Local Environment Study by Parson Brinckerhoff (March 2004) identifies the availability of water to the Area E Region and quantifies the provision of water to the proposed development.

The PB report provides a strategy of bulk water supply for up to 160,000 population in the Shire and includes options for raising Clarrie Hall Dam to increase storage capacity and the construction of an additional dam at Byrrill Creek.

The water supplied in the vicinity of Area E comes from Clarrie Hall Dam via the Bray Park filtration plant through to north Tumbulgum Reservoir.

The Duroby main is a 600mm trunk water main that traverses the northern boundary of Area E and is supplied from the North Tumbulgum Reservoir.

TSC have identified the 600mm Duroby main as the preferred water supply for Area E and a pipeline connecting the proposed 3ML reservoir near Mahers Lane and Terranora Road, with the 600mm Duroby main. There is sufficient capacity from the North Tumbulgum reservoir to service Area E, provided a reservoir is constructed on site.

Council's most recent advice via emails dated 14th October 2010 and 25th November 2010, indicates that they are currently investigating alternative strategies which include potentially a 2 ML reservoir at Chambers Reservoir of which one third (1/3) capacity would be for Altitude Aspire and the balance for future population densification within the existing Chambers Zone.

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1.0 Introduction

1.1 Background Information

Bradlees Civil Consulting have been commissioned by Metricon QLD Pty Limited to prepare a response to Department of Planning (NSW) Director Generals Environmental Assessment Requirements (DGR) as required for the proposed development of land designated as Area E in the Tweed Shire's Residential Development Strategy.
Our original report dated May 2010, provided a response to the DGR specifically for the civil works component of the development which incorporated the proposed earthworks, roadworks and services infrastructure for the Site.

This revised report addresses additional detail as indentified in the DOP Test of Adequacy Response to the EA previously submitted by the Proponent in October 2010.

Details in this report have been prepared in consultation with Tweed Shire Council, the relevant statutory authorities and specialised consultants together with reports and documentation as follows;

- *Banora Point Sewerage Strategy Study – Vol.1 Study Report (Sept 1999);* by Tweed Shire Council,
- *Tweed Area E Local Environmental Study (March 2004);* by Parsons Brinckerhoff Aust Pty Ltd
- *The Tweed Shire Council Development Design Specifications (v1.3) D1, D5, D6, D9, D11, D12 and D13*
- *Tweed Development Control Plan – Section A5 v1.1.1 (August 2008)*
- *Traffic Noise Assessment `Altitude Aspire' Residential Subdivision, Fraser Dr, Terranora - Acoustic Report (11 March 2010);* by TTM Consulting Pty Ltd.
- *Broad Geotechnical Assessment for Residential Subdivision – Altitude Aspire Development, Fraser Drive. (February 2010);* by Morrison Geotechnic Pty Ltd
- *Tweed Road Contribution Plan CP No.4 ver 5.1 (January 2009);* by Tweed Shire Council
- *Preliminary Intersection Assessment Report (April 2010);* by Bitzios Consulting Pty Ltd

In addition to the above, the following key elements of the subdivision layout design were established as a result of several workshop meetings with the project consulting design team.

These key elements underpin the basis of the subdivision layout design as follows:-

a) Tweed Shire Council (TSC) requirement that all access be provided via the proposed Collector Rd, Broadwater Parkway located to the north of the site.

b) As a consequence of (a) above, all internal roads to the subdivision will access the site, from the lowest areas of the site.

c) As a result of (a) and (b) above, to access the higher areas of the site, in particular the South east areas, and provide connectivity throughout the subdivision, access across the existing gully is necessary.

d) The subdivision layout design has adopted Tweed Shire Council's, "new urbanism" principles for connectivity throughout the development. (We note there is only one (1) cul-de-sac in the layout design which provides access to seven (7) lots out of a total of three hundred and seventeen (317) lots.

e) The maximum road grade provided is 16% in accordance with TSC requirements. The majority of road grades are 12% or less.

f) In accordance with good engineering practice, balance earthworks for the site and avoid the cost and traffic nuisance of importing fill material from off site along public roads.

g) To provide a range of lot grades and sizes to facilitate a variety of house design and residential product for marketing purposes.

1.2 Site – Area E: Altitude Aspire

The subject property is located at Fraser Drive Terranora, and is described as;
Lot 1 DP 304649, Lot 1 DP 175235, Lot 1 DP 781687, Lot 2 DP 778727, Lot 1 DP 781697, Lot 1 DP 169490, and Lots 40 and 43 DP 254416 at the southern end of Fraser Drive, Terranora, Tweed LGA .

The site has been designated as Area E in the Tweed Shire's Residential Development Strategy.

For the purpose of this report the subject Site is designated - `Altitude Aspire', a section of the overall `Area E' located to the north-eastern corner of `Area E' with extensive frontage to Fraser Drive to the east and existing development at Parkes Lane to the South.

1.3 Objectives of Report

The objectives of this revised report are to provide further details to the DOP Test of Adequacy response to EA and the Engineering response to the original Director Generals Environmental Assessments Requirements (DGR) in accordance with the following:

1. Review and evaluate the development with respect to existing and proposed ground levels, and strategies necessary to accommodate earthworks (including conceptual earthworks plans);

2. Review and evaluate the development with respect to roads (internal and external), access to the subject land and road/street criteria and standards;

3. Review and evaluate the development with respect to existing and proposed external infrastructure and strategies; (Water, Sewerage & Stormwater Drainage);

4. Prepare conceptual schematics for internal reticulation; (Water, Sewerage and Stormwater Drainage);

5. Review and evaluate the development with respect to stormwater drainage internal and external to the site, including flooding considerations and legal discharge.

2.0 Revised Details for the Department of Planning (DOP) Test of Adequacy Response to Environmental Assessment.

NOTE:
The following responses are in reference only to the Civil/Engineering component of the exhaustive list of DGRs as provided. Refer Appendix 17.

Director General's Environmental Assessment Requirement (DGR)	***Response***
DGR 2.5 ***Demonstrate that slope sensitive building design initiatives have been considered in the subdivision design to ensure there is a suitable access gradient and minimal cut and fill.***	The existing topography of the site is generally steep with slopes of 20% to over 25% grading into two defined gullies, one running south-north along the centre of Area E and a second gully within the Altitude Aspire Site also running south-north. Refer to Appendix 1 for existing Contour and Topography plan. Due to the existing steep topography the proposed development will require cut and fill movement of material across the whole of Area E. The proposed cut/fill earthworks for Altitude Aspire will ensure material use is maintained within the Site and external material movement will not be required. Preliminary earthworks volume calculations for the proposed works within the Altitude Aspire Site have indicated a balanced cut to fill ratio in material use. This proposal will ensure the minimal disturbance to the existing surrounding outside the Site boundary. Refer to Appendix 2 for draft detail plans as follows; - Cut to Fill Earthworks Plans - Earthworks Layout Plans - Typical Earthworks Sections An extensive network of low to medium height retaining structures throughout the subdivision is proposed to achieve a design allotment grading of 5% to 15%. Where steeper allotments (grades >15%) are envisaged, adequate provision will be made to ensure suitable access and useability of such allotments.

DGR 2.5 Continued	A high retaining structure (up to 3.0m) is proposed for the site boundary along Fraser Drive. Refer Appendix 3 for draft detail plans as follows; - Slope Analysis Plan - Preliminary Retaining Wall Plan In accordance to Council's design guidelines and specifications the proposed roads infrastructure has been designed to ensure grade limits are maintained (generally 11%-13% with 16%max), and access gradients to allotments have been set to a maximum 1:4 grade. Further detail design and consultation with architectural consultants (MPS Architects P/L) will address the issue of allotment frontages steeper than 1:4 with site specific driveway and building designs proposed accordingly. Refer to Appendix 4 for preliminary design plans as follows; - Road Layout Plans - Road Long Section Plans, - Typical Road Cross Section Plans.
DGR 2.6 ***Provide details of any staging (for the subject site and the overall Terranora E area) that demonstrates the lots will be released in an orderly and coordinated manner, including the release of allotments for sale, the installation of services and infrastructure.***	The overall macro staging of the Terranora E area is shown indicatively on the Preliminary Master Plan concept prepared by Cardno Pty Ltd for Metricon Qld P/L and Lanlex No.49 P/L in June 2007. Copy of this Master Plan is attached as Appendix 5 The proposed staging for the development of the site incorporates the systematic installation of all services and infrastructure as required for each stage, allowing for accessibility and a practical release of allotments into the market. Refer to Appendix 6 for proposed services and infrastructure staging for the Altitude Aspire subject area.

DGR 2.6 Continued	A temporary access to service the development is proposed at the south eastern corner via Fraser Drive. Construction of the Broadwater Parkway (northern access - ultimate phase) is to be constructed concurrently to the stage 7 works. Upon completion of this stage the temporary access (southern access) will be closed and redeveloped into lots as per the ultimate plan. Refer to Appendix 7 for plan showing temporary access intersection of Road 1 and Fraser Drive.
DGR 4.1 ***Identify existing capacity of, and requirements for the provision of all appropriate services and infrastructure, including: sewerage, water, stormwater, electricity, waste disposal, telecommunications, gas, open space, roads and transport, pedestrian and cycle-friendly infrastructure, community facilities and social infrastructure, and State Infrastructure. Undertake consultation with relevant agencies and provide evidence of this consultation. Identify and describe staging, if any, of proposed infrastructure works.***	Extensive studies have been undertaken identifying the infrastructure requirements for the overall development of Area E and accordingly were referenced in the preparation of this response. Conceptual schematics have been prepared for both sewerage and water supply infrastructure to service the development proposal, consistent with the current regional planning provisions. Requirements in relation to both external services and internal reticulation have been addressed. Detail design will be completed in accordance to TSC Development Control Plan – Section 5 and relevant Development design specifications. **a) <u>Water Reticulation</u>** Parson Brinckerhoff (March 2004) identified the major sources of water supply to the Area E as being a 600dia Duroby main to the north of the Site as fed from the North Tumbulgum Reservoir, and a secondary 150mm main along Terranora Rd to the south. A study by GHD (GHD 1999) attributed the capacities of these two sources as 3000EP and 1000 EP respectively (Parson 2004). For the ultimate servicing of Area E, a new 3ML reservoir is proposed for construction as part of the Altitude 3 Site development which will provide the internal reticulation of Area E. Supply to this 3ML reservoir will be via a pipe connection to the existing 600mm dia Duroby pipeline.