

APPENDIX G - Supplementary Information on Visual Amenity

SUPPLEMENTARY INFORMATION ON VISUAL AMENITY

Background

The visual amenity of the proposed development is well described in Section 7.14 of the EA. However, in response to various issues raised about the visual impact of the development further work has been undertaken to provide more insight on this aspect.

The photomontages contained in Figures 7.7 to 7.10 of the EA clearly show the existing and proposed development. However, in order to illustrate the extent of the visual impact in the middle to far distance clearly, a 300 mm telephoto lens on a Canon 350D Digital camera was used which tends to exaggerate the visual impacts. Most photomontages use 50 mm to 90 mm lens (on a 35 mm camera) to create images most similar to that actually experienced by humans. The photographs contained in this appendix were taken with an Olympus Stylus 1030 SW Camera with the lens set at a focal length of 28mm (35 mm equivalent SLR camera) and serve to supplement the photomontages. Accordingly, the set of photographs contained in **Figures G1, G3, G5, G7 and G9** tend to under-represent the visual impacts slightly.

It is generally accepted that the degree of visual intrusion caused by objects viewed at distances greater than about 4 km (middle to far distance) are not dominant in the landscape. Objects viewed from less than about 4 km (middle distance) are visually evident and their degree of visual intrusion depends on the project and its setting within the landscape and factors such as foreground screening and the sensitivity of the viewer. At less than 1 km (near distance), objects will generally be visually dominant in the landscape.

For all subdivision areas except the Council's estate, the water body of Lake Wyangan will be the dominant landscape feature for views towards the development site. It should be noted that the Lake is not generally visible from the development site. The skyline will not be altered by the development when viewed from any of the estates.

It is appropriate to note that recently completed rural residential developments within all the estates in the Lake Wyangan area have been quickly planted with tree and shrub species. Most dwellings more than 5 years since completion have established landscaping vegetation around their dwellings such that it is no longer possible to view the quarry site from the dwelling or its curtilage.

In order to illustrate the effect of vegetation, two sets of viewsheds were generated. **Figures G2, G4, G6, G8 and G10** show which areas are visible from a certain viewing point firstly in the instance of no human structures or intervening vegetation and then assuming some degree of vegetation screening as indicated in the figures. The viewsheds were calculated using digital elevation grids interpolated from airborne laser scan (ALS) data.

The vegetation barriers assumed for each viewshed have been situated at the following:

- 100m from each of the five viewing points (in the direction of the quarries);
- along the western edge of Lake Wyangan (approximating the ridge marking the highest point between viewing points 1 to 3 and the quarries);
- along a line approximating the ridge marking the highest point between viewing point 4 and the quarries, and

- along the eastern border of the two proposed quarry pits.

Assessment of Views from Key View Points

Based on the issues raised, Council has selected five key view points to the east of the proposed landfill and quarries in areas of existing or potential residential development. These view points are Sunset Waters, Wyangan Estate (Mancini's development), Pelican Shores, Todd Road/ McCarthy Road (Council land) and Betts' land (Lot 180 which borders on Lot 202). The visual impact from each of these is described in the following sections.

Sunset Waters

Sunset Waters is located some 5.4 km⁴ from the centre of the proposed landfill (existing quarry) and quarry pits 101 and 103. **Figure G1** shows that it is difficult to distinguish the existing landfill and quarry just below the ridge line. As the proposed development is of a similar scale and nature to the existing landfill and quarry, the visual impacts without mitigation will be similar. The second photograph in **Figure G1** shows the view from the ridge above the existing quarry eastwards over Lake Wyangan towards Sunset Waters. The figure illustrates how the terrain slopes away gently from McPherson's Range.

The viewshed diagram in **Figure G2** is based on a viewing height of 1.5 m and illustrates which areas are visible (shown in yellow) and which areas are not visible (shown in beige) from the viewing point (shown as a red dot) based purely on the natural topography of the area. The figure shows that the development will be visible to viewers from Sunset Waters. **Figure G2** also shows how some strategically placed low vegetation screening in the form of 3 m high shrubs and small trees, reduces the viewshed and therefore how screening could be used to effectively hide the development from view without obliterating views over Lake Wyangan.

Wyangan Estate

Wyangan Estate is located some 5.3 km from the centre of the proposed landfill and quarry pits. **Figure G3** shows that it is difficult to see the existing and proposed landfill and quarries due to the blocking effect of vegetation close to the view point. **Figure G3** also shows the view from the ridge above the existing quarry eastwards over Lake Wyangan towards Wyangan Estate.

The viewshed diagram in **Figure G4** illustrates which areas are visible from the viewing point based purely on the natural topography of the area. The figure shows that the development will be visible to viewers from Wyangan Estate in the absence of vegetation within the development and between the development and Lake Wyangan. The figure also shows how some strategically placed low vegetation screening in the form of 3 m high shrubs and small trees reduces the viewshed and therefore how screening could be used to effectively hide the development from view if desired.

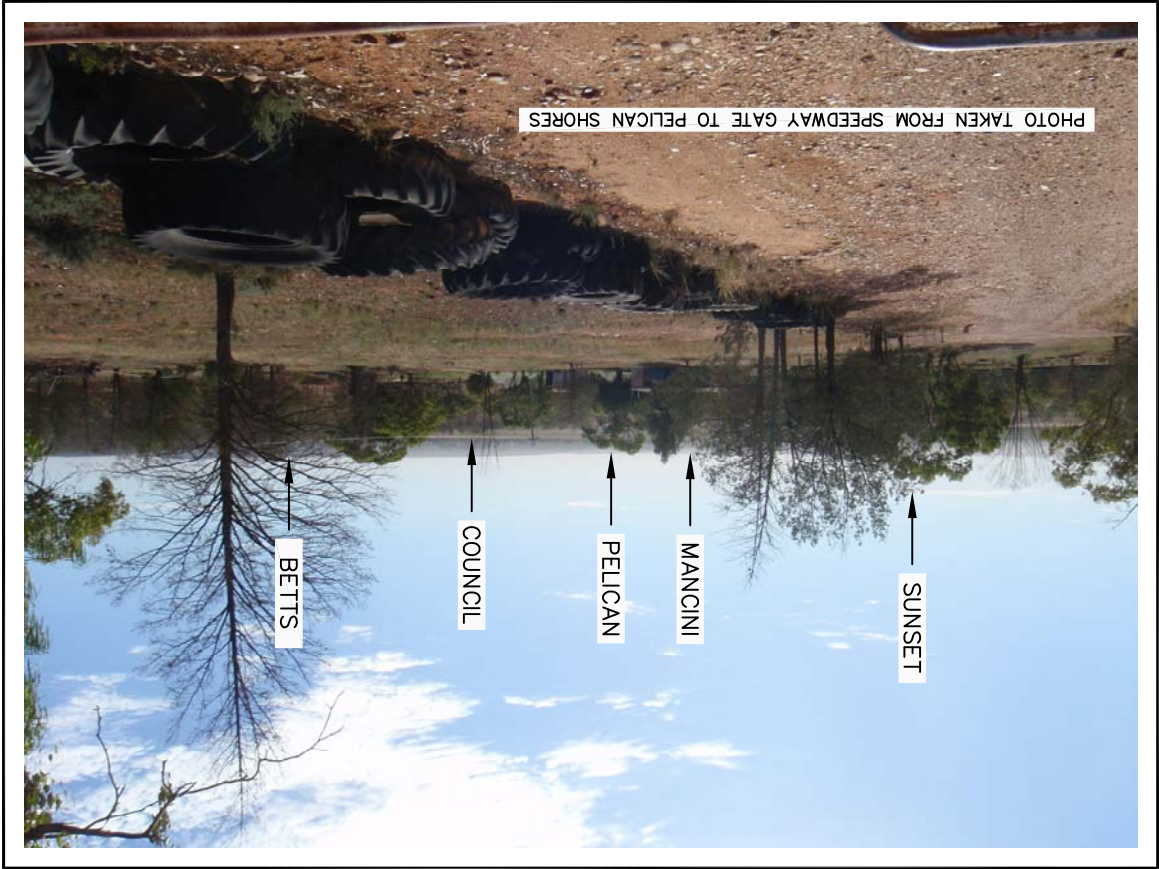
Pelican Shores

Pelican Shores is located some 4.9 km from the centre of the proposed landfill and quarry pits. **Figure G5** shows that it is difficult to see the existing

⁴ The distances contained in the visual analysis differ from those contained in Table 2 as the latter are taken from the cadastral boundaries.

original size	A4	 coffey environments SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE	project no: NSYSRHOD06029AA-D01	figure no: G1
scale	NTS		title: PHOTOGRAPHS - SUNSET WATERS	
date	02/02/10		project: THARBOGANG QUARRY & LANDFILL	
approved	ML		client: GRIFFITH CITY COUNCIL	
drawn	MV			

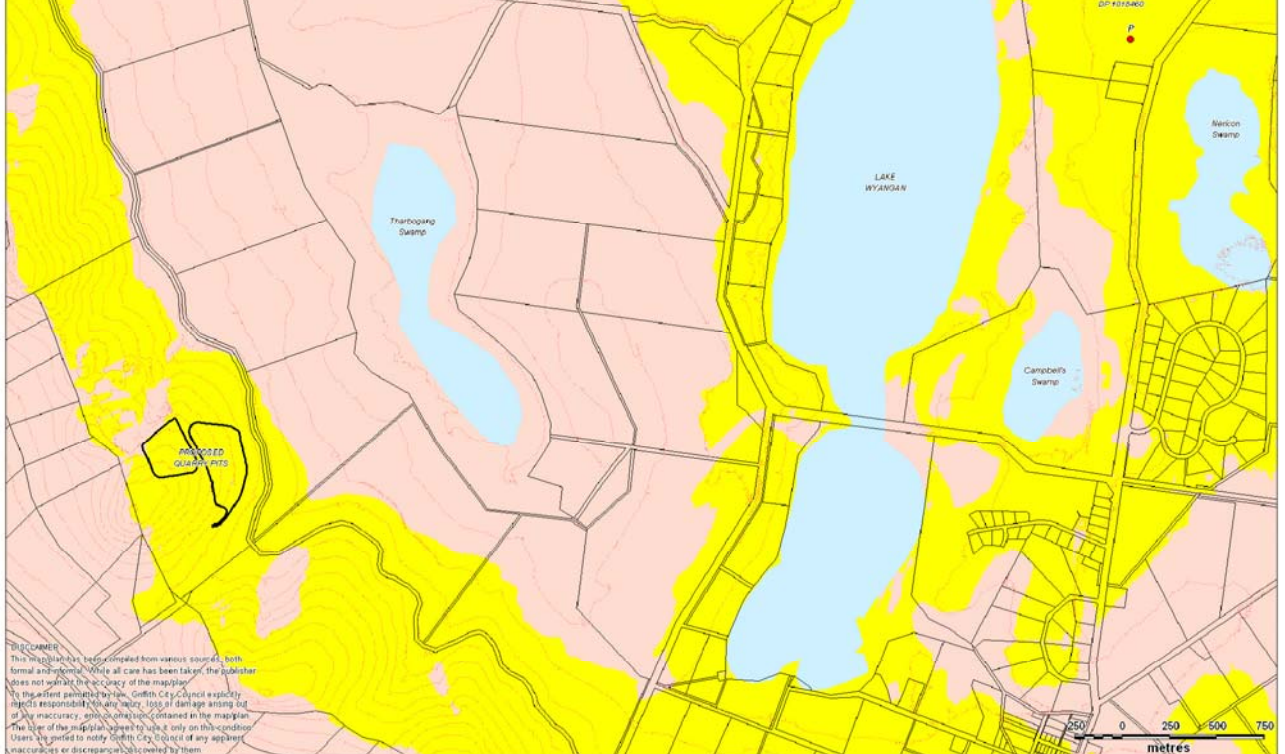
Coffey Environments Pty Ltd ©



VIEWSHED FOR LOT 104 DP 1018460

LEGEND
 Visible from Point P
 Not visible from Point P

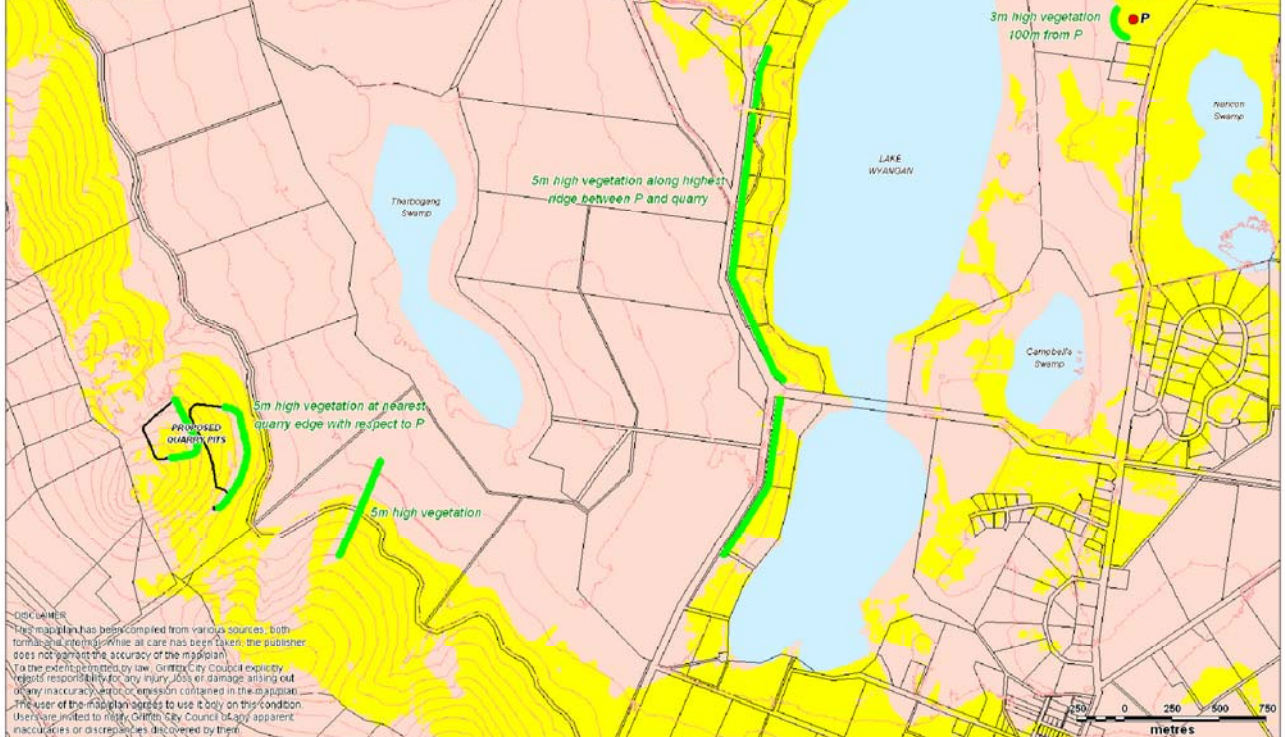
NB: Point P represents 1.5 metres above highest estimated point within lot
 Contour Interval 5 metres



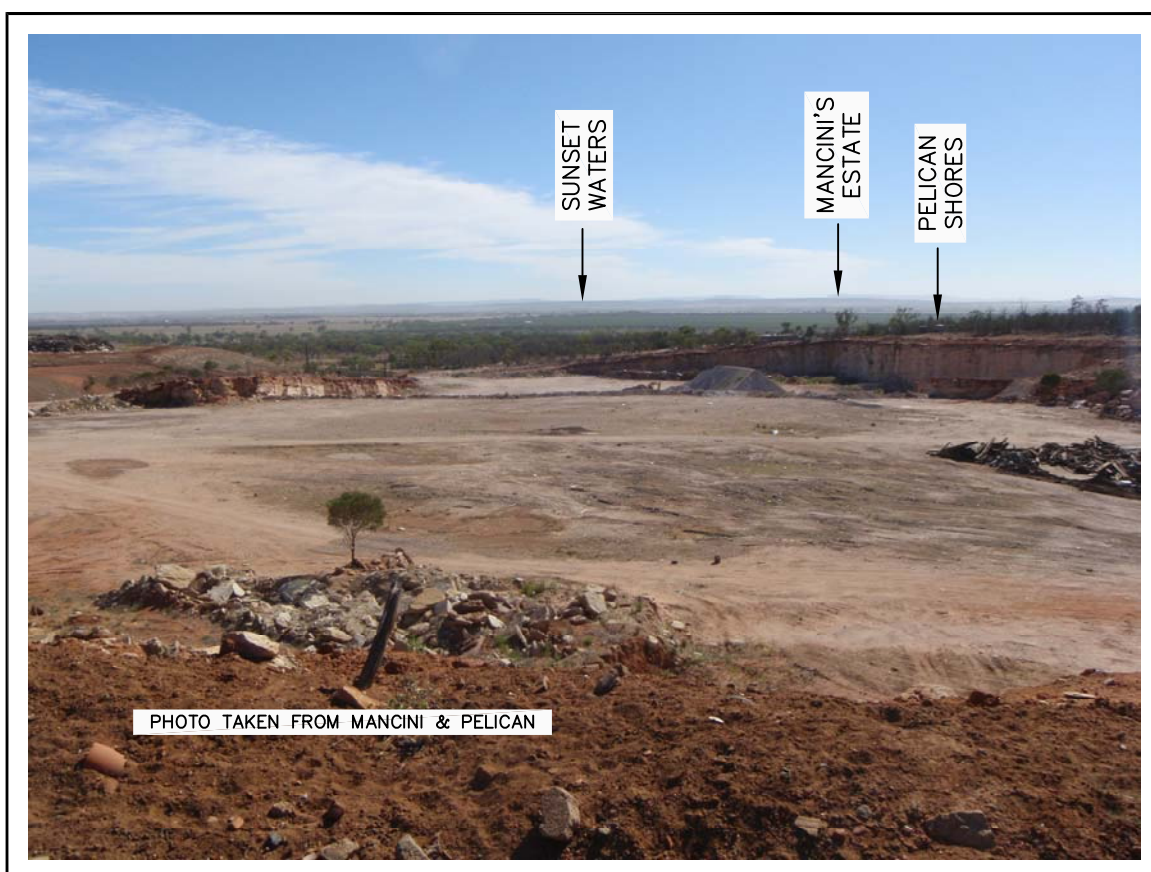
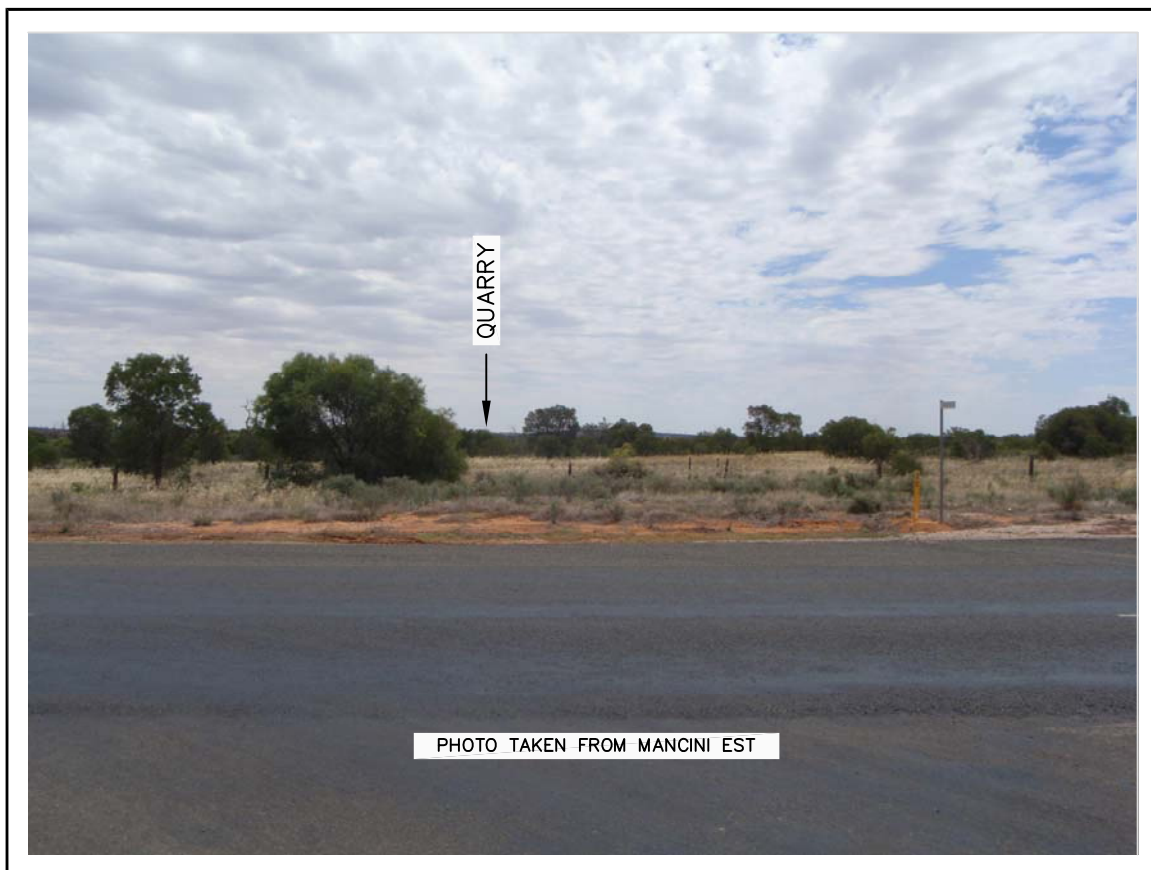
VIEWSHED FOR LOT 104 DP 1018460

LEGEND
 Visible from Point P
 Not visible from Point P

NB: Point P represents 1.5 metres above highest estimated point within lot
 Contour Interval 5 metres

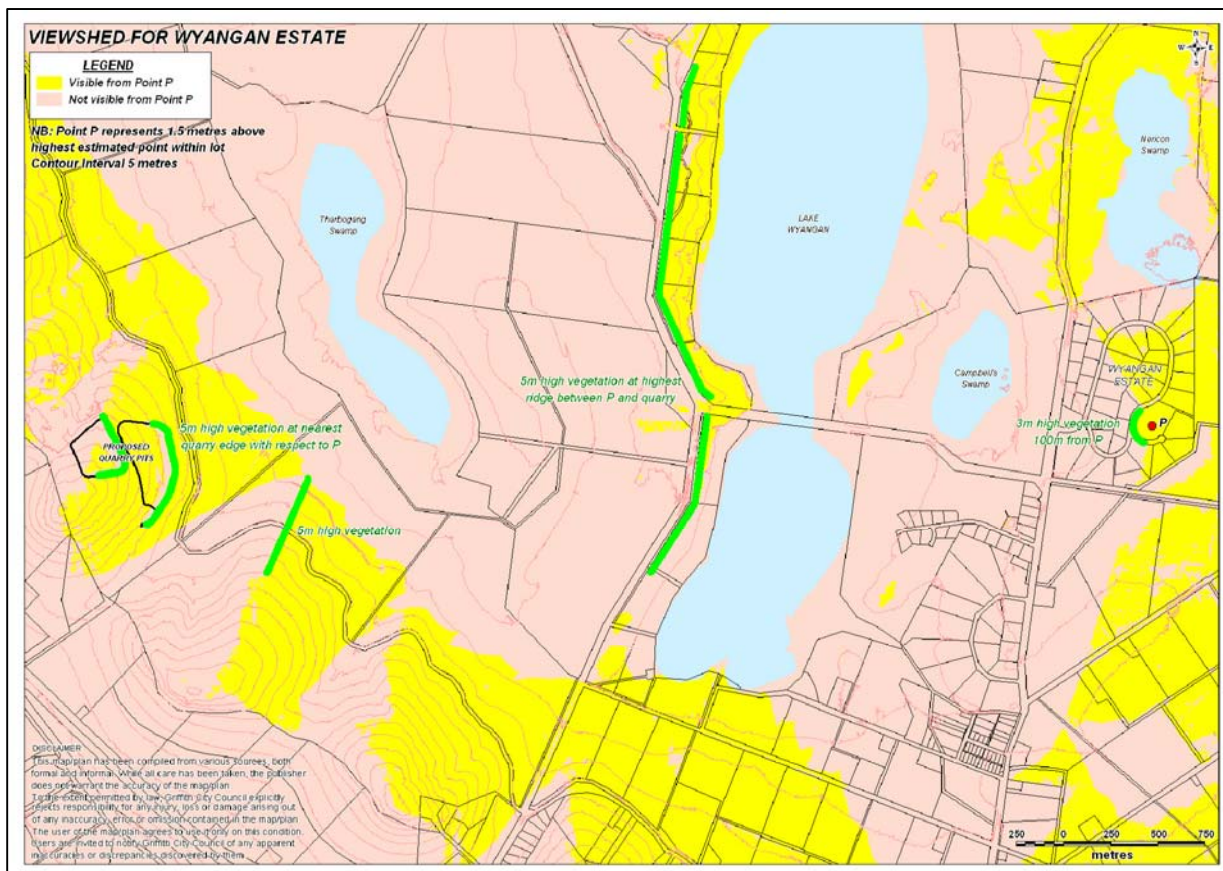
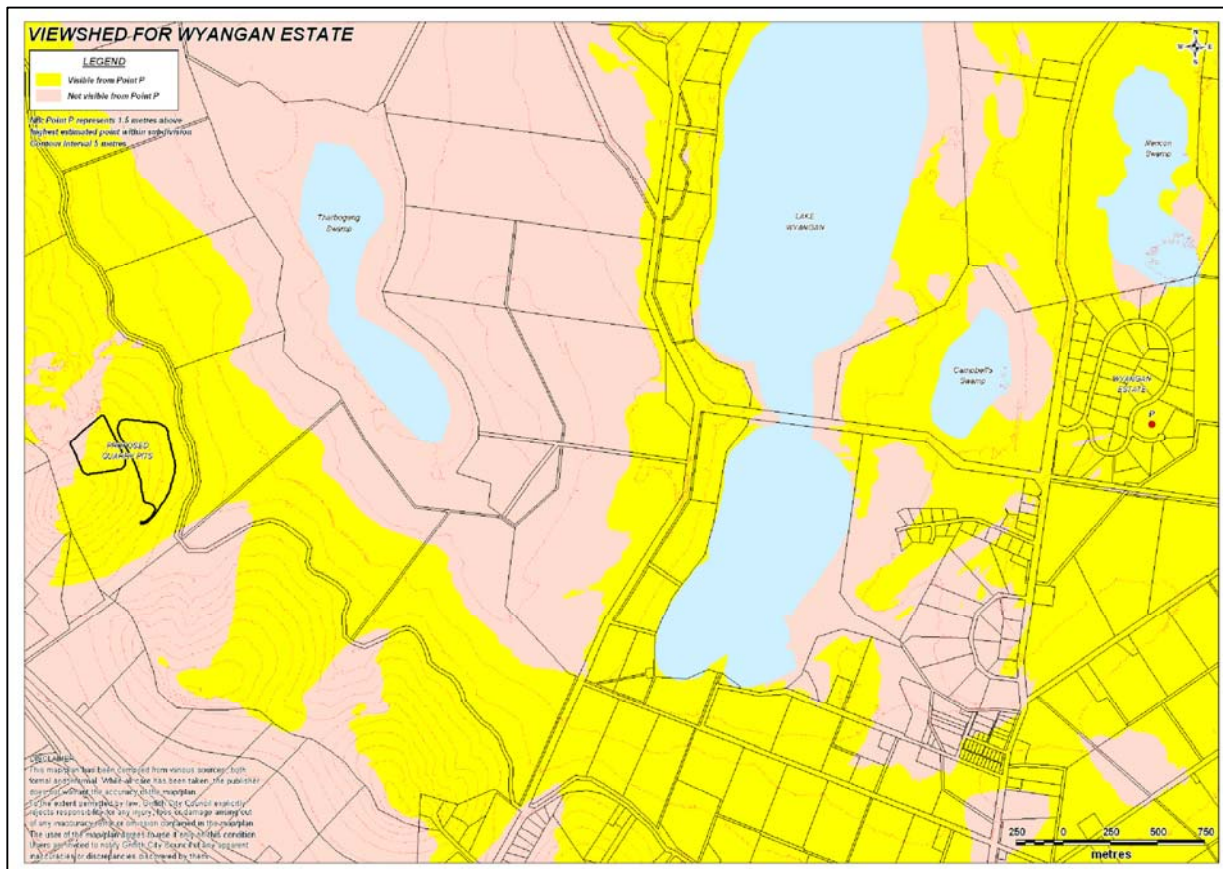


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approved			project:	THARBOGANG QUARRY AND LANDFILL	
date	17/02/2010		title:	VIEWSHED FOR LOT 104 DR 1018460	
scale	AS SHOWN		project no:	NSYSRHOD06029AA	figure no: G2
original size	A4				



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drawn	MV	 coffey environments SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE	client:	GRIFFITH CITY COUNCIL	
approved	ML		project:	THARBOGANG QUARRY & LANDFILL	
date	02/02/10		title:	PHOTOGRAPHS - WYANGANG	
scale	NTS		project no:	NSYSRHOD06029AA-D01	figure no:
original size	A4				G3



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approved			project:	THARBOGANG QUARRY AND LANDFILL	
date	17/02/2010		title:	VIEWSHED FOR WYANGAN ESTATE	
scale	AS SHOWN		project no:	NSYSRHOD06029AA	figure no:
original size	A4				G4

and proposed landfills and quarries due to the blocking effect of vegetation in the middle distance. The figure also shows the view from the ridge above the existing quarry eastwards over Lake Wyangan towards Pelican Shores.

The viewshed diagram in **Figure G6** illustrates which areas are visible from the viewing point based purely on the natural topography of the area. The figure shows that the development will be visible to viewers from Pelican Shores in the absence of vegetation within the development and between the development and the proposed development. The figure also shows how some strategically placed low vegetation screening in the form of 3 m high shrubs and small trees reduces the viewshed and could be used to effectively hide the development from view if desired.

McCarthy Road

Council's property on McCarthy Road is located some 5.4 km from the centre of the proposed landfill and quarry pits. **Figure G7** shows that it is difficult to see the existing and proposed landfills and quarries and illustrates how vegetation between the site and development effectively blocks views of the proposed development.

The viewshed diagram in **Figure G8** shows that the development will be visible to viewers on McCarthy Road in the absence of any screening effect of vegetation. The figure also shows how some strategically placed low vegetation screening in the form of 3 m high shrubs and small trees reduces the viewshed and could be used to effectively hide the development from view.

Betts' land

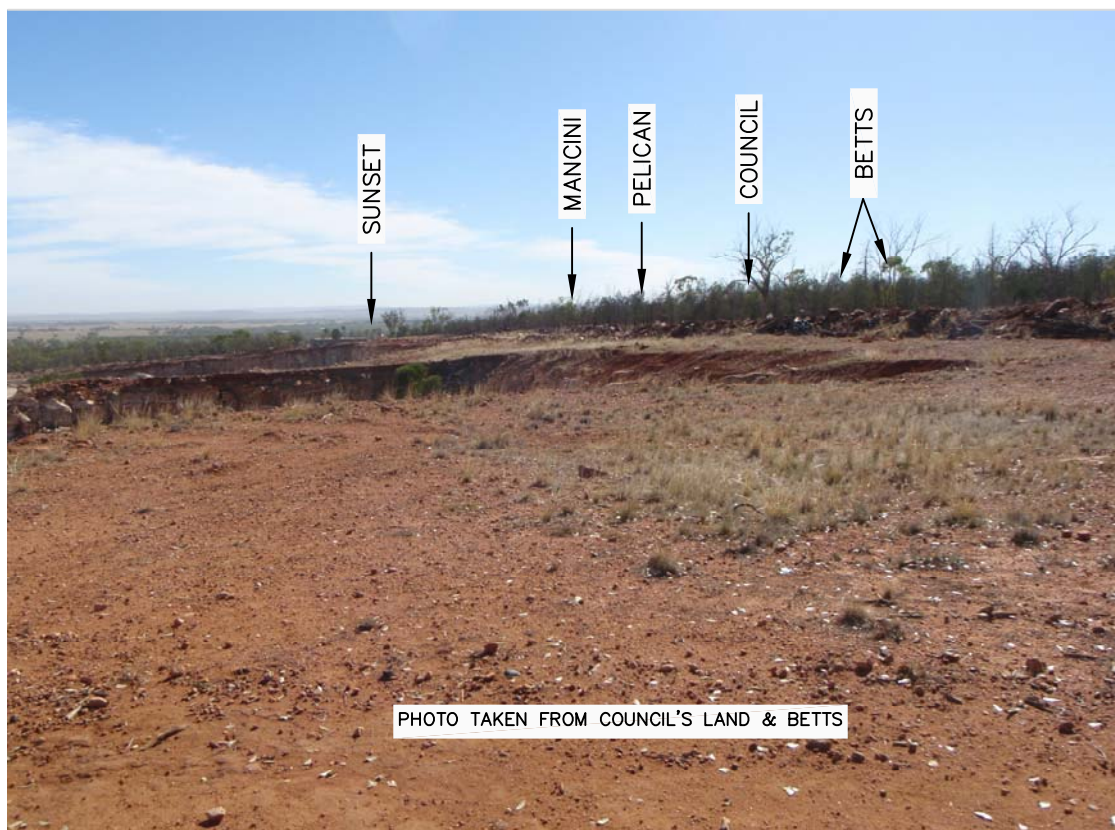
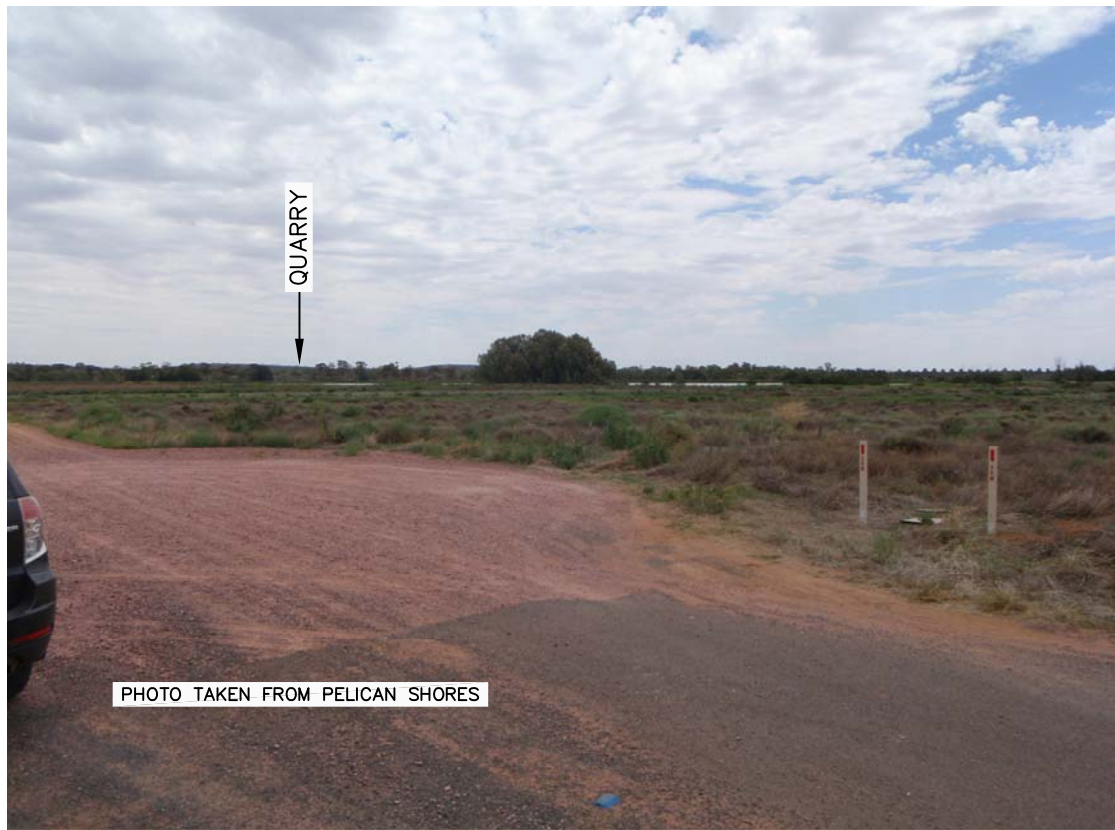
Betts' land (Lot 180) adjoins Lot 202 to the south east. A view point located approximately 0.9 km from the centre of the proposed development and some 0.5 km from the closest point has been selected. **Figure G9** shows that the existing landfill and quarry is not visible, and how the edge of pit 101 will be visible in the middle distance where the trees are sparse.

The viewshed diagram in **Figure G10** shows that the development will be visible to viewers on Betts' land in the absence of any screening effect of vegetation. Figure G10 also shows how some strategically placed low vegetation screening in the form of 3 m high shrubs and small trees reduces the viewshed and could be used to effectively hide the development from view. For this viewing point, the vegetation already exists at least in part and thus existing views would be filtered through the trees.

Management and mitigation measures

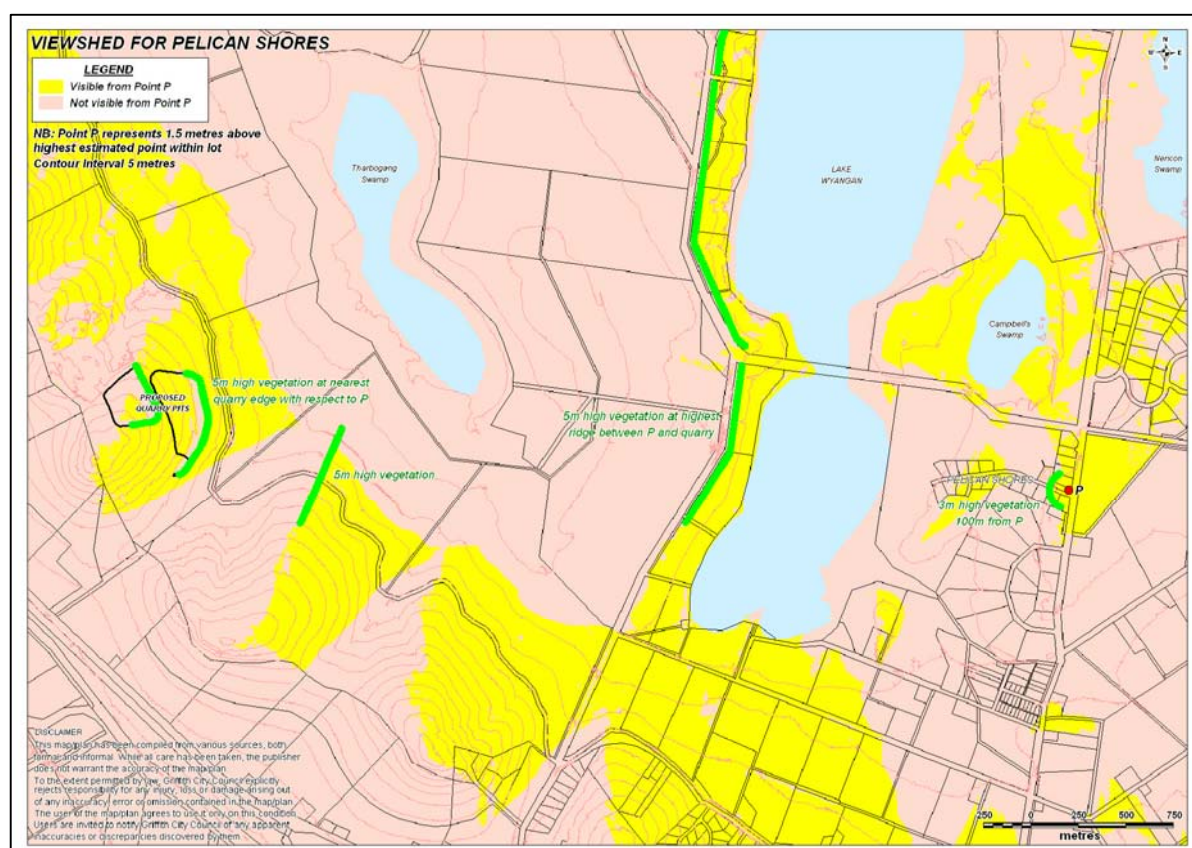
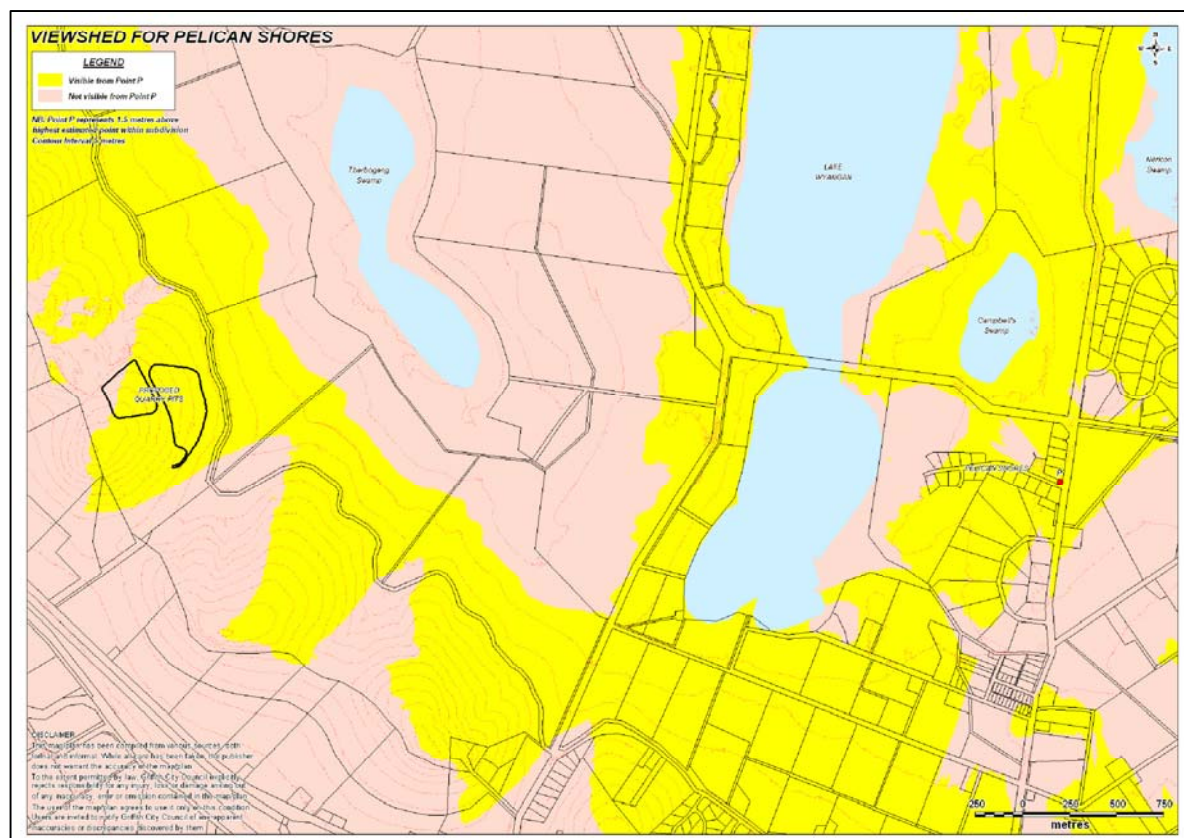
Figures G1 to G10 and the above interpretations support the findings of the EA that due to the topography the proposed development will be visible from many areas to the east. However, the figures also clearly show that the actual extent of the visual impact is small due to the intervening distance and the screening effect of vegetation.

Despite the above, Council is committed to minimise the visual impact of the proposed development and have included the following management and mitigation measures in their Statement of Commitments (**Appendix E** of the Response to Submissions). These include the design and operation of the quarries and landfill, vegetation management on Lot 202 and controls on residential subdivision. Each of these measures is discussed in further detail below.



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approved	ML		project:	THARBOGANG QUARRY & LANDFILL	
date	02/02/10		title:	PHOTOGRAPHS - PELICAN SHORES	
scale	NTS		project no:	NSYSRHOD06029AA-D01	figure no: G5
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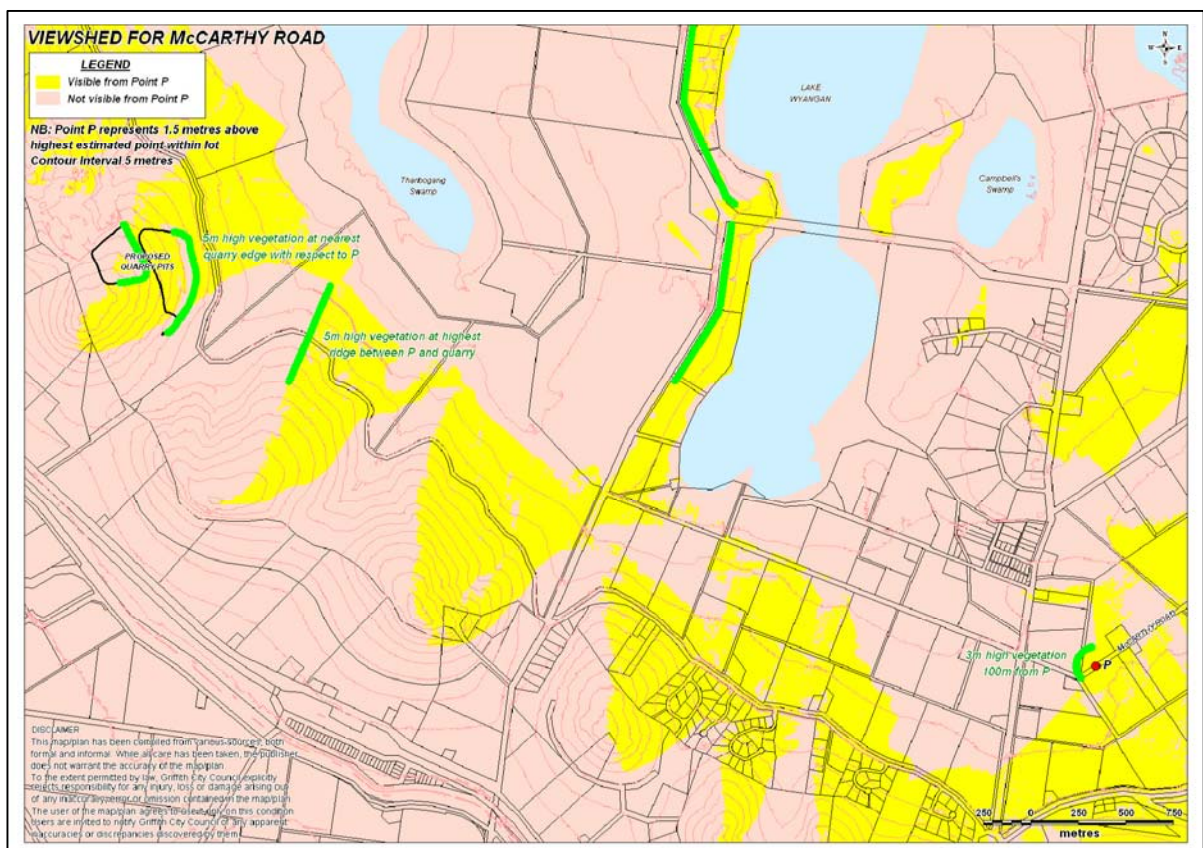
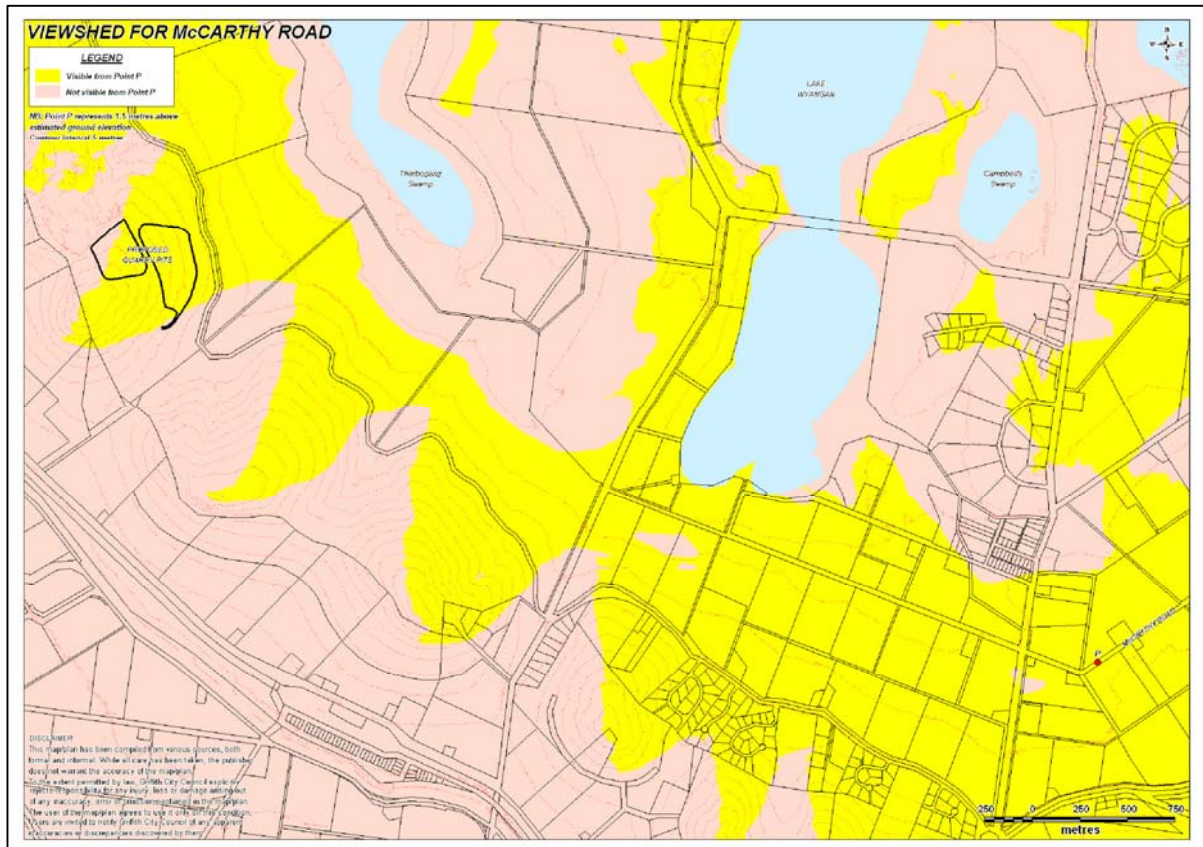


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approved			project:	THARBOGANG QUARRY AND LANDFILL	
date	17/02/2010		title:	VIEWSHED FOR PELICAN SHORES	
scale	AS SHOWN		project no:	NSYSRHOD06029AA	figure no:
original size	A4				G6

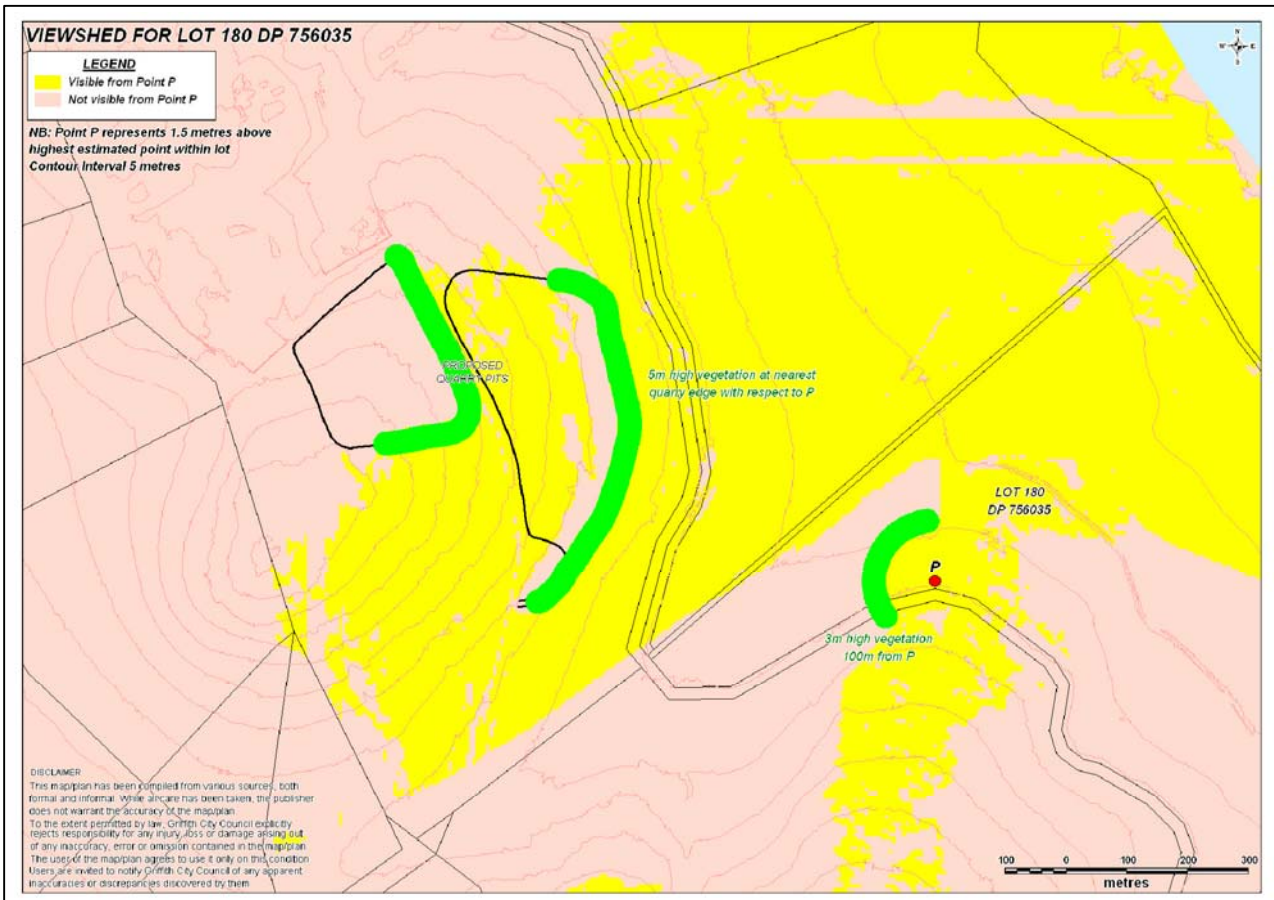
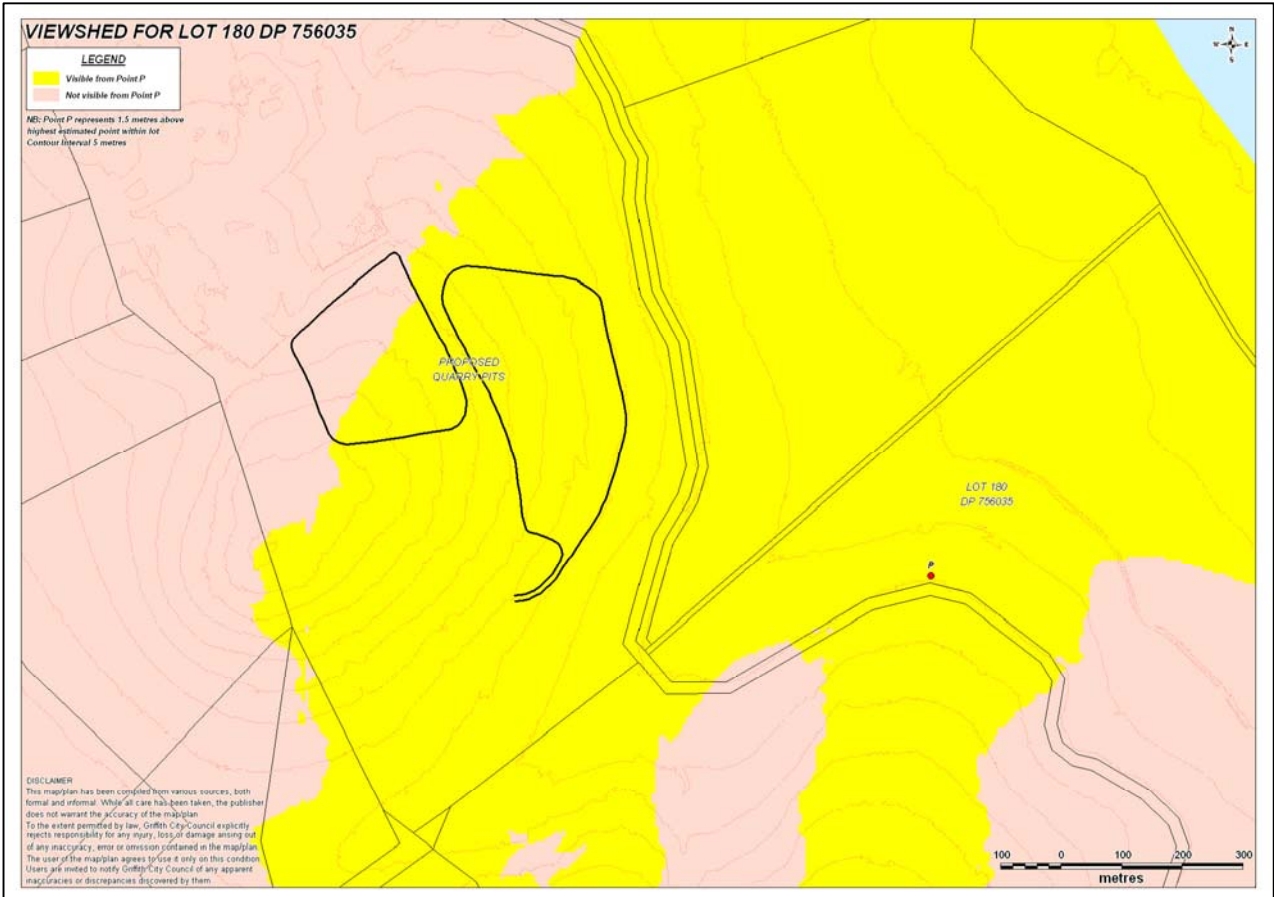
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scale	NTS		title: PHOTOGRAPHS - MCCARTHY		
date	02/02/10		project: THARBOGANG QUARRY & LANDFILL		
approved	ML		client: GRIFFITH CITY COUNCIL		
drawn	MV				

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approved			project:	THARBOGANG QUARRY AND LANDFILL	
date	17/02/2010		title:	VIEWSHED FOR McCARTHY ROAD	
scale	AS SHOWN		project no:	NSYSRHOD06029AA	figure no:
original size	A4				G8



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approved			project:	THARBOGANG QUARRY AND LANDFILL	
date	17/02/2010		title:	VIEWSHED FOR LOT 180 DP 756035	
scale	AS SHOWN		project no:	NSYSRHOD06029AA	figure no:
original size	A4				G10

Mitigation measure for the quarries

In terms of the design of pits 101 and 103, batters of 5 m height and with a slope no steeper than 1 horizontal to 3 vertical will be cut with 5 m wide benches between each batter. The benches will be backfilled with topsoil and progressively rehabilitated with native plant species that should ultimately reach sufficient height to screen the batters. Figure 19 of Appendix J of the EA illustrates how the mature vegetation will screen the pit faces.

Furthermore, in order to minimise the unnaturally straight / regular angles typical of quarries, fissures will be created to resemble the profile of the existing scarp along McPherson's Range. These fissures will be offset at each bench to minimise the risk of erosion and to reduce the formation of unnaturally straight vertical lines. Adoption of this more irregular profile will minimise the visual impact of the quarry (as well as provide habitat features and mimic the natural drainage patterns occurring in the scarp area).

Revegetation of the pit floor will further minimise the visual impact from certain locations. Even though the shallow soils are likely to limit the successful establishment of large tree species this is not of much consequence from a visual perspective as the floor of the quarries will not be visible except from limited areas on Lot 202.

Mitigation measures for the landfill

Closure and rehabilitation of the existing landfill will reduce the current visual impact and create a positive effect. However, to maintain the integrity of the capping layer, only shallow-rooted species will be allowed to establish and therefore the area will not blend fully into the surrounding woodland areas. A list of proposed species is provided in Appendix 6 of Appendix J of the EA.

The proposed landfill cells will be built up in the existing quarry. It is not possible to minimise the visual impact effectively until the landfill is ultimately closed. Upon closure, the visual impact will be reduced in a similar manner to that described above for the existing landfill.

Mitigation measures for the surrounding land

As part of the vegetation offset, Council has committed to maintain and where appropriate rehabilitate the native vegetation on Lot 202. This will serve to obscure much of the quarrying and landfilling activities from within and directly around the site. However, given the vertical extent of each pit (AHD 135 m to AHD 170 m) and the gentle topography, the vegetation immediately to the east of the sites will reduce the extent of the impact, but will not be able to screen the full extent of the landfill and pits effectively.

The facility will not operate at night and therefore there will be no impact from lighting. Furthermore, the visual impact of the flaring of landfill gas will be minimised by means of shielding.

Fencing of the site, effectively managing wind-blown litter (including regularly picking up any litter) and ensuring no water borne material leaves the site will ensure that the visual amenity value of Lot 202 and the adjoining properties to the east is not impacted.

Screening for new residential subdivisions

The viewshed diagrams show the effectiveness of existing vegetation or potential for strategic landscaping to minimise visual impacts. Accordingly, should Council consider rezoning land for residential purposes close to the proposed development where the quarry and landfill site is clearly visible, Council should ensure that adequate screening is included in any subdivision design. It is not intended that there would be any screening requirement for rural dwellings associated with farming, agricultural or horticultural development other than the normal landscaping consideration for any development application. Furthermore, given that Lake Wyangan is more than 4 kilometres distant from the quarry and landfill site, Council does not suggest that there is likely to be any impact on potential future residential zones close to Lake Wyangan.

**APPENDIX H - Supplementary Information on Groundwater
Impacts**

10 February 2010

Coffey Environments
3 Rider Boulevard
Rhodes NSW 2138

Attention: Mike Luger

Dear Mike

RE: Tharbogang Quarry and Landfill Expansion: Response to Submissions

As requested, we have reviewed the groundwater related issues raised in the letter from the Department of Planning dated 15 December 2009, as well as the issues raised by Len Mancini in his submission (inclusive of the initial review by Heggies dated 12 October 2009).

As highlighted in our report of 15 January 2008, groundwater flows and discharge areas in the vicinity of the site are uncertain due to the lack of data points. As a result of this uncertainty and despite the low recharge potential, depth to groundwater, low hydraulic conductivity, little evidence of leachate migration from the existing landfill operations, naturally poor water quality and distance to groundwater users, Coffey Geotechnics recommended a suite of measures to minimise the risk of groundwater contamination from the proposed landfill. These measures included:

- stormwater and surface water management to minimise water infiltration and contamination of runoff from the site; and
- a design incorporating a fully lined landfill with a double bottom liner, with cell drainage and leachate collection systems to isolate the landfill material from the underlying soils and effectively prevent any pathways for leachate to enter the groundwater

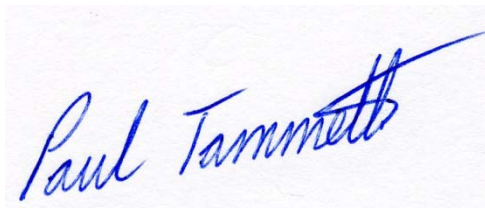
The landfill designed by Coffey Mining has incorporated these measures and provided engineering details in accordance with the NSW DECC Environmental Guidelines for Solid Waste Landfills. Lastly, Coffey Geotechnics recommended the installation of additional monitoring bores (including two to the west of the ridge) and implementation of a groundwater monitoring program, inclusive of a groundwater protection plan in the unlikely event that containment of the leachate fails. In agreeing to these recommendations, Griffith City Council has effectively engineered out any potential groundwater impacts and hence any further assessment or investigations are not required in order to inform a decision on the acceptability of the proposed landfill site.

While the Environmental Assessment deals with the impacts of the proposed rather than existing landfill, various issues concerning the existing landfill site have been raised.

We understand that some years ago leachate probably originating from the animal pits discharged into land to the east. Council subsequently retrofitted a surface water and leachate management system to the existing landfill site and have discontinued use of the animal pits. There have been no further reports of contamination. While the results of groundwater monitoring to date have shown no evidence of leachate contamination of the groundwater, there is a risk of groundwater pollution from past activities that could potentially be detrimental to groundwater users and the environment.

Therefore it is important that the monitoring and groundwater protection plan outlined above for the proposed landfill site is extended in order to manage the risks associated with the existing landfill operations.

For and on behalf of Coffey Geotechnics Pty Ltd

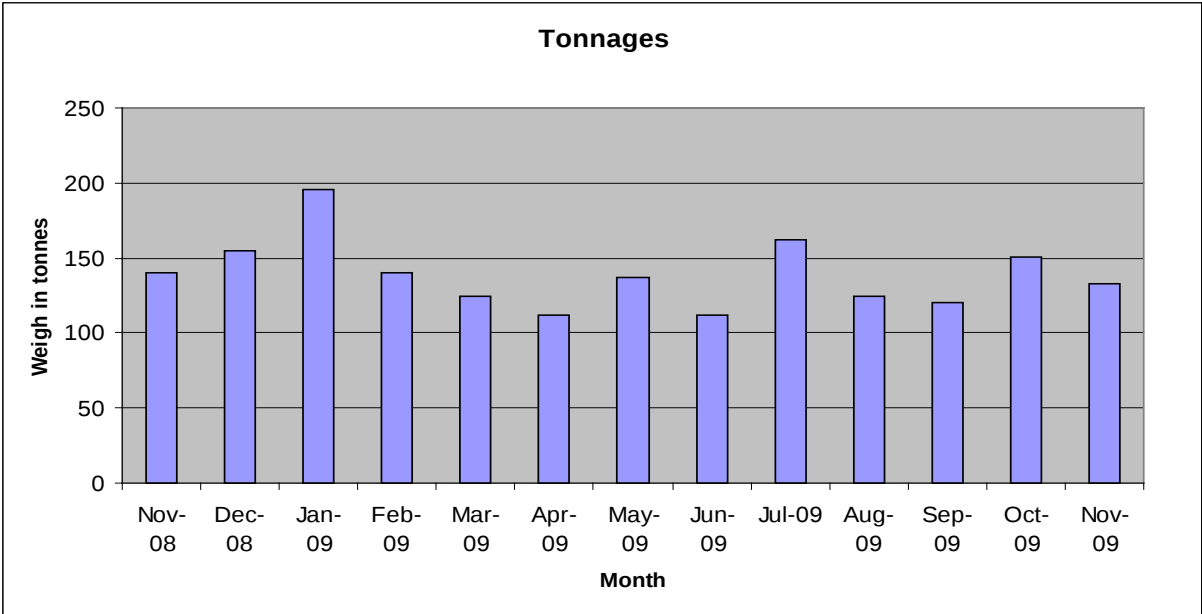
A handwritten signature in blue ink, reading "Paul Tammetta", with a stylized flourish at the end.

Paul Tammetta

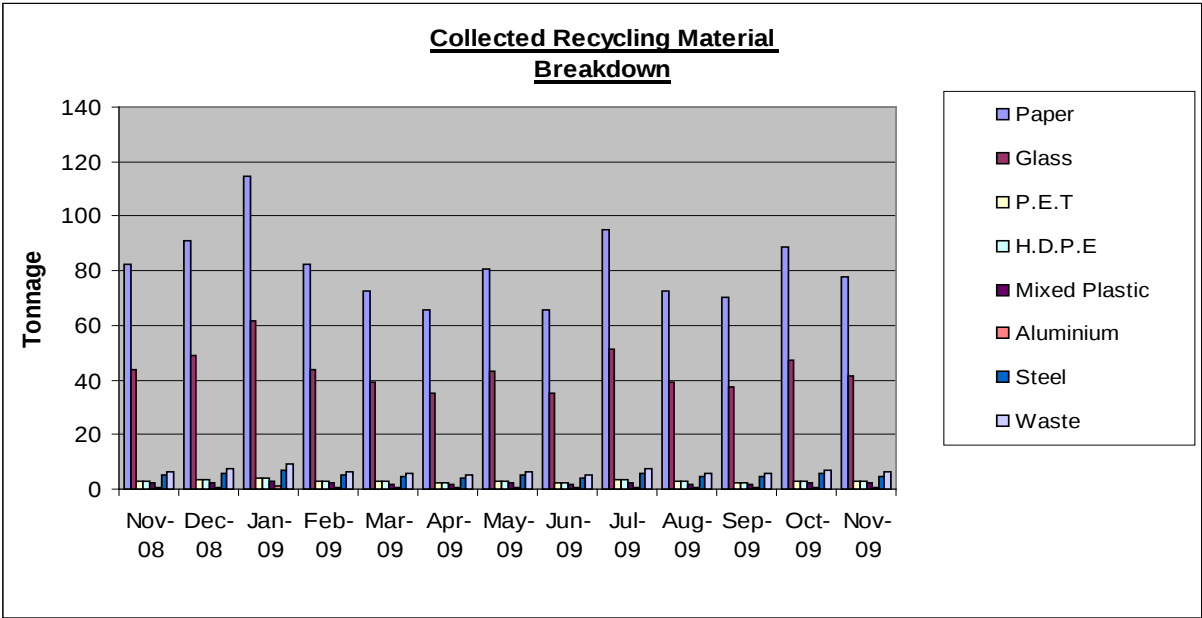
Associate Hydrogeologist

APPENDIX I - Recycling and Waste Data

RECYCLING AND WASTE DATA



Graph 1 twelve month brake down of recycling material collected.



Graph 2 individual recycling material breakdown.

Tharbogang Quarry and Landfill – Response to Submissions

2009 Weigh Bridge Data	
Product	Tonnage
ASBESTOS	98
BULKY WASTE	92
CAR BODIES	8
CAR TYRES	138
CLEAN FILL	7076
CLEAN UP AUSTRALIA	4
CONCRETE & BRICKS	583
DOMESTIC & MIXED WASTE- B.TRAILER/L.TRUCK	102
DOMESTIC AND MIXED WASTE	6675
DPI GREEN WASTE	3
GCC ASBESTOS	1
GCC CAR TYRES	88
GCC COMMERCIAL WASTE	1854
GCC CONCRETE & BRICKS	1454
GCC DOMESTIC & MIXED WASTE	6794
GCC GREEN WASTE	513
GCC HORSE OR COW	4
GCC LIGHT EARTHMOVER TYRES	2
GCC LIGHT TRUCK TYRES	1
GCC SHEEP LARGE DOG GOAT	443
GCC SMALL DOG OR CAT	337
GCC STEEL & METALS	21
GRAVEL -20	4034
GRAVEL-40	33058
GREEN WASTE	1202
HEAVY TRUCK TYRES	9
HORSE & COW	2
LARGE EARTHMOVER TYRES	1
LIGHT TRUCK TYRES	22
PRIVATE ST SWEEPER WASTE	10
PUTRESCIBLE WASTE	24
RECYCLED STEEL	192
RECYCLED/ HEAVY CONCRETE	53
RECYCLED/LIGHT CONCRETE	11
RECYCLED/UNRFED CONCRETE	633
REFRIGERATOR	21
ROADSIDE LITTER	2
SHEEP LARGE DOG GOAT	46
SMALL DOG / CAT	61
STEEL & METALS	17
STORM WATER SEDIMENT	0
STREET SWEEPER DOMESTIC WASTE.	3782
X CHARITY DOMESTIC WASTE	139

Table 1: 2009 breakdown of waste entering Tharbogang Waste Management Centre and associated tonnes (rounded to nearest whole number)