REVISED WANDINA STRUCTURE PLAN

LOTS 9020 & 103 SHOREVIEW STREET, WANDINA

AUGUST 2007

ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Greater Geraldton Local Planning Scheme No. 1.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

2007

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015.*

Date of Expiry: **19 OCTOBER 2030**

REVISED WANDINA STRUCTURE PLAN

LOTS 9020 & 103 SHOREVIEW STREET, WANDINA

AUGUST 2007

PREPARED BY	ROBERTS DAY TOWN PLANNING + DESIGN GHD PTY LTD
FOR	PALTARA PTY LTD

CONTENTS

01 INTRODUCTION

1.1 Background

A Structure Plan for the Wandina landholding was granted approval by the City of Geraldton - Greenough (formerly known as the Shire of Greenough) and Western Australian Planning Commission in 2003 and is still currently valid. The objective of the Structure Plan design was to allow for a development that complements the natural landform, while incorporating retaining walls to ensure suitable grades for roads and residential lots. Since the approval of the Structure Plan, detailed planning and engineering investigations and design have been undertaken into the feasibility of developing the balance of the Wandina Estate. Because of these investigations, there has been a need to revise the Structure Plan design to ensure road alignments and grades accord with the City requirements for acceptable road design. Given the steeply sloping nature of the site, there was also a need to provide for some deeper residential lots to ensure a suitable area is available within each lot for building.

The Revised Structure Plan described in this report, reflects the findings of the detailed planning and engineering investigations and proposes a design that can be appropriately and realistically developed on the Wandina site. The revised design has regard to the existing statutory and strategic planning framework and to the adjoining landowners. This includes retention of road connections with the adjacent Department of Housing and Works (DHW) Joint Venture Wandina landholding to the east.

1.2 Aims and Objectives

The principle objective of this document is to provide a guide for the cohesive and orderly development of land within the Revised Structure Plan area. More specifically, the aims and objectives of the Revised Structure Plan are as follows:

- To provide a framework for the progressive subdivision and development of the area identifying public open space and residential uses;
- To ensure that future development is sympathetic to the existing landform;
- To integrate the existing residential area with the proposed development;
- To orientate lots to allow for passive solar access and to maximize available ocean views;
- To provide a neighbourhood with a variation of residential lot sizes and road layout that is sensitive to the existing site attributes;
- To incorporate retaining walls where required to ensure the creation of residential lots suitable for building.

02 THE SITE

REGIONAL CONTEXT

LOCAL CONTEXT

2.1 Land Description

The subject land comprises Lots 9020 and 103 Shoreview Street, Wandina and is owned by Paltara Pty Ltd. The Structure Plan area comprises a total area of approximately 24 hectares. The site is currently vacant.

The Revised Structure Plan area generally coincides with the area included in the former Structure Plan design. The only exception is the exclusion of the Stage 6B approved subdivisional area (WAPC Reference 128151) where subdivision works are currently underway.

2.2 Location

The subject land is bound by Brand Highway to the west, existing residential development to the south and north and the DHW land to the east, which is the subject of a separate structure plan proposal for residential development. Tarcoola Beach is the nearest beach, located approximately 500m to the west.

The site lies approximately four kilometres to the south of the Geraldton city centre. Access to Geraldton is currently via Brand Highway, which can presently be reached from the Revised Structure Plan area via Barett Drive to the north.

2.3 Vegetation

Vegetation cover over the site comprises open banksias with low lying shrubs.

2.4 Terrain and Geology

The terrain and geology is such that the western half is Calcareous sands (Quindalup dune system) with elevations of approximately RL 11m AHD adjacent to Brand Highway rising to elevations of approximately RL 25m AHD to a Tamala limestone ridge that dissects the development midway north south. The ridge rises further to up to AHD 55m, to Tamala limestone sand over Tamala limestone on the eastern half. The terrain affords spectacular views to the Indian Ocean.

03 STATUTORY CONSIDERATIONS AND RELATED PLANNING STUDIES

3.1 Local Authority Zoning

The subject land is zoned 'Single Residential (R12.5)' and is included within Development Area No. 12 under the Town Planning Scheme No 4 (Greenough) (refer Scheme Map).

The City does not support subdivision or development for land contained within a designated Development Area, unless:

a) an overall plan has been approved by the Council; and

b) the land has been appropriately zoned to accommodate the subdivision or development proposed.

In this case the land is zoned for low density residential development and this Revised Structure Plan is submitted to satisfy criteria a) above and superseded the Council approved Structure Plan from 2003.

3.2 Geraldton Region Plan (Western Australian Planning Commission, 1999)

The Geraldton Structure Plan, which forms part of the Geraldton Region Plan, designates the subject land 'Future Urban' (refer Greater Geraldton Structure Plan).

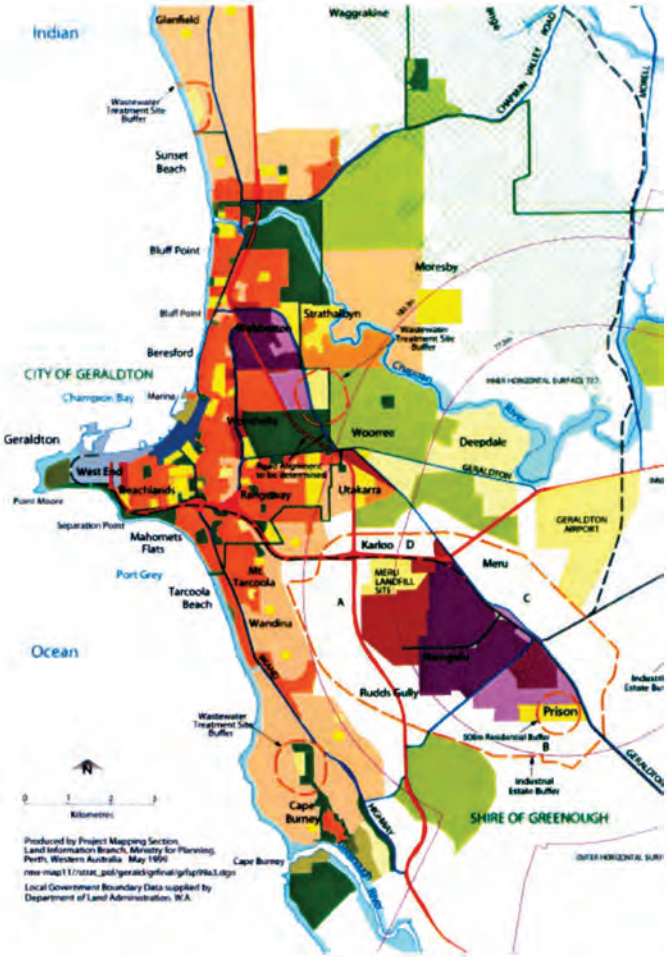
The Wandina locality is acknowledged in the report as being strategically located immediately south of the existing urban front and therefore well positioned for medium-term development. The report projects that development of Wandina has the capacity to yield an additional 1,800 lots, mostly on DHW's land. The Region Plan report also recognises the elevated nature of the Wandina land and associated expansive views that are available to the coast.

The extent of residential development proposed by the Revised Structure Plan is therefore consistent with the Geraldton Region Plan.

3.3 Aboriginal Heritage

An archival search of the 'Aboriginal Sites Register' of the Department of Indigenous Affairs confirmed there are no recorded sites of cultural significance to Aboriginal people on the land comprising the Structure Plan.

However, acknowledging the requirements of the Aboriginal Heritage Act, all contractors working on the development will be made aware of their responsibilities with regards to the discovery of Aboriginal heritage sites.



EXTRACT FROM GREATER GERALDTON STRUCTURE PLAN

04 THE STRUCTURE PLAN

4.1 Overview

The Revised Structure Plan for Wandina (Appendix A) has been prepared to provide a framework for the cohesive and orderly development of the land, whilst ensuring that the design is responsive to the existing site attributes; in particular the site's natural terrain. The proposed design yields 186 single residential lots, a duplex site and three public open space/drainage areas.

4.2 Design

A detailed review of the 2003 endorsed Structure Plan has found that there was a need to modify the Structure Plan design to ensure road alignment and grades satisfy Shire standards and that residential lots are created that are capable of feasible development. The design modifications affect the southern portion of the Structure Plan area, keeping the design over the northern portion intact.

The design still incorporates a rear laneway in the north western sector of the landholding which will provide access into those lots fronting Brand Highway, and minimise disturbance of the site's vegetation. This design concept will obviate the need to construct long driveways up the escarpment from Brand Highway, retain the coastal vegetation and allow for the development of framed/split level housing.

The main variation has been brought about by the necessity to restrict the number of east-west oriented road links due to the nature of the escarpment terrain. The proposed revised design therefore predominantly incorporates north-south oriented roads, with east-west links limited to those locations where the more gently sloping terrain has the capacity to accommodate acceptable grades.

4.3 Education

The provision of primary schools for the South Geraldton area was reviewed by the Department of Education and Training (DET) as part of the Geraldton Region Plan. As a result of further analysis the DET has confirmed only one primary school is required. The primary school site is located on the adjoining DHW land (Seacrest). The Revised Structure Plan for Wandina has direct road and pedestrian linkages with the adjoining DHW land along the eastern boundary of the estate. These road linkages will provide residents with direct access to both the primary school and private (catholic) pre-primary to high school site.

4.4 Residential Lots

The Revised Structure Plan design allows for the creation of 186 single residential allotments ranging in area from 700m2 to 2527m², a duplex site comprising approximately 1,700m2 and two POS areas comprising 5795m² and 8671m² and a drainage area of 2966m². The lot sizes comply with the prevailing R12.5 density coding and range in size in response to the natural topography, with the larger and deeper lots generally corresponding with the steeper terrain.

Land Use/Lot Summary

Gross Site Area	24.4757ha
Deductions - Drainage	 2966m²
Nett Site Area	24.1791ha
Public Open Space (10%)	2.41ha
Public Open Space Provided - Central POS - Southern POS	 5795m² 8671m²
Total Public Open Space Provided	1.45ha
Balance POS (cash-in-lieu)	0.96ha

Lot Yield

LOT SIZE	NO. LOTS
700m² – 800m²	79
801m² – 900m²	24
901m² – 1000m²	16
1000m² +	67
Duplex	1
Total	187

4.5 Built Form

The lots are all capable of accommodating dwellings that are designed and oriented for passive solar access. Lots have also been carefully oriented and site levels established to maximise ocean views.

In order to achieve sufficiently level building sites for residential development, limestone retaining walls of up to 4.0 metres will be integrated into the development. In some instances two parallel tiered retaining walls will be applied to soften the visual impact of the walling.

No retaining is proposed for the lots developed towards the middle of the site, immediately above the ridgeline. These lots will be level with the verge for the first 10 metres and then graded 1:1.5 to the rear of the lot. They will form a distinct design precinct featuring architecturally designed dwellings that respond to the natural terrain of each lot. This may include pole/framed homes and multi-level homes, where retaining is integrated into the dwelling design. A reduced front setback of 3.0 metres is permitted on these lots, if required, to aid the development of this style of housing.

Lots with dual street frontage will be retained on their western boundary and accessed from the eastern side. The visual aspect available to the dwellings built on the lots located behind will not be adversely impacted by the rear of the houses on the dual frontage lots, as they will be elevated to also capture ocean views.

4.6 Public Open Space and Drainage

The former Structure Plan design had proposed a drainage area in the north and two POS areas, comprising in total 4,900m2, within the southern portion of the Structure Plan area. The revised design proposes to retain the northern drainage area and to amalgamate the two southern POS areas into one larger area comprising approximately 5,795m^2. This area is central to the southern lots and configured to provide a pedestrian connection through to the Brand Highway. The space is also designed to incorporate an unfenced drainage basin within its lower reaches with capacity to accommodate a 1 in 10 year storm event. The drainage basin will be attractively landscaped so as contribute to the recreational value and visual amenity of this park.

A second POS area of 8671m^2 is proposed on the southern boundary of the estate. This POS area adjoins a 2.775ha POS site in the adjoining estate. This consolidated area of POS will accommodate the active recreation needs of future residents.

As previously discussed and approved by both the City of Geraldton - Greenough and WA Planning Commission, the steep topography within Wandina Estate renders the majority of the landholdings less suited to the provision of POS than the flatter land to the east on the DHW site. The Revised Structure Plan makes provision for 1.45ha of POS. The balance area of the 10% POS provision is proposed be given up as a cash-in-lieu contribution. The use of the cash-in-lieu funds will be subject to the approval of the City of Geraldton - Greenough and WA Planning Commission. The creation of a larger POS areas within the Structure Plan Area will be to the benefit of residents and an enhancement on the previous Structure Plan design.

4.7 Movement Network

An integrated road network is proposed that allows for efficient and convenient vehicular and pedestrian/cyclist access.

The movement network incorporates longer sections of north-south oriented road connections and a minimum number of shorter east-west connections in response to the natural terrain of the escarpment. This approach also allows the maximum number of lots to be oriented for coastal views.

The larger central POS area, together with the east west road connections, will ensure that a high level of pedestrian access is maintained between the eastern and western sectors of the development and beyond.

The extension of View Crest Drive will provide access to Brand Highway, which is reserved as an 'Important Regional Road' in the Town Planning Scheme No. 4 (Greenough). MRWA has previously agreed to a connection with Brand Highway approximately 150 metres north of Sander Street. The intersection location shown in the Revised Structure Plan design is located approximately 20 metres south of the MRWA agreed location to allow for a safer intersection design.

The extension of Harbour Ridge Drive through the Structure Plan Area has been maintained to ensure the road system is integrated with the adjoining development to the north and west. The location proposed for connections with adjoining development is consistent with those shown in the former Structure Plan design.

Dual use paths are proposed along the length of Harbour Ridge and View Crest Drives.

05 SERVICING CONSIDERATIONS

5.1 Earthworks and Retaining Walls

The natural terrain of this site generally falls steeply from RL 55m AHD from the east to RL 11m AHD at Brand Hwy to the west, with a steep 1:1.5 grade limestone ridge through the centre of the development running north south.

Extensive earthworks are required to render this site suitable for residential development. The western half that is predominately on sand will be excavated to the finished surface level and generally graded to match the toe of the limestone ridgeline. The lower half of the limestone ridge will remain as natural, with the upper half filled with clean imported fill to approximately RL 46 AHD. East of the ridge, the site will predominately be filled to finished surface levels of approximately RL 55 AHD.

In areas of excavation in limestone it is proposed these areas be over excavated by 500mm, the surface ripped and clean sand fill placed and compacted to the finished surface level. An appropriate site classification will be determined upon completion of the geotechnical investigation.

On the majority of lots, level sites have been achieved where practical. Lots immediately above the ridgeline are level with the verge 10m into the lot and then generally graded 1:1.5 to the rear of the lot.

To achieve nominally flat lots, limestone retaining walls will be required throughout the development, with heights up to 4m. The arrangement of lots and retaining walls has been coordinated to optimise ocean views from as many lots as possible. Approximately half the number of lots have 3m high retaining walls along the full front verge boundary with an 8 x 8m area specifically designated for a future garage, which will have limestone steps built in the wall leading from the garage to the top of the lot.

At present it is proposed for the lots adjacent to Brand Highway to be some 1.5m to 2.0m above the Highway, which may eliminate the need for solid fencing to attenuate traffic noise. However the specific requirement will be determined at a more detailed stage of design in consultation with MRWA.

Refer to Appendix B - Preliminary Sewer, Drainage Service and Retaining Wall Plan.

5.2 Roadworks

Existing Brand Highway, View Crest Drive and Harbour Ridge Drive provide access to the site. The extension of View Crest Drive (Road 1) will provide the connectivity through the proposed and existing development to Brand Highway with an average grade of 10% on a 7.4m road in an 18m road reserve. A 2.0m wide dual use path (DUP) will be constructed along the full length of View Crest Drive. MRWA has approved in principle the View Crest Drive intersection with Brand Highway to be located some 150m north of Sander Street, however the current design positions this intersection 20m closer to Sander Street (130m separation) to allow for a flatter approach grade of 10% from Brand Highway. This arrangement would ultimately yield an overall safer intersection design.

Road 2 will be a loop road off View Crest Drive near the Brand Highway intersection. An appropriate intersection treatment at the Brand Highway and View Crest Drive intersection will be confirmed at a more detailed stage of design.

Extension of the existing Harbour Ridge Drive (Road 3) will provide connectivity to the existing developments to the north and west via a 6m road in an 18m road reserve, with grades up to 7.5%. A 1.5m wide DUP has been assumed along the length of this road.

Road 4, is a loop road off the extended Harbour Ridge Drive, with Road 5, a cul-de-sac road off Road 4.

Roads 2, 4 and 5 are 6m roads in a 15m road reserve with grades up to 6.5%.

5.3 Water

There is an existing 150AC water main on Brand Highway, 100P-12 mains on View Crest Drive and Harbour Ridge Drive. Without detailed Water Corporation scheme planning it is anticipated that 100P-12 mains will be distributed throughout the development within road reserves and connect into the existing mentioned mains.

5.4 Sewerage

There is an existing 150 diameter sewer servicing the northern lots of View Crest Drive and Harbour Ridge Drive that continues northwards into the existing development. Without detailed Water Corporation scheme planning it is proposed that approximately 11 lots will connect into this existing sewer at Harbour Ridge Drive.

Lots on roads 4, 5 and the remainder of Harbour Ridge Drive will be served by 150 diameter sewer reticulation in the road reserve, gravity feeding to a local low point at the intersection of Harbour Ridge Drive and Road 4. The sewer will then traverse the ridge via the twinside retained bank allocated in the POS in a series of access chambers within the terracing and connect into the sewers in Road 2. The details of the sewers traversing the ridge will be determined at a more detailed stage of design. The sewers in Road 2 and View Crest Drive will gravity feed to the low point at the intersection of Brand Highway, and then gravity feed northwards in a 225 diameter about 250m along Brand Highway to an existing temporary pump station.

House connections to lots with retaining walls at the front verge will typically require the connection to be extended under the retaining wall and brought up to within 1m of the finished surface level.

5.5 Drainage

A pit and pipe stormwater drainage system is proposed to drain stormwater runoff from road reserves, with lot drainage to be retained and disposed within the lots by soakage pits. The road reserve stormwater drainage system will typically be designed for a 1 in 5 year ARI storm event.

Stormwater from Harbour Ridge Drive (Road 3) and Road 4 will be collected by pits and pipe to the local low point at the intersection of Harbour Ridge Drive and Road 4. At this low point the number and type of pits will be designed to accommodate the 1 in 100 year storm event and the pipes downstream of this low point will also be designed for the 1 in 100 year event. This is to minimise the likelihood of localised flooding and erosion during major storm events.

Downstream of this low point, the stormwater will traverse the limestone ridge via the twinside retained bank allocated in the POS and then discharge into a basin located at the intersection of Road 2 and View Crest Drive. Details of this arrangement will be determined at a more detailed stage of design. The basin has been designed to accommodate the 1 in 10 year storm event, unfenced with 1 in 6 batters where possible, with 1 in 2 batters to the toe of the ridge.

The proposed pipe drainage of the extended View Crest Drive will connect into the existing 375 diameter drainage on View Crest Drive which collects the existing catchments of Allender Place and upper sections of Shoreview Street. The drainage from View Crest Drive and Road 2 will discharge into a basin at the intersection of Brand Highway. This basin will be designed to accommodate the 1 in 100 year storm event, fenced with 1 in 2 batters, minimising the likelihood of stormwater flow onto Brand Highway from the development. The 1 in 100 year flows will likely enter the basin via a series of double side entry pits and section of flush kerbing graded towards the basin, however details shall be confirmed at a more detailed stage of design.

A further option that may be considered in the detailed design stage is the use of "leaky" drainage pits that allow infiltration of the smaller storm events at source, with the flows from the more significant storm events being transported to the basins. This method was successfully used at the Swansea development in Mosman Park, Perth, in similar geotechnical conditions.

Refer to Appendix C - Preliminary Earthworks/Drainage Plan.

5.6 Telstra

There is existing Telstra Infrastructure within the immediate vicinity of the proposed development. Along Brand Highway there is located within the highway road reserve Optic Fibre and mains communication cables which will be protected during construction.

Proposed Telstra infrastructure will share trenches with Western Power Underground feed as per Telstra's Standard Estate Development. The unit developments will be Main Distribution Frame (MDF) fed. There are no foreseen problems with Telstra connections due to the availability of surrounding infrastructure.

5.7 Power

There are no foreseen power supply issues due to the presence of nearby residential developments.

5.8 Gas

There are no foreseen gas supply issues from Alinta with an existing 80 PVC main along Shoreview Street.

06 CONCLUSION

The Revised Structure Plan design provides a planning framework to guide detailed design and implementation of progressive stages of subdivision.

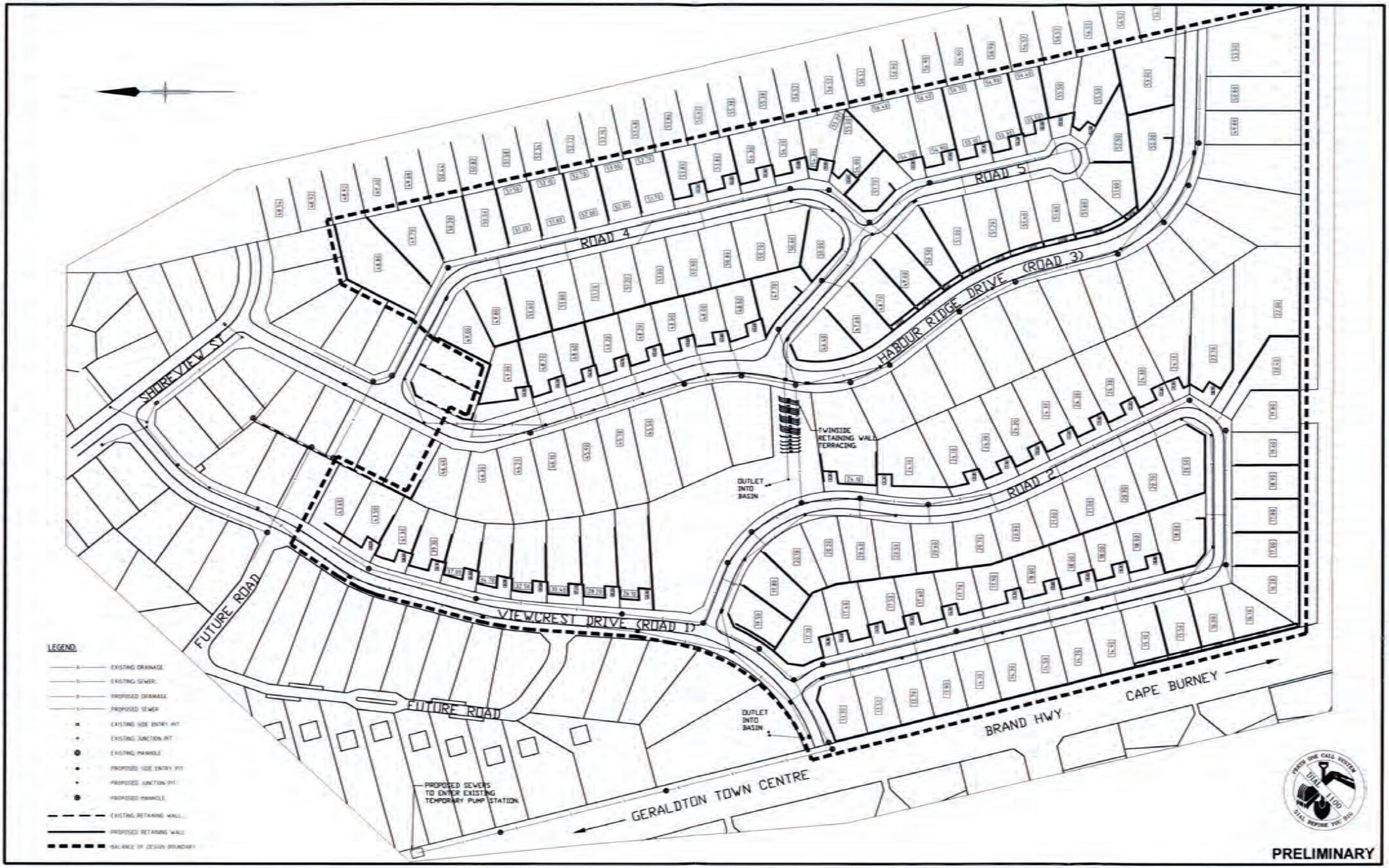
This report has described the process and rationale underpinning the proposed revisions to the existing approved design. These revisions have culminated in a design that is more responsive to the natural terrain of the site. This design will foster subdivision and development with a high level of amenity that incorporates an appealing combination of architecturally designed homes that are integrated into the existing landform (i.e. pole/framed and split level housing) and level development sites where exceptional views are preserved to the coast via the incorporation of a terrace of limestone retaining walls.

The City and Western Australian Planning Commission's adoption of the Revised Structure Plan will ensure future subdivision and development can proceed that is of a high standard and reflective of the local site and contextual circumstances pertaining to this land.

APPENDIX A

REVISED STRUCTURE PLAN

APPENDIX B
PRELIMINARY SEWER, DRAINAGE SERVICE AND RETAINING WALL PLAN



PRELIMINARY SEWER, DRAINAGE SERVICE AND RETAINING WALL PLAN

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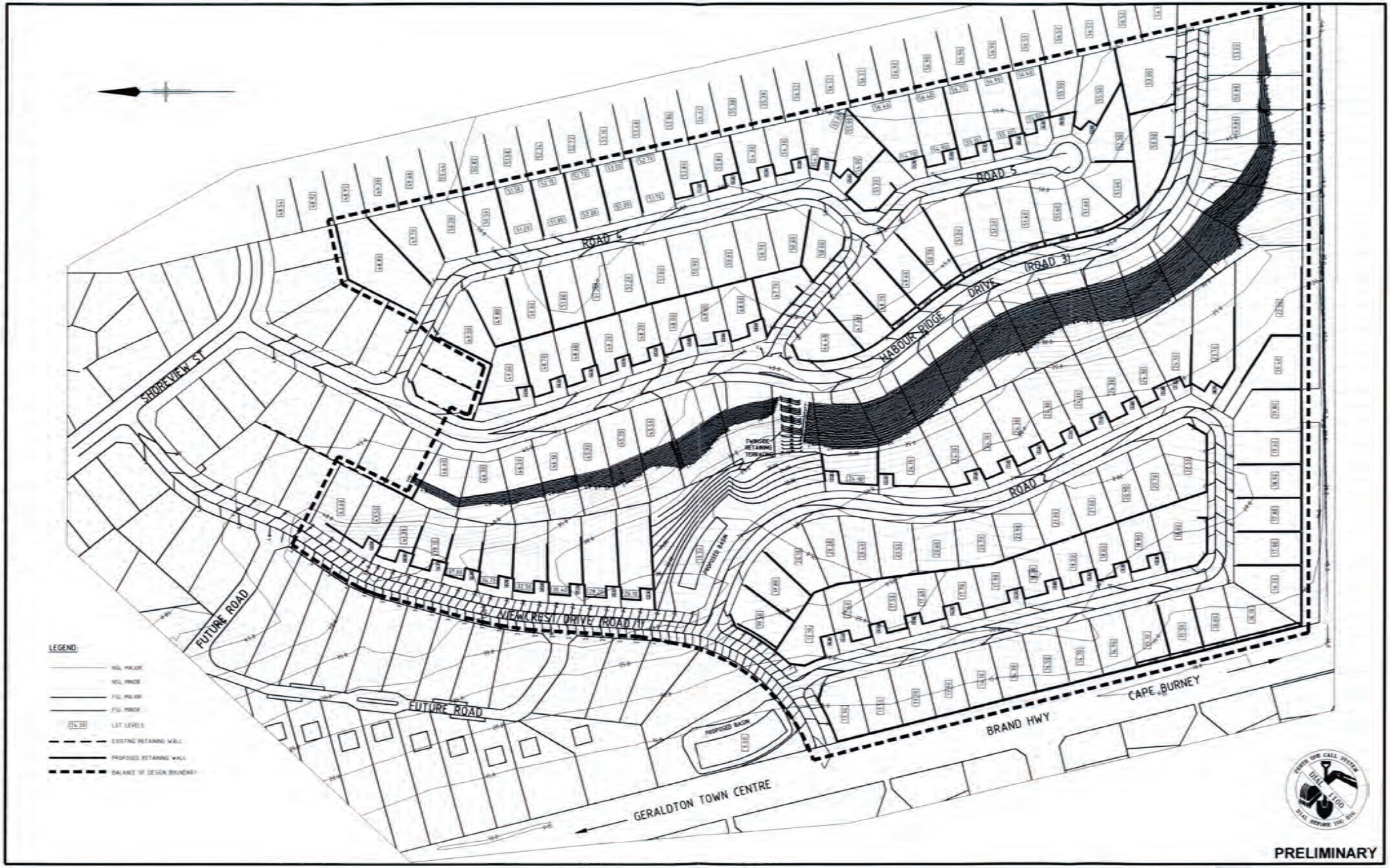
APPENDIX C
PRELIMINARY EARTHWORKS/DRAINAGE PLAN



PRELIMINARY EARTHWORKS / DRAINAGE PLAN

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APPENDIX D
TRAFFIC STUDY

Government of Western Australia

MAIN ROADS
Western Australia

ABN: 50 860 676 021

Enquiries: Michael Glynn on 9956 1200
Our Ref: 06/823
Your Ref:

5 April 2006

Mr J Riley
Riley Consulting
PO Box Z5578
PERTH WA 6831

Dear Sir

WANDINA ESTATE ACCESS TO BRAND HIGHWAY; SHIRE OF GREENOUGH

I refer to your letter dated 30 March 2006 concerning the proposed access onto Brand Highway from Wandina Estate.

Main Roads confirms that both the intersection location 130 metres north of Sander Street and the proposed right turn lane configuration are acceptable.

The concept sketch provided deals only with the right turn lane. It is anticipated that left turn lane requirements for south bound traffic exiting Brand Highway will be addressed in the detailed design along with the drainage and lighting issues previously raised with the developers.

Formal approval for construction will only be provided once the detailed design has been assessed by this office.

If you require any further information please contact me on 9956 1200.

Yours faithfully

P R CARTWRIGHT
A/REGIONAL MANAGER
MID WEST

Mid West Region, Eastward Road, Geraldton or PO Box 165, Geraldton Western Australia 6531
Telephone: (08) 9956 1200 Facsimile: (08) 9956 1240
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Regional Manager Mid West Region
Main Roads Western Australia
PO Box 165
Geraldton
WA 6531

16th March 2006
Your ref 803-1-8v2

Dear Sir
Wandina Estate Access to Brand Highway – Shire of Greenough

I write with regard to the above development and the proposed access to Brand Highway.

Further to your letter dated 22nd June 2005, EDC has requested that I undertake a review of the proposed access location with regard to intersection spacing and current Austroads Standards. I have been advised by the civil engineer that the proposed location of the development access is due to the levels on the site and that complying with the advised 150 metre separation to Sander Street will result in an unacceptable gradient approaching Brand Highway. Obviously steep grades approaching a Highway present significant safety concerns. The gradient also presents a stormwater drainage issue.

Relocation of the proposed access as shown in the structure plan provides an appropriate approach to Brand Highway and resolves the drainage issues.

I have attached a copy of my technical note reviewing the proposed access location and conclude that, due to the low volume of traffic expected to turn right into the structure plan area at the proposed access location, a relaxation of Austroads Standards can be supported. The report provides a sketch of the proposed access location and the distances achieved for right turning lanes. The layout accords with Austroads Standards, providing the minimum right turn lane length to the proposed access and maintains the desirable right turn lane length for Sander Street.

I trust the enclosed technical note is sufficient for Main Roads to review the proposed access location and provide approvals for its construction. Should you have any queries please do not hesitate to contact me.

Yours faithfully

Jonathan Riley
Riley Consulting

EDC Wandina Structure Plan

Access to Brand Highway

Traffic and Transportation Consultants

PURPOSE

This technical note is provided on behalf of EDC to assess proposed access to Brand Highway. The location of the site and the current traffic data provided by Main Roads and the Shire of Greenough is shown in Figure 1 below. The structure plan is attached as Appendix A.

SUMMARY

Analysis of the future traffic volumes associated with the proposed Wandina structure plan indicates that a type BA (minimum treatment) right turn lane is warranted at the Brand Highway access.

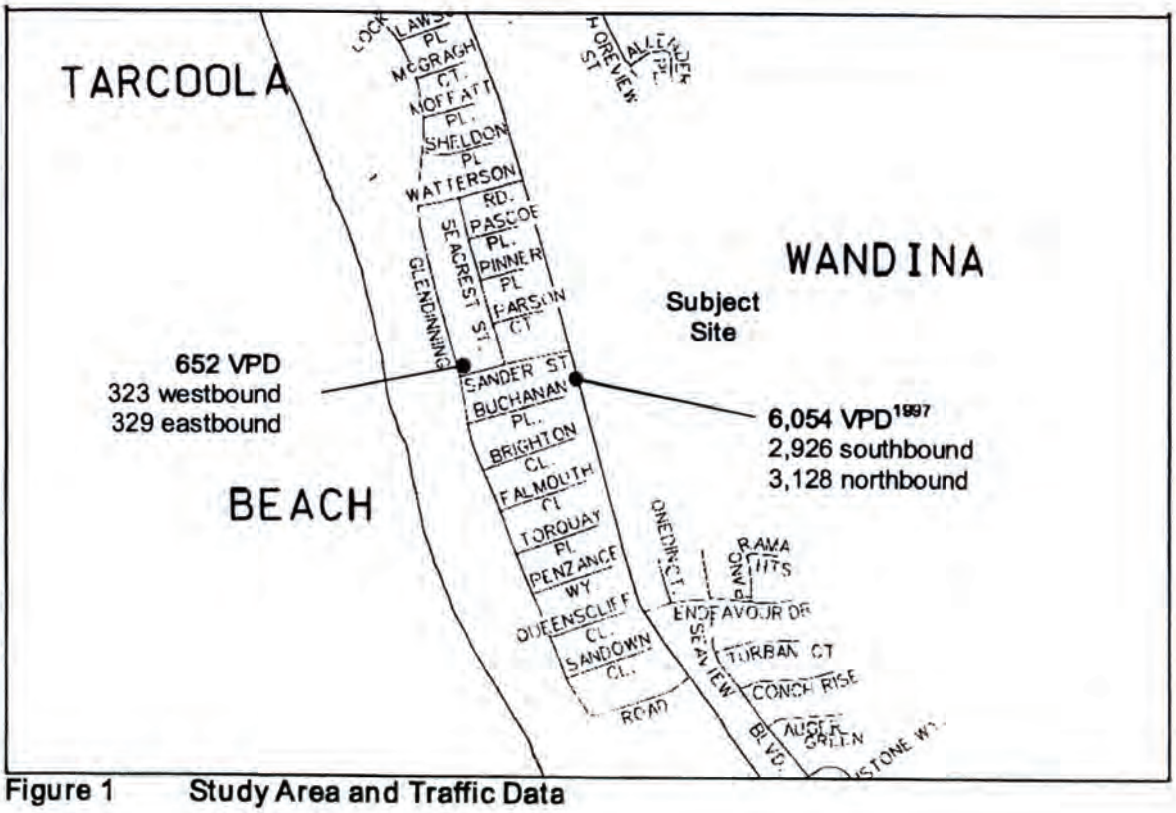


Figure 1 Study Area and Traffic Data

TRAFFIC GENERATION

Based on the road layout shown in the structure plan, it is estimated that 92 lots would access the Brand Highway via the proposed access. The remaining lots would access the Brand Highway at Barrett Drive to the north. Assuming a daily trip rate of 10 trips per lot per day, which could be considered high for an urban fringe development, 920 vehicle movements per day can be expected to use the proposed access.

Discussions with Shire officers and Main Roads support the assumption that 80% to 90% of traffic from the proposed development will head north to Geraldton. On the basis of an 85% attraction to/from Geraldton, 782vpd would head north and 138 would head south. This is the scenario used for the purpose of assessing the right turn lane provision.

Based on the traffic count of Sander Street the morning peak period is between 8am and 9am when 6.4% of the daily flow occurs with 77% of vehicles exiting the residential area. The evening peak period is between 5pm and 6pm when 10.3% of the daily flow occurs and 67% of vehicles enter the residential area. It is considered a reasonable assumption to apply this distribution to the proposed Wandina structure plan traffic. Table 1 shows the derived peak period traffic movements.

Table 1 Wandina Structure Plan Traffic Movements

Time	North (85%)		South (15%)	
Movement	In – left turn	Out – right turn	In – right turn	Out - left turn
8am to 9am (6.4%)	12	38	2	7
5pm to 6pm (10.4%)	54	27	10	5

Table 1 shows that the evening peak period is the critical period for traffic turning right from the Brand Highway. Traffic data provided by Main Roads only shows the combined daily flow for the Highway, but it could be assumed that generally over the 24hr period traffic would be split 50% northbound and 50% southbound. It would further be assumed that the peak period would be up to 10% of the daily flow, split 70/30 in the peak direction. Therefore, during the evening peak period it would be assumed that:

6,054 + 3% growth pa = 7,900vpd (2006) x 10% = 790 vehicles during the evening peak, split 70% from Geraldton = 553 southbound / 237 northbound.

Turn Lane Requirements

Reference to Austroads - Guide to Traffic Engineering Practice Part 5 – *Intersections at Grade* Table 6.41 shows the warrants for the provision of a right turn lane. Figure 2 shows the anticipated turning and opposing flows associated with the proposed access. It can be seen from Figure 2 that a BA type right turn lane is warranted.

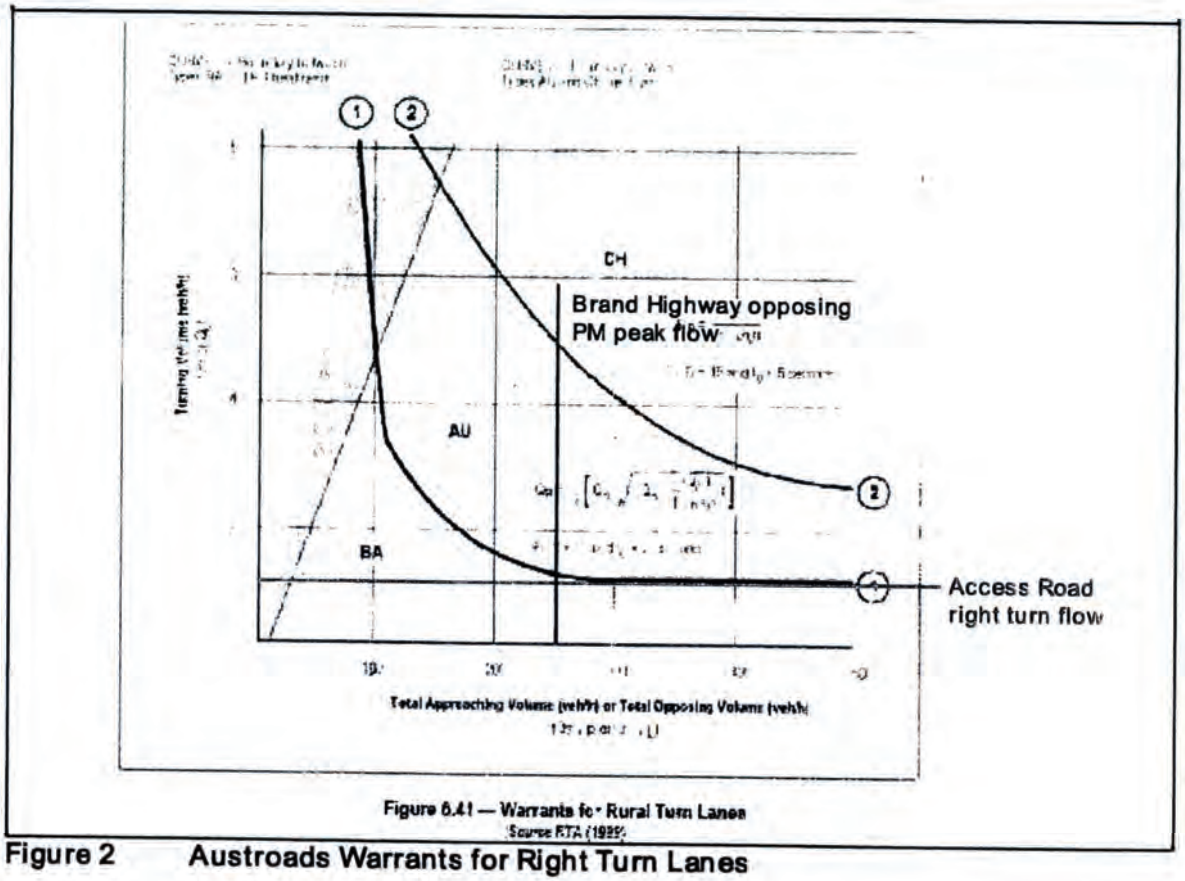


Figure 2 Austroads Warrants for Right Turn Lanes

A type BA turn lane is the minimum provision and requires only minor widening of the existing carriageway to allow sufficient width for a vehicle to pass a turning vehicle. Figure 3 shows the required layout.

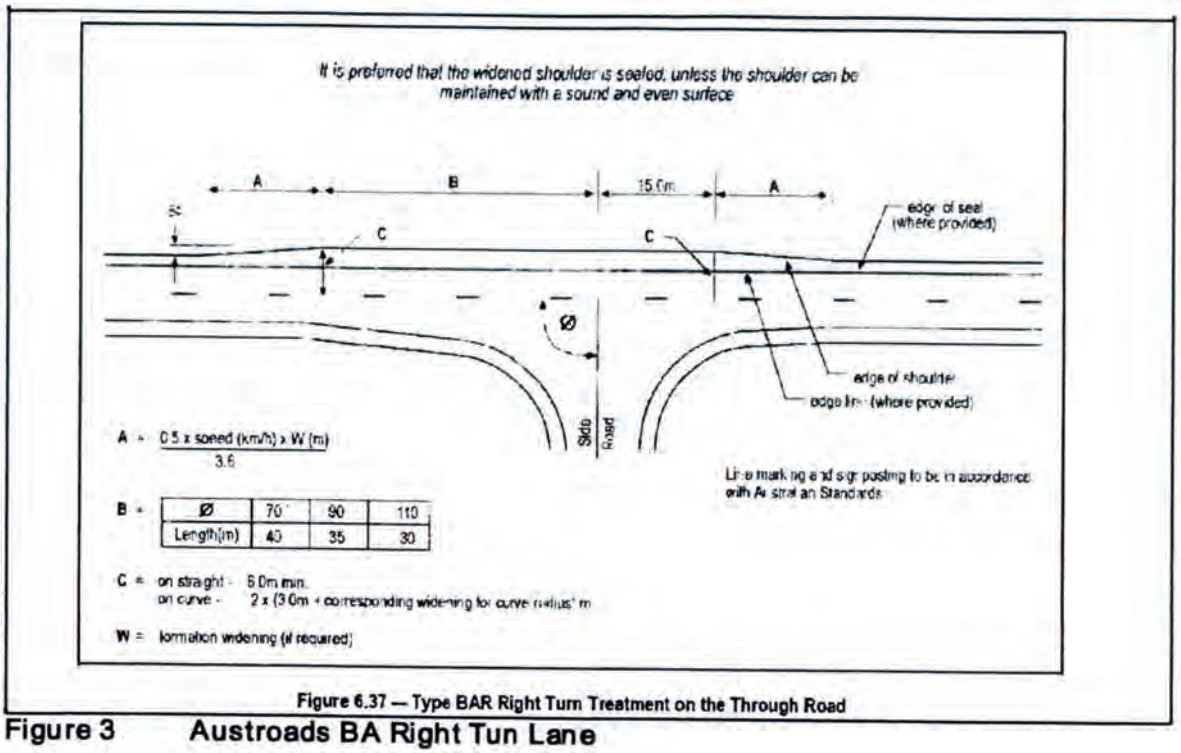


Figure 6.37 — Type BAR Right Turn Treatment on the Through Road

Figure 3 Austroads BA Right Tun Lane

Future Road Requirements

Correspondence from Main Roads has indicated that in-principle approval has been granted for an access 150 metres north of Sander Street. The Main Roads correspondence also suggests that the separation distance between the access and Sander Street of 130 metres is insufficient to achieve right turning lanes. It has been shown that a type BA right turn lane is warranted and this can be provided within 60 metres to the approach to the intersection. This distance can be accommodated within the shown intersection spacing. However, to ensure that future upgrades to the Brand Highway are not compromised, the requirements for right turn lanes are reviewed below. Appendix B shows an aerial photograph of the existing turn lane to Sander Street (taken from the DLI Skyview website).

Austroads indicates that with a 70kph posted speed on Brand Highway a minimum diverge length of 55 metres can be used, although ideally 75 metres is preferable. It can be seen that the 150 metre intersection separation stated by Main Roads is based on twice the preferable deceleration distance. It is suggested that the minimum length of 55 metres can be used for the subject site entry based on the very low demand for traffic to make this movement. Traffic turning right approaching from Geraldton should be provided with the desirable length. Figure 4 shows how the right turning lane could be provided if required at some future time. The turn lanes have a separation of 14 metres.

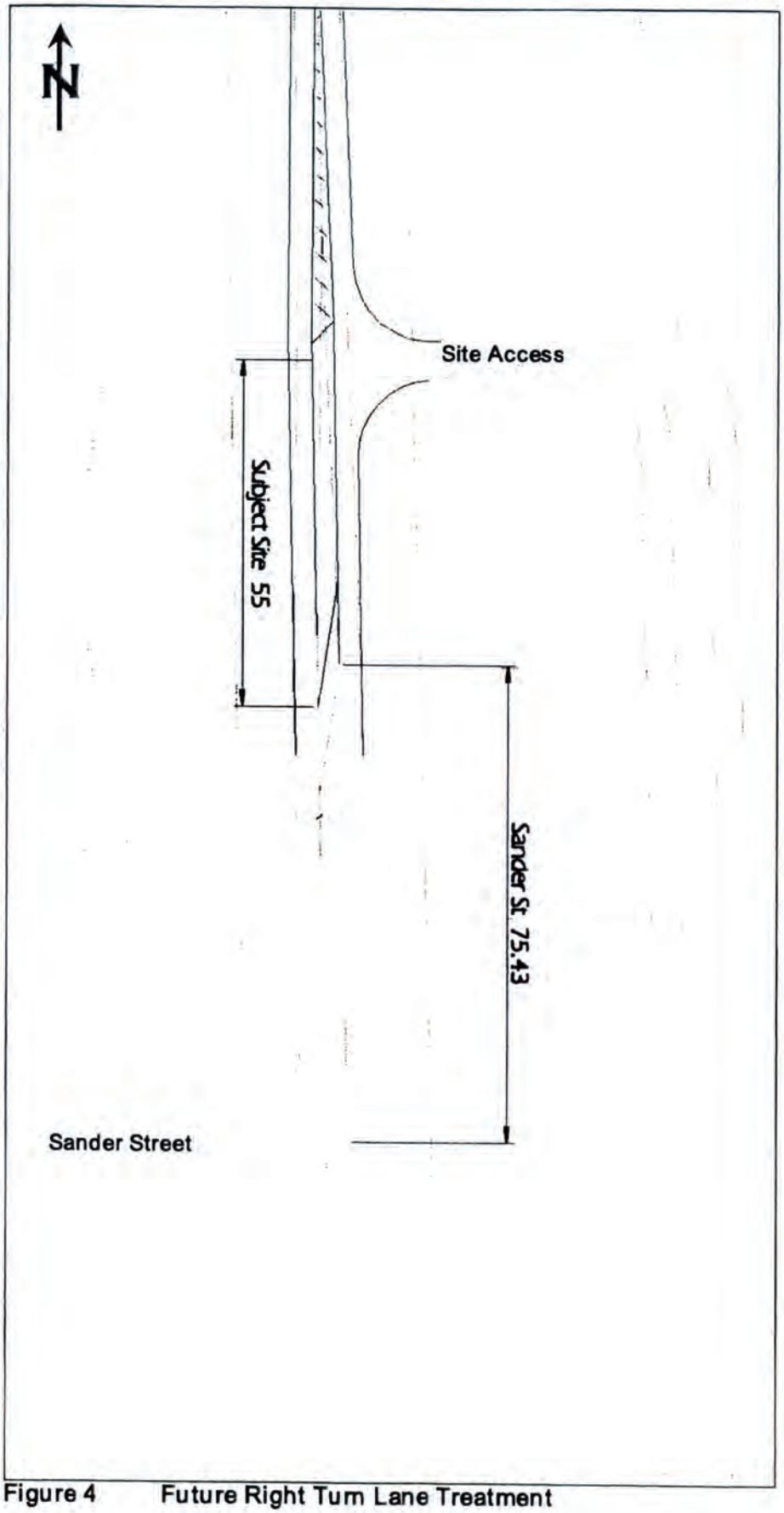


Figure 4 **Future Right Turn Lane Treatment**

CONCLUSIONS

The analysis of the proposed access to the Brand Highway draws the following conclusions:

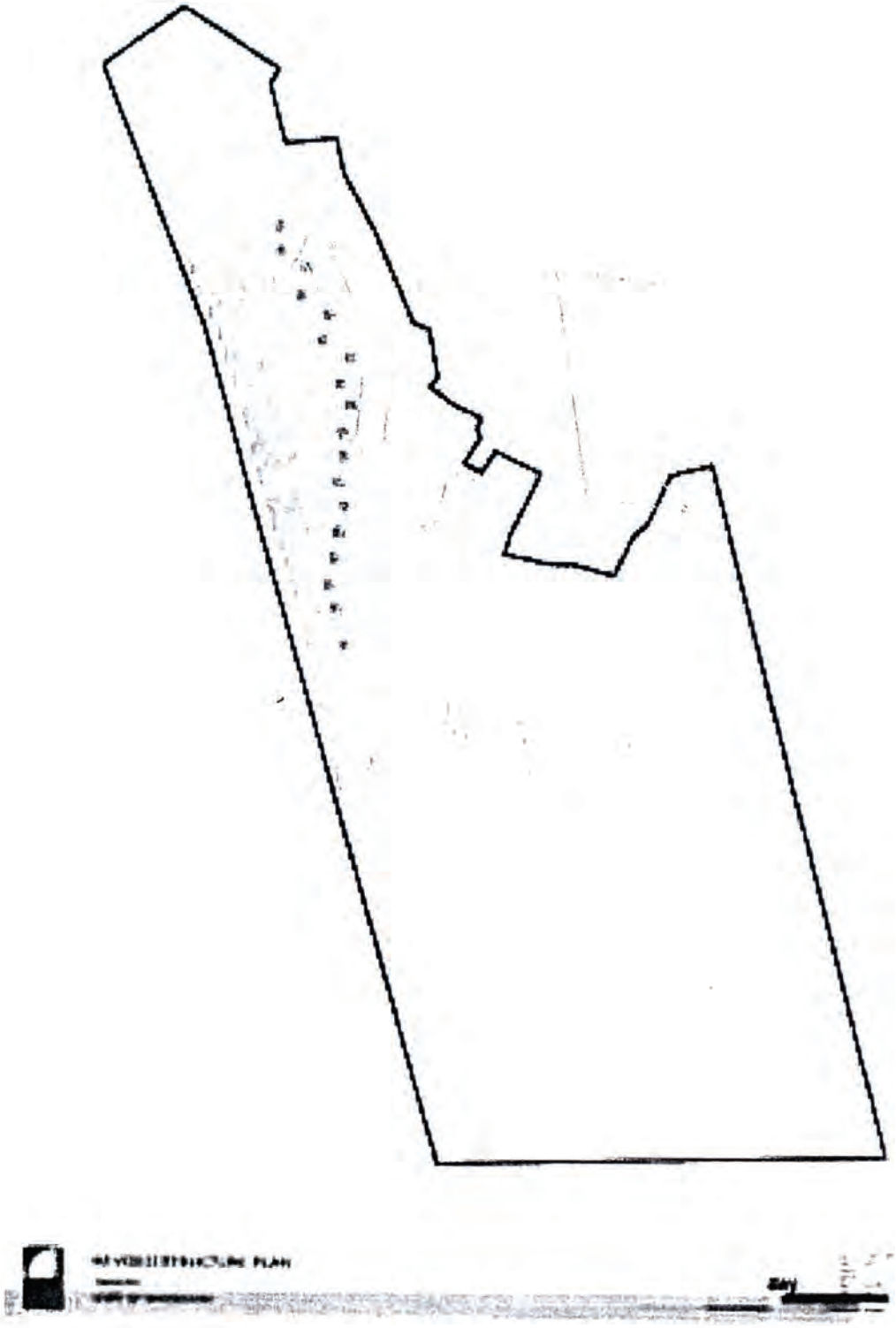
- The analysis of the proposed residential access to the Brand Highway indicates that a minimum treatment right turn lane would be warranted (type BA treatment). Generally a type BA right turn lane would comprise of minor road widening with no formal turn lane.

- A right turn lane has been constructed to service residential development to the west side of Brand Highway (Sander Street) approximately 130 metres south of the proposed access. Typically for planning purposes, a minimum distance of 150 metres would be required to provide back to back full standard turn pockets. However, the volume of right turning traffic accessing the subject site is very low and a full standard right turn lane is not warranted.

- Figure 4 shows how back to back right turn lanes can be introduced on the Brand Highway to service the two accesses. Figure 4 is based on maintaining the existing turn lane to Sander Street at 75 metres, the desirable Austroads standard. The right turn lane for the proposed site access is shown at 55 metres, which is the minimum length indicated by Austroads. The tapers for the two right turn lanes overlap by about 14 metres which is acceptable.

- In summary, it is considered that the layout indicated in Figure 4 is appropriate on the basis that:
    - The layout conforms to Austroads Standards
    - The level of right turning traffic to the subject site is low and would only warrant the minimum right turn treatment (type BA)
    - The proposed access arrangement provides a better standard to the warranted right turn lane treatment (type BA).

APPENDIX A



APPENDIX B

Aerial Photograph from DLI Skyview

LEGEND

Earthworks contours

○ Reduced front setback of 6.0m is permitted

× Reduced front setback of 3.0m is permitted to aid in the development of a split level or framed housing style.

(NB. If at the development stage a reduced front setback is required a Detailed Area Plan can be prepared and endorsed.

REVISED STRUCTURE PLAN

WANDINA

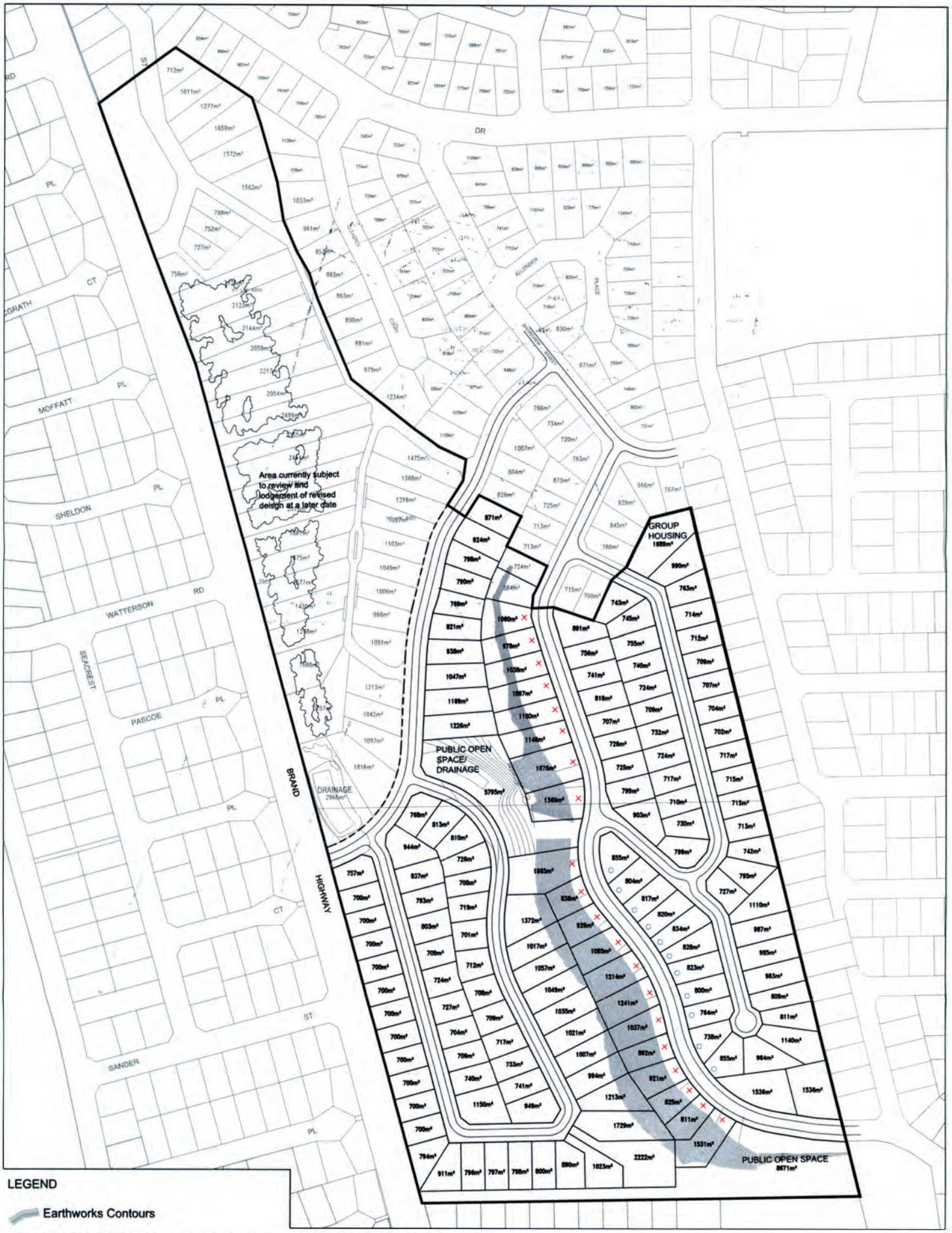
SHIRE OF GREENOUGH

roberts day

town planning + design

scale: 1:2000 @A2
drawn: JH/BG/OL
checked: TT
approved: TT
date: 30/07/07
client: EDC

dwg no: EDC GER ILL 01 rev C



LEGEND

Earthworks Contours

○ Reduced front setback of 6.0m is permitted (in accordance with R15 coding)

× Reduced front setback of 3.0m (minimum) is permitted to aid in the development of a split level or framed housing style.

(NB. If at the development stage a reduced front setback is required a Detailed Area Plan can be prepared and endorsed.)

REVISED STRUCTURE PLAN

WANDINA

CITY OF GERALDTON - GREENOUGH

robertsday

scale: 1:2000 @ A2
drawn: JH/BG/DL
checked: TT
approved: TT
date: 15/08/07
client: EDC

dwg no: EDC GER STR 01 rev C