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ABN: 26 131 659 339

Orchard Hills Waste and Resource Management Facility

Traffic and Parking Assessment

Prepared by:

Traffic Solutions Pty Ltd

February 2010

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Traffic and Parking Assessment

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1. INTRODUCTION

This report has been prepared to accompany an Application to the Department of Planning for a proposed Waste and Resource Management Facility at 123-179 Patons Lane, Orchard Hills (**Figure 1**).

The proposed facility would incorporate a waste recycling, reprocessing plant and ancillary waste emplacement capable of accepting general solid waste (non-putrescible). It is also intended to continue to extract clay/shale throughout the life of the project to satisfy available markets and to create additional airspace for waste emplacement. Access to the site would be via Patons Lane, off Luddenham Road.

The proposal is a major project and as such requires the preparation of an *Environmental Assessment*. The Department of Planning requires the following Traffic and Transport requirements to be addressed.

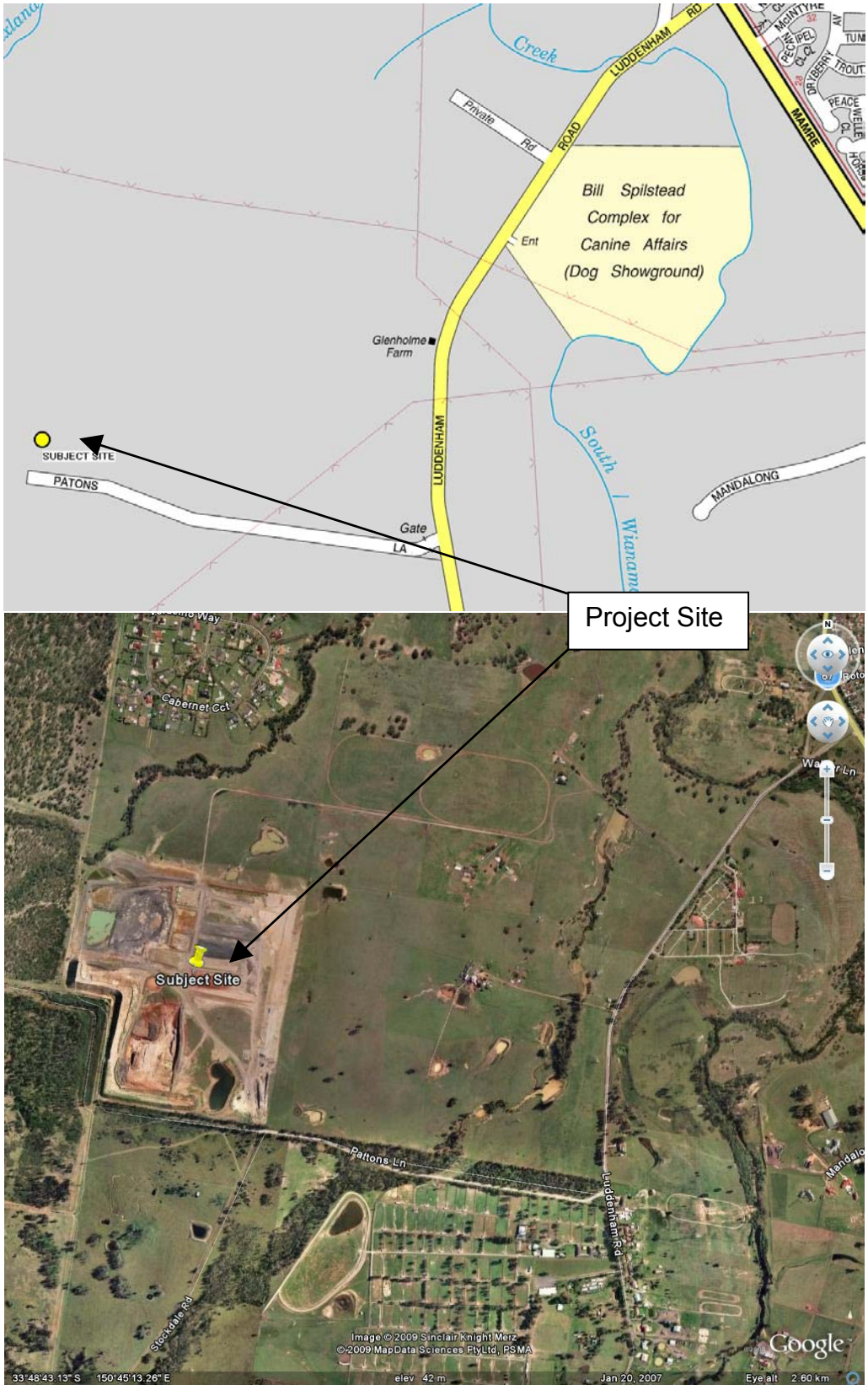
1. Accurate predictions of the traffic volumes likely to be generated during construction and operation.
2. A detailed assessment of the potential impacts of this traffic on the capacity, efficiency and safety of the surrounding road network, including modelling of the intersections at Luddenham Road/Patons Lane and Luddenham Road/Mamre Road.
3. Details of any proposed road upgrade works and the measures that would be implemented to ensure that the relevant road network is appropriately maintained during the life of the project.
4. Details of the proposed access and parking arrangements on site.

The Roads and Traffic Authority (RTA) were contacted to ascertain any special requirements to be addressed in the Traffic assessment component of the *Environmental Assessment*. The RTA sought the following to be addressed.

1. Daily and peak traffic movements (classified) likely to be generated by the proposed development including the impact on nearby intersections and the need/associated funding for upgrading or road improvement works (if required).

   The key intersections to be examined / modelled include:

   - Luddenham Road / Patons Lane; and
   - Luddenham Road / Mamre Road.
2. Details of heavy vehicle movements including vehicle types, frequency and anticipated routes on the major arterial and local road network.
3. An assessment of the potential increase in toxicity levels of loads transported on arterial and local roads to/from the site and consequently, the preparation of an incident management strategy for crashes involving such loads, if relevant.
4. Implementation of appropriate measures to ensure the 'tracking" of material onto arterial roads is minimised.



LOCATION

Fig 1

5. Details of the proposed accesses and parking provisions associated with the proposed development including compliance with the requirements of the DCP and relevant Australian Standards (i.e.: turn paths, sight distance requirements, aisle widths, etc).

A copy of the Department of Planning and RTA letters is attached as **Appendix A.**

To that end, this document examines the implications of the project and will assess the:

1. potential traffic generation;
2. impacts of the estimated traffic generation on the existing road network; and
3. proposed truck access driveway location and suitability.

2. PROPOSED DEVELOPMENT

2.1 The Project Site

The Waste and Resource Management Facility is proposed on a 60ha site formerly known as Erskine Park Quarry and is described as Lot 40 in DP 738126. This land is referred to throughout this report as the "Project Site" (see **Figure 1**).

2.2 Project Overview

The principal activities of the project would include the following.

- Erection and operation of the waste recycling and re-processing facility.
- Development and operation of staged waste emplacement cells to contain all residual wastes from the recycling facility, other imported wastes (unable to be reprocessed) and selected construction and demolition wastes recovered from sections of the on-site perimeter bund walls.
- Refurbishment of the former weighbridge and offices together with the construction of a range of on-site infrastructure including a truck wheel wash and water management structures.
- Ongoing clay/shale extraction (subject to market demand) to recover light-firing shale for use by the brick industry and other clay/shale materials for off-site construction projects and as optimal cover material for the on-site waste emplacement and final capping.

In addition, Patons Lane is proposed to be reconstructed in accordance with a previous development consent and construction certificate. The approved road design plans for Patons Lane would provide a sealed roadway with a single lane in each direction.

The facility would have the capacity to receive an average of approximately 300 000 tonnes per annum of general solid waste (non-putrescible) generated predominantly in the Sydney Metropolitan Area. It is expected, however, that the volume of waste received would ramp up over several years, with the level 300 000 tonnes per annum of incoming wastes achieved by about Year 4 or 5. Allowance has also been made for the receipt of a maximum of 600 000tpa of general solid waste to allow for peaks/large contract jobs. It is anticipated that the waste would consist predominantly of Construction and Demolition (C&D) waste (including low level contaminated soils) and Commercial and Industrial (C&I) waste. No wastes comprising putrescibles wastes would be received on site, however, it is acknowledged that small quantities of putrescibles material is contained in C&I waste. No liquid, hazardous or restricted wastes would be received on site. The site would not be open for waste receipts from the general public thereby providing considerable control over wastes received.

The Proponent's preliminary market evaluation suggests that, once the facility is fully operational, between approximately 50% and 67% of the waste received (150 000t per year / 200 000t per year on average) on site would be suited to recycling and/or re-processing with the remaining 50% of the waste received for emplacement.

Table 2.1 provides the proposed hours of operation for all activities. It is noted that non-audible maintenance activities may need to be undertaken outside the nominated hours, 7 days per week.

Table 2.1
Proposed Hours of Operation

Activity	Monday to Friday	Saturday	Sunday
Site Establishment/Construction	7:00am to 6:00pm	8:00am to 5:00pm	-
Waste Receipts and Recycled Products Despatch	6:00am to 5:00pm	8:00am to 5:00pm	-
Clay/Shale Transportation	7:00am to 6:00pm	8:00am to 5:00pm	-
Extraction Activities	7:00am to 6:00pm	8:00am to 5:00pm	-
Waste Re-processing	7:00am to 6:00pm	8:00am to 5:00pm	-
Waste Emplacement Management	7:00am to 6:00pm	8:00am to 5:00pm	-

The life of the facility would be approximately 25 - 30 years.

During the site establishment period, a range of equipment would travel to and from the Project Site. The principal vehicle types would be as follows.

- Low loaders delivering earthmoving equipment (up to 2 loads/4 movements per day for up to 5 days during the site establishment period).
- Table-top trucks or tankers delivering parts/equipment/fuel/drainage material for use on site (up to 4 loads/8 movements per day for 25 days during the site establishment period).
- Tri-axle truck and dog trailers for use in transporting clay/shale from the site for brick manufacture or for the construction industry (up to 20 loads/40 movements per day throughout the entire site establishment period).
- Light vehicles used by employees, couriers and visitors (up to 25 return vehicle trips or 50 movements per day).

After approximately 3 years, it is expected that full operation would be achieved (i.e. average of 300,000t per annum and a maximum of 600 000t per annum). Trucks transporting waste to the Project Site would typically range from two axle rigid trucks including covered open bin vehicles (roll on/roll off) and compactor vehicles, truck and dog trailers, six axle semi-trailers and B-doubles.

Trucks transporting clay/shale from the Project Site would invariably be truck and dog trailers. Back loading would be undertaken, wherever possible. Annual dispatches of clay/shale may vary from 200 000t to 400 000t.

The estimated average 100 000t per annum of products produced from the recycling/re-processing plant would be despatched from site, with an estimated 20% despatched as backloads, using truck and dog trailers. Depending on the wastes received, recycled re-processed product despatch could increase to approximately 160 000t per annum.

The number of light vehicles travelling to and from the Project Site daily has been estimated by the Proponent as typically between 20 and 30 or generating between 40 and 60 light vehicle movements including staff which has been estimated at approximately 20.

B-doubles not currently permitted on Luddenham Road and Patons Lane, however, the Proponent intends to lodge an application for approval to operate B-doubles to the RTA for consideration. Until such time as an approval is issued, the maximum size vehicles permitted would be restricted to 19m articulated vehicles.

Vehicle access is proposed directly onto Patons Lane and ample areas are provided for staff and truck parking on site.

Patons Lane is a public road, however it is fitted with a locked gate near its intersection with Luddenham Road with the agreement of all five adjoining landowners. This status would remain after reconstruction and throughout the life of the Project.

Vehicular access from the Project Site onto Patons Lane would be via a 12.5m wide combined entry/exit driveway.

This report has been prepared utilising plans prepared by R. W. Corkery & Co. Pty Limited. Reduced figures of the proposed development are reproduced in **Appendix B** of this report.

All heavy vehicles would approach the Project Site via Mamre Road, Luddenham Road and Patons Lane. Vehicles travelling to/from the north would likely exit/enter Mamre Road from either the M4 Western Motorway or Great Western Highway. Vehicles travelling to/from the south would enter/exit Mamre Road from Elizabeth Drive and subsequently the Westlink M7.

Vehicles would not travel on local roads between the Project Site and the Western Motorway or Westlink M7 except when materials are being received from/delivered to those areas.

For planning purposes, the Proponent estimates that 80% of the truck movements to and from the Project Site would occur from Mamre Road northwards whilst the remainder of truck movements would occur from Mamre Road southwards.

3. EXISTING CONDITIONS

3.1 Road Hierarchy

Mamre Road is classified as a State Road under the RTA's *"Sydney and Surrounding State and Regional Roads plan – 1993"* and Luddenham Road is classified a Regional Road.

Patons Lane serves a local road function.

A review of the Authority's approved B-double routes plans reveals that Luddenham Road and Patons Lane are not approved B-double roads at present. In recognition of this, the Proponent intends to lodge an application for approval to operate B-doubles on the relevant sections of these roads to the RTA for consideration.

3.2 Traffic and Parking Controls

The main features of the existing traffic controls in the vicinity of the Project Site are as follows.

- Mamre Road and Luddenham Road generally have an 80 km/h speed limit in the vicinity of this area, however, Luddenham Road, reduces to 60 km/h in the vicinity of Patons Lane.
- The intersection of Mamre Road and Luddenham Road is controlled by seagull linemarking.
- The intersection of Luddenham Road and Patons Road has been reconstructed to provide a right turn treatment with a minor holding area in Luddenham Road for right-turning vehicles entering Patons Lane. Stop restrictions exist in Patons Lane at the intersection.
- Mamre Road and Luddenham Road generally have double white centre line marking, however, intermittent overtaking areas are provided.
- Patons Lane has double white centreline provided approaching its intersection with Luddenham Road.
- Mamre Road and Luddenham Road provide one lane in each direction in the vicinity of the Project Site.

There are no restrictions on parking in the vicinity of the Project Site.

3.3 Existing Traffic Flows

To determine the level of traffic activity in this area, data on the traffic movements in the vicinity of the Project Site have been collected by surveys undertaken by Curtis Traffic Surveys as part of this study from 6.30am – 9.30am and 3.00pm – 6.00pm on Tuesday 16 June 2009 at the intersections of:

- Mamre Road and Luddenham Road, Orchard Hills; and
- Luddenham Road and Patons Lane, Orchard Hills.

The detailed results of the surveys are attached as **Appendix C**. The peak hour flows at the survey locations is depicted on **Figure 2 and 3** on the following pages.

A closer review of the intersection count at Luddenham Road and Patons Lane during the morning and evening peak hours revealed greater detail on the existing peak hour heavy vehicle trips. The recorded peak hour car and truck flows in Luddenham Road (near Patons Lane) during the peak hours are as set out in **Table 3.1**.

Table 3.1
Luddenham Road Peak Hour Vehicle Volume, Direction and Classification

Peak Hour	Northbound		Southbound		Total
	Cars	Trucks (>3t)	Cars	Trucks (>3t)	
AM Peak hour 7.30am – 8.30am	207	5	60	3	275
PM Peak hour 3.15pm – 4.15pm	102	5	178	16	301

The existing heavy vehicle volumes represent 2.9% and 6.9% in the morning and evening peak hours respectively.

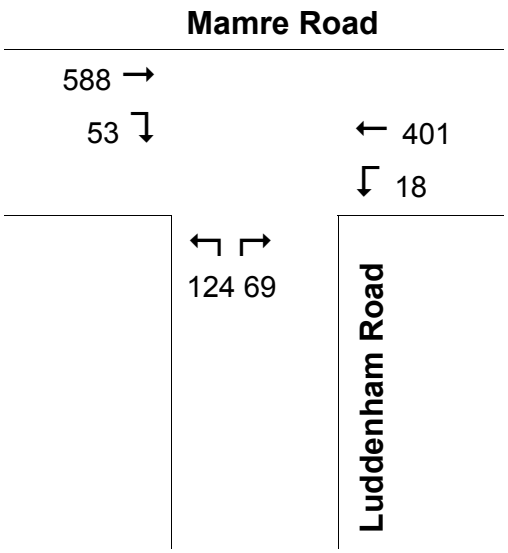
In addition, tube counters were placed on Luddenham Road north of Patons Lane (at the 60 km/h sign at No. 182 Luddenham Road) from the 18th to the 25th June 2009. The tube surveys have recorded every vehicle travelling along Luddenham Road over 24hrs over the whole week. The automatic counter recorded the number of vehicles in each direction, speed and classification of all vehicles. The key data collected is set out in **Table 3.2**.

Table 3.2
Luddenham Road Tube Count Traffic Volume Data

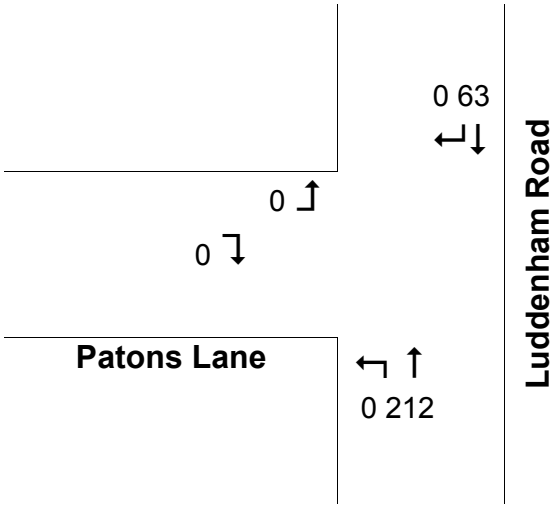
Location	AADT	Average Weekday peak hours		85th % speed	% of heavy vehicles
		AM	PM		
Northbound	1554	258 7.00am – 8.00am	310 5.00pm– 6.00pm	84 km/h	5%
Southbound	1608			88 km/h	5%
Total	3162			84 km/h	5%

It is apparent from the Road Hierarchy that Luddenham Road serves an important link, however, the overall traffic flows are considered low.

Peak Hour
7.30am – 8.30am

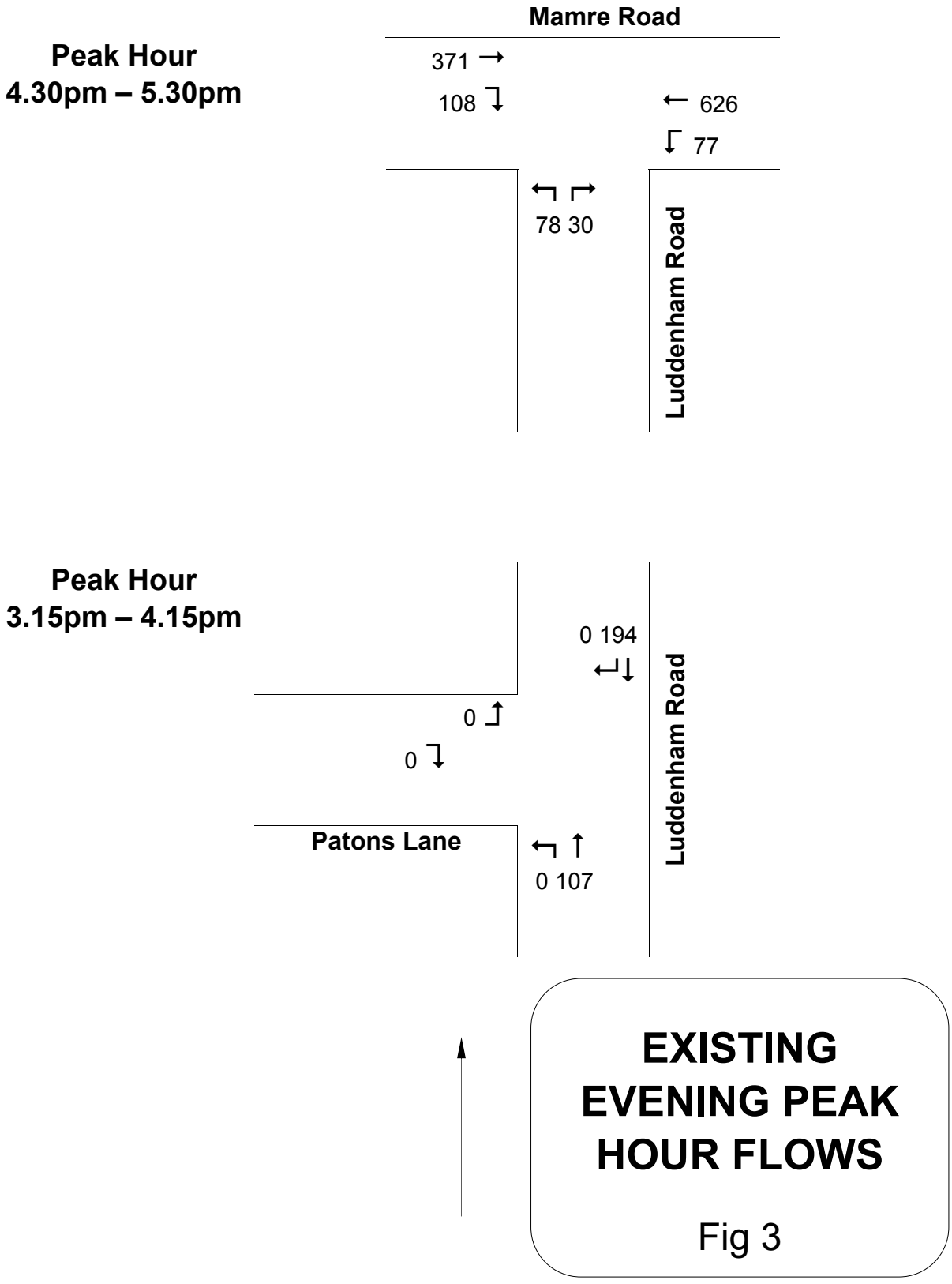


Peak Hour
7.30am – 8.30am



EXISTING MORNING PEAK HOUR FLOWS

Fig 2



EXISTING EVENING PEAK HOUR FLOWS

Fig 3

An indication of the growth of traffic volumes on Luddenham and Mamre Roads in the vicinity of the Project Site are provided by the RTA publication *'Traffic Volume Data 2002, Sydney Region – volume 1'*. This document provides a daily volume for Mamre and Luddenham Roads at the Sydney Water Supply pipeline since 1993 (combined direction) which provides details of traffic volume trends at this location. Details of traffic volumes at this location since 1993 are set out in **Table 3.3**.

Table 3.3
Daily traffic flows

Year	AADT	
	Luddenham Road	Mamre Road
1993	2017	9676
1996	2085	10859
1999	2524	12153
2002	2586	12446
2005	2977	14074

This data reveals that the traffic volumes on Luddenham Road have increased by 15% (5% p.a average) in the most recent 3 year period up to 2005 and Mamre Road has increased by 13.1% (4.36% p.a. average) during the most recent 3 year period.

Accordingly, to assess the impact of the proposed waste and resource management facility when at full production in 3 years the flows along Mamre Road and Luddenham Road in the peak hours would be increased by 15% and 13.1% (respectively) or 3 years growth in the intersection modelling for the post development scenario.

3.4 Midblock Roadway Capacity

With regards to the capacity of rural roads the RTA's 'Guide to Traffic Generating Developments, Section 4.2.4. Table 4.5 is reproduced in **Table 3.4**.

Table 3.4
Two way peak hour flow on two-way rural roads (veh/hr), 100km/h

Terrain	Level of Service	Percent of heavy vehicles			
		0	5	10	15
Level	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290
Rolling	B	500	420	360	310
	C	920	760	650	570
	D	1370	1140	970	700
	E	2420	2000	1720	1510
Mountainous	B	340	230	180	150
	C	600	410	320	260
	D	1050	680	500	400
	E	2160	1400	1040	820

The table assumes the following criteria.

- Terrain level with 20% no overtaking.
- Rolling with 40% no overtaking.
- Mountainous with 60% no overtaking.
- 3.7 m traffic lane width with side clearances of at least 2m.
- 60/40 directional split of traffic.

Using this table, the existing operation of Luddenham Road with 301 vehicles in the peak hours and 5% heavy vehicles operates at a very good level of service 'A'.

3.5 Existing Intersection Operation

Figures 2 and 3 depict the existing traffic flows at the intersections of Luddenham Road with Mamre Road and Patons Lane.

Using INTANAL 2008 a software programme developed by Sims Varley Traffic Systems Pty Ltd for the purpose of analysing signalised, roundabout and sign controlled intersections, the existing operation of these intersections has been assessed. The following tables are the results of the intersection modelling and a copy of the INTANAL output files are attached as **Appendix D**. A brief guide on evaluating the results of INTANAL analysis is reproduced in the following pages.

Table 3.5
Mamre Road and Luddenham Road, Orchard Hills
(Give Way control seagull intersection)

	Existing	
	AM	**PM**
Level of Service	B	B
Degree of Saturation	0.24	0.18
Total Average Delay (sec/veh)	12.2s	11.0s
Average delay for right turn from Luddenham Rd	15.2s	17.2s

The results of the modelling reveal that the intersections of Mamre Road and Luddenham Road currently operate at a good level of service with minimal delays and spare capacity.

As the intersection count at Luddenham Road and Patons Lane recorded no vehicles turning into or out of Patons Lane no modelling has been undertaken. With no turning vehicles no delays to any movements could be modelled.

4. KEY ISSUES

4.1 Vehicle Access and Parking

Vehicular access to the proposed development is via the existing 10m wide gate off Patons Lane. The approved reconstruction of Patons Lane would not proceed westward beyond the entrance to the Project Site. However, in the unlikely event Patons Lane is extended in the future beyond the entrance to the Project Site, a site inspection revealed that the driveway would access Paton Lane at grade and sight lines would easily exceed the Australian Standard requirements AS 2890.1 and 2.

Geometric design requirements for car park layouts are specified in the '*Australian/New Zealand Standards, Parking Facilities Part 1; Off Street Car Parking (AS/NZS 2890.1)* of 2004. This standard classifies this development as a Class 1A off-street car parking facility requiring a category 1 driveway. Given that this site has a total area of 60 hectares, ample area would be available for parking of cars and compliance with this standard can be achieved. Most cars would be parked adjacent to the re-furbished office.

In addition to the standards for off-street car parking, the Australian Standards, AS 2890.2:2002 provides the design requirements for varying size heavy vehicles. In this regard, the maximum vehicle to be catered for on site is the 26m B-double. This standard suggests that the minimum driveway width for articulated vehicles should be 12.5m. Application of the AUSTROADS 26m B-Double turning path indicates that the existing 10m wide gate off Patons Lane can easily cater for one B-double at a time and increasing the gate width to 12.5m would enable two heavy vehicles to pass simultaneously. It is understood the Proponent would widen the gate width to 12.5m following the receipt of confirmation from the RTA that the sections of Luddenham Road and Patons Land are approved to carry B-doubles.

Accordingly, with the widened driveway this Project adheres to the above Australian Standard requirements.

Penrith City Council's "*Penrith Development Control Plan 2006 – Part 2 Section 2.11 Car Parking"* has no requirements applicable to this Project. The Proponent estimates 20 full time staff and up to 10 part time staff, however, given the size of the site, ample area is available to cater for the parking of staff cars and contractors trucks as required.

4.2 Estimated Project-Related Traffic Generation of Proposal

The estimated traffic generation by the Project can be calculated using the information provided by the Proponent in Section 2 of this report.

During site establishment, it is expected that approximately 102 vehicle trips per day could be expected during, the initial 6 months (see Section 2). Given this breakdown, it is estimated that during the peak hours approximately 30 vehicle trips could be generated in the morning and evening peak hours respectively (27 in and 3 out in the morning and reverse in the evening).

During full operation, the Proponent has provided the following heavy scenarios and light vehicle numbers to assist in estimating the number of vehicle movements associated with the Project.

Waste Receipts

Heavy vehicles transporting waste to the Project Site would typically range from two axle rigid trucks including covered open bin vehicles (roll on/roll off) and compactor vehicles, truck and dog trailers, six axle semi-trailers and B-doubles. For the purposes of the assessments of impacts of heavy vehicles delivering waste to the Project Site, four levels of waste deliveries are proposed which, based on an average load of 20 tonnes, would generate the heavy vehicle movements listed in **Table 4.1**.

Table 4.1
Average Daily Heavy Vehicle Movements for Waste Deliveries

Scenario	Annual Waste Deliveries	Average Daily Deliveries	Average Daily Heavy Vehicle Movements*
1	200 000t	740t	74
2	300 000t	1090t	110
3	450 000t	1640t	164
4	600 000t	2180t	220
* Assumes receipts on Saturday = 50% weekday quantities			

Clay/shale Despatch

Trucks transporting clay/shale from the Project Site would invariably be truck and dog trailers carrying an average 30t load. For the purposes of the assessments of impacts of heavy vehicles transporting clay/shale from the Project Site, three production levels are proposed which, based on an average load of 30 tonnes, would generate the heavy vehicle movements listed in **Table 4.2**.

Table 4.2
Average Daily Heavy Vehicle Movements for Clay/shale Despatch

Scenario	Annual Clay/shale Despatched	Average Daily Clay/shale Despatched	Average Daily Heavy Vehicle Movements#
1	200 000t	800t	54
2	300 000t	1200t	80
3	400 000t	1600t	108
# Assumes clay/shale despatched Mondays to Fridays only			

Recycled/Re-processed Product Despatch

The products produced by the recycling and re-processing plant would be despatched from site, with a small proportion as backloads in heavy vehicles carrying an average 25t load. For assessment purposes, it is estimated approximately 20% of the recycled products are backloaded and four production levels are considered. The production levels and their corresponding average daily movements are listed in **Table 4.3**.

Table 4.3
Average Daily Heavy Vehicle Movements for Product Despatch

Scenario	Recycled/Re-processed Products Despatched	Average Daily quantity Despatched	Average Daily Movements[#]
1	80 000t	290	20
2	120 000t	440	30
3	150 000t	545	38
4	160 000t	580	40
[#] Assumes products despatched on Saturday = 50% weekday quantities			

Cumulative Heavy Vehicle Traffic Movement

In order to establish a realistic cap to place on overall heavy vehicle traffic levels, the operational scenarios listed in **Tables 4.1** to **4.3** and their heavy vehicle movements were considered collectively for each scenario. **Table 4.4** lists four cumulative scenarios.

Table 4.4
Heavy Vehicle Transport Scenarios

	Waste Deliveries		Clay/Shale Despatched		Recycled / Re-processed Products Despatched		Total Truck Movements
Scenario	Quantity (tpa)	Av. Daily Movements	Quantity (tpa)	Av. Daily Movements	Quantity (tpa)	Av. Daily Movements	
1	600 000	220	nil	nil	150 000	38	258
2	450 000	164	200 000	54	160 000	40	258
3	300 000	110	300 000	80	120 000	30	220
4	200 000	74	400 000	108	80 000	20	202

Based on the scenarios listed in **Table 4.4**, the maximum average heavy vehicle movements for deliveries of wastes to the Project Site or clay/shale and recycled/re-processed products from the Project Site would vary from 180 to 258 per day (90 to 129 loads). In reality, whilst these scenarios are based on average levels, above average traffic levels would occur, not necessarily for all three materials on the one day. It is therefore proposed to set a maximum number of heavy vehicle movements at a level of 15% above the average level for Scenario 1 in **Table 4.4**, ie. 296 movements or 148 loads per day.

During the operational life of the facility, there would be periods at the start and finish of each extraction campaign where low loaders would be used to deliver/remove earthmoving equipment. Other trucks likely to travel to and from the Project Site during operational periods include those delivering fuel, tyres, gravel for leachate drainage, leachate piping, etc. For the purpose of predicting traffic-related impacts, it is anticipated these other trucks would generate up to 10 additional truck loads or 20 additional heavy vehicle movements, Monday to Saturday. Hence, the maximum daily heavy vehicle movements would be 316.

The number of light vehicles travelling to and from the Project Site daily would typically vary between 20 and 30 or generating between 40 and 60 light vehicle movements. These movements would be concentrated at the beginning and end of each operational day. Typically, morning and afternoon light vehicle levels would be between 10 and 15 with the remainder spread throughout the remainder of the day.

Therefore the total daily traffic generation of the site when fully operating is estimated as 316 vehicle trips. Based upon an 11 hour working day this equates as an average of 29 heavy vehicle trips per hour.

The number of light vehicles travelling to and from the Project Site daily has been estimated by the Proponent as typically between 25 and 30 or generating between 40 and 60 light vehicle movements including staff. These movements would be concentrated at the beginning and end of each operational day. Typically, morning and afternoon light vehicle levels would be between 10 and 15 with the remainder spread throughout the remainder of the day.

For the purpose of this assessment, the full production scenario would be used which includes staff to assess a worse case scenario assuming that 80% light/staff vehicles and 50% of the heavy vehicles would approach site in the morning peak and that this situation would reverse in the evening peak hour. (i.e. 12 cars and 15 trucks approach plus 3 cars and 14 trucks depart the site in the morning peak and vice versa in the evening peak hour).

It can be seen from the potential traffic generation that the initial establishment period would be lower than that of a full operation.

4.3 Impact on Midblock Capacity

As outlined in Section 3.4, the existing operation of Luddenham Road with up to 301 vehicles (including 5% heavy vehicles) in the peak hours would operate at a very good level of service 'A'.

The existing heavy vehicle volumes represent 2.9% and 6.9% in the morning and evening peak hours respectively. **Table 4.5** provides a comparison between the existing and potential flows along Luddenham Road with an additional 29 heavy vehicle trips and 15 light vehicle trips in the peak hours.

Table 4.5
Luddenham Road peak hour vehicle volume, direction and classification

Peak Hour	Existing			Post Development		
	Cars	Trucks (>3t)	Total	Cars	Trucks (>3t)	Total
AM Peak hour 7.30am – 8.30am	267	8	275	282	37	319
PM Peak hour 3.15pm – 4.15pm	280	21	301	295	50	345

The post development heavy vehicle volumes would represent 11.6% and 14.5% in the morning and evening peak hours respectively.

Using the data in **Table 4.5**, the post development operation of Luddenham Lane with up to 345 vehicles in the peak hours and 14.5% heavy vehicles would still fall into the very good level of service 'A' category and is therefore considered satisfactory.

4.4 Impact upon Key Intersections

For the purposes of this assessment, the 44 estimated morning and evening peak hour approach and departure vehicle trips (as calculated in Section 4.2) have been assigned proportionally to the adjacent road system on basis of existing flows at Mamre Road assuming 80% of approaching and departing truck traffic travels to/from the M4 Motorway and no truck traffic travels south along Luddenham Road. **Figures 4** and **5** depict the potential additional morning and afternoon peak hour traffic volumes for the intersections based upon the forecast flows.

As noted in Section 3.3 (**Table 3.3**) of this report, the traffic volumes on Luddenham Road have increased by 15% (5% p.a average) in the most recent 3 year period up to 2005 and Mamre Road has increased by 13.1% (4.36% p.a. average) during the most recent 3 year period.

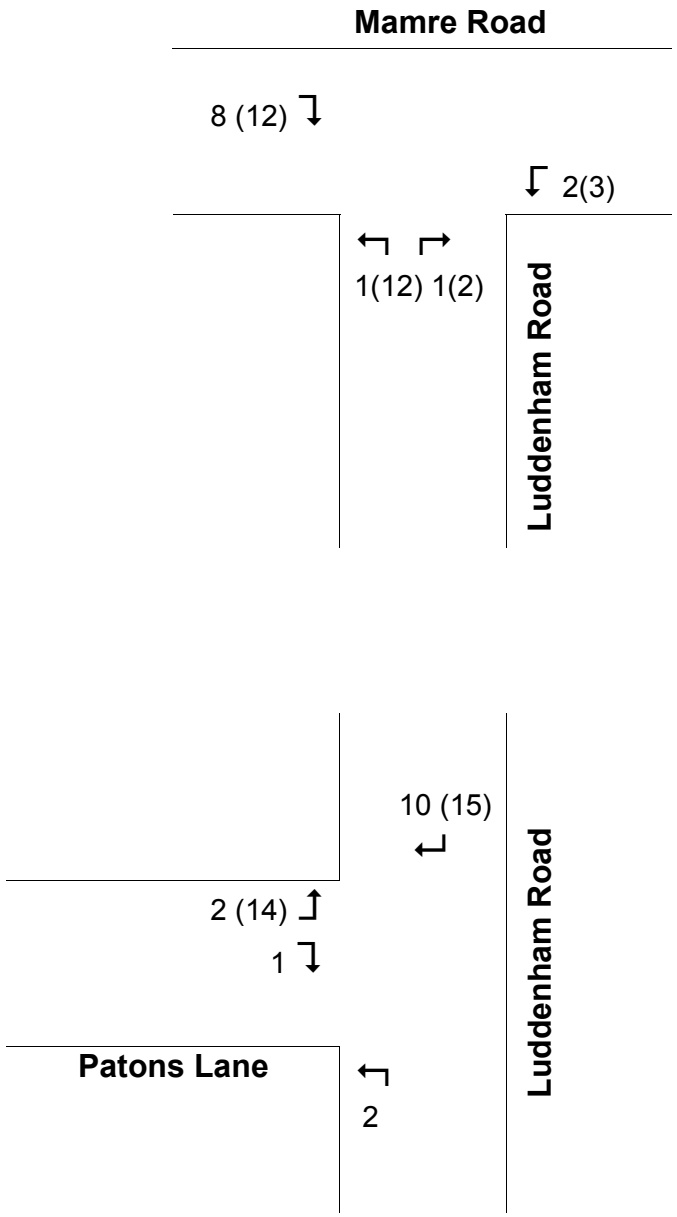
Accordingly, to assess the impact of the proposed waste and resource management facility when at full production in 3 years, the flows along Mamre Road and Luddenham Road in the peak hours would be increased by 15% and 13.1% (respectively) or 3 years growth in the intersection modelling for the post development scenario.

A comparison of intersection performance between the existing and projected traffic demands during the morning and evening peak hours upon the intersections Luddenham Road with Mamre Road and Patons Lane has been conducted. **Table 4.6** presents the results of the intersection modelling.

Table 4.6
Intersection Modelling Results

	Mamre Road and Luddenham Road, Orchard Hills (Give Way control seagull intersection)			
	Existing		**Proposed**	
	AM	**PM**	**AM**	**PM**
Level of Service	B	B	B	B
Degree of Saturation	0.24	0.18	0.32	0.34
Total Average Delay (sec/veh)	12.2	11.4	13.2	13.5

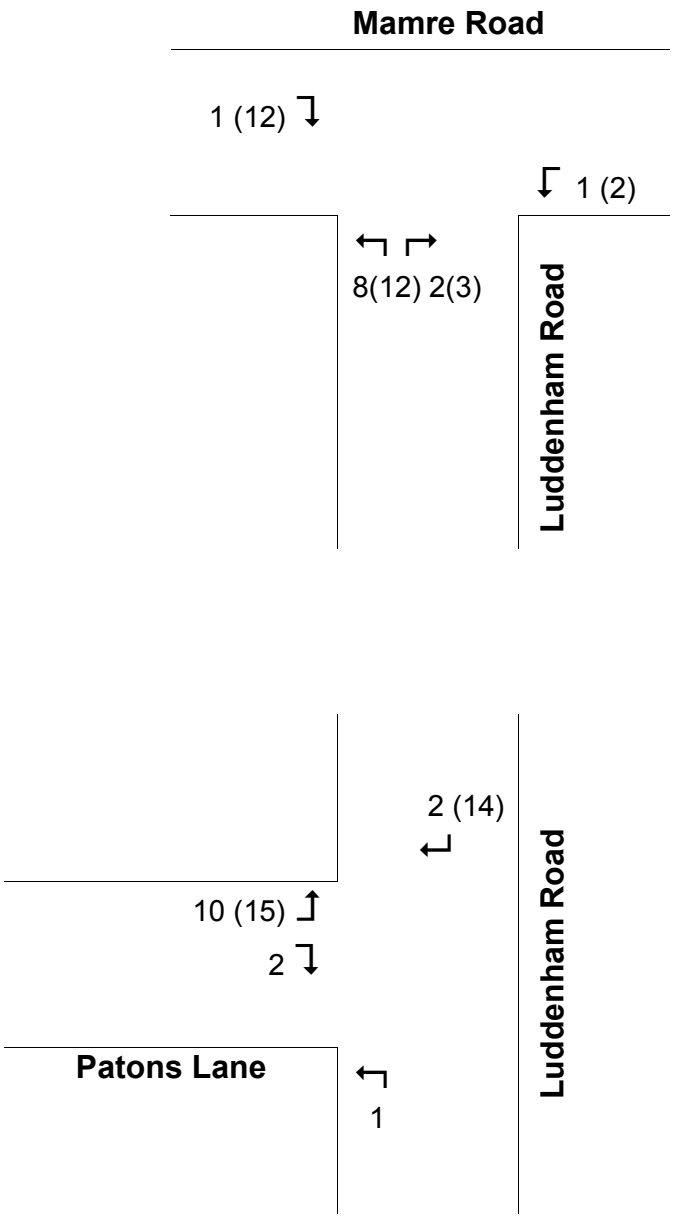
	Luddenham Road and Patons Lane, Orchard Hills (Stop sign control)			
	Existing		**Proposed**	
	AM	**PM**	**AM**	**PM**
Level of Service	A	A	A	A
Degree of Saturation	0.0	0.0	0.04	0.08
Total Average Delay (sec/veh)	0.0	0.0	5.8	5.5



Cars (trucks)

POTENTIAL ADDITIONAL MORNING PEAK HOUR FLOWS

Fig 4



Cars (trucks)

POTENTIAL ADDITIONAL EVENING PEAK HOUR FLOWS

Fig 5

The results of the modelling reveal that the:

- good Level of Service at the intersections modelled would not change with the estimated additional Project-related traffic generation;
- the additional traffic demand on the intersections modelled as a consequence of the proposed development would only alter the Degree of Saturation and Total Average Delays minutely; and
- the proposed driveway would operate at a very good level of service with minimal delays.

4.5 Heavy Vehicle Manoeuvring

As stated previously, Patons Lane is currently not an approved B-Double route. Accordingly, the maximum vehicle to be catered for on site is currently a 19m articulated vehicle. However, the proponent is proposing to prepare a 26m B-Double route assessment application under separate cover.

To determine if this size vehicle can access the Project Site AUSTROADS B-Double turning template has been over laid upon the site access survey plan at scale. This procedure has revealed that a 26m B-double vehicle would be able to enter the Project Site from both Luddenham Road into Patons Lane and from Patons Lane into the Project Site.

In addition, the ability for the AS 2890.2 – 2002 articulated (19m) vehicle to enter the site has also been assessed using the turning and templates revealing sufficient driveway width for this size vehicle also.

Consequently, the Project would be able to cater for all heavy vehicles up to 26m B-doubles, should the B-double route be approved by the Roads and Traffic Authority.

5. CONCLUSIONS

The preceding analysis has demonstrated that:

- the existing access driveway onto the Project Site from Patons Lane proposed to serve the development is suitably located and provides good sight distance in both directions along Patons Lane;
- the site with approximately 60 hectares in area would have ample area to provide all necessary car and truck parking areas;
- the proposed development satisfies the related geometric design specifications contained in the Australian Standards for off - street parking and vehicular access although the driveway width onto the Project Site would need to be extended to 12.5m to satisfactorily cater for B-doubles;
- the very good Level of Service at the intersections modelled would not change with the estimated additional traffic generation of the proposed development;

- the additional traffic demand on the intersections modelled as a consequence of the proposed development would only alter the Degree of Saturation and Total Average Delays minutely; and
- servicing of the site by heavy vehicles the subject development proposal would be sufficient to cater for all heavy vehicles up to 26m B-doubles.

Appendix A: Copy of DoP and RTA Letters

NSW GOVERNMENT
Department of Planning

Major Projects Assessment
Industry
Phone: (02) 9228 6537
Fax: (02) 9228 6466
Email: christine.chapman@planning.nsw.gov.au
23-33 Bridge Street
GPO Box 39
SYDNEY NSW 2001

Our ref: S08/01676

Mr Scott Hollamby
Environmental Scientist
R.W.Corkery & Co. Pty. Limited
1st Floor, 12 Dangar Road
BROOKLYN NSW 2083

Dear Mr Hollamby

The Orchard Hills Waste Project (MP 09_0074)
Director-General's Requirements

I refer to your application for the Orchard Hills Waste Project.

I have attached a copy of the Director-General's requirements for the project. These requirements have been prepared in consultation with the relevant agencies, and are based on the information you have provided to date. I have also attached a copy of the agencies' comments for your information.

Please note that the Director-General may alter these requirements at any time.

If the project is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. It is your responsibility to contact the Department of Environment, Water, Heritage and the Arts in Canberra (6274-1111 or http://www.environment.gov.au) to determine if the proposal requires an approval under the EPBC Act. The Commonwealth Government has accredited the NSW environmental assessment process so if it is determined that an approval is required under the EPBC Act, please contact the Department immediately as supplementary Director-General's requirements may need to be issued.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit the Environmental Assessment (EA) for the project. This will enable the Department to determine the:

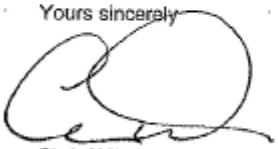
- applicable fee (see Division 1A, Part 15 of the Environmental Planning and Assessment Regulation 2000); and
- number of copies (hard-copy or CD-ROM) of the EA that will be required for exhibition purposes.

Once the Department receives the EA, it will review it in consultation with the relevant agencies to determine if it adequately addresses the Director-General's requirements, and may require you revise it prior to public exhibition.

The Department is required to make all the relevant information associated with the project publicly available on its website. Consequently, I would appreciate it if you would ensure that all the documents you subsequently submit to the Department are in a suitable format for the web, and arrange for an electronic version of the EA to be hosted on a suitable website during the assessment process.

If you have any enquiries about these requirements, please contact Felicity Greenway on 9228-6338.

Yours sincerely



20.5.04

Chris Wilson
Executive Director
Major Projects Assessment
As delegate for the Director-General

	• a signed statement from the author of the environmental assessment certifying that the information contained in the report is neither false nor misleading.
Key Issues	• **Noise** - including a quantitative assessment of the potential construction, operational and traffic noise impacts of the project, in particular the staged removal of the bund walls. • **Traffic and Transport** - including: - accurate predictions of the traffic volumes likely to be generated during construction and operation; - a detailed assessment of the potential impacts of this traffic on the capacity, efficiency and safety of the surrounding road network, including modelling of the intersections at Luddenham Road/Patons Lane, and Luddenham Road/Mamre Road; - details of any proposed road upgrade works, and the measures that would be implemented to ensure that the relevant road network is appropriately maintained during the life of the project; and - details of the proposed access and parking arrangements on site. • **Waste** - including: - the measures that would be implemented to ensure that the project is consistent with the aims, objectives, and guidance in the *NSW Waste Avoidance and Resource Recovery Strategy 2007, DECC's Guidelines for Solid Waste Landfills* and *Composting and Related Organics Processing Facilities*; - details of the quantities and classification of waste to be received, processed, recycled, stockpiled and landfilled; - details on the location and size of stockpiles of unprocessed and processed/recycled waste at the premises; and - details on landfill hole design and integrity. • **Soil and Water** - including: - detailed modelling of the potential surface and groundwater impacts of the project paying particular regard to Blaxland Creek and other nearby watercourses and associated riparian corridors; - a site water balance for the project, including a description of the measures that would be implemented to minimise water use on site and any water licensing requirements for the project; - details of the proposed erosion and sediment controls (during construction), the stormwater and leachate management system (during operations), flooding, potential offsite drainage impacts, and water supply and efficiency measures; and - assessment of potential soil and groundwater contamination. • **Rehabilitation and Final Landform** - including a detailed description (including plans and RLs) of how the site would be progressively rehabilitated and integrated into the surrounding landscape. • **Air** - including a quantitative assessment of the potential air quality impacts of the project. • **Odour** - including a quantitative assessment of the potential odour impacts of the project; • **Greenhouse Gas** - including: - a quantitative assessment of the scope 1, 2 and 3 greenhouse gas emissions of the project; - a qualitative assessment of the potential impacts of these emissions on the environment; and - an assessment of all reasonable and feasible measures that could be implemented to minimise the generation of greenhouse gas emissions associated with the project. • **Biodiversity** - including: - an assessment of the potential impacts of the project on threatened species and endangered ecological communities;

Our Reference:	RDC 09M460
Your Reference:	S08/01676
Contact:	Edmond Platon
Telephone	8849 2906

RTA

Manager, Industry
Major Development Assessments
Department of Planning
GPO Box 39
Sydney NSW 2001

Attention: Megan Webb

DIRECTOR GENERAL'S REQUIREMENTS: ORCHARD HILLS WASTE PROJECT PROPOSED WASTE RECYCLING AND MANAGEMENT FACILITY AT AN EXISTING QUARRY 123-179 PATONS LANE, ORCHARD HILLS.

Dear Sir/Madam,

I refer to your letter of 17 March 2009 (Ref: S08/01676) requesting the Roads and Traffic Authority (RTA) to provide details of key issues and assessment requirements regarding the abovementioned development for inclusion in the Director General's Environmental Assessment (EA) requirements.

The RTA would like the following issues to be included in the transport and traffic impact assessment of the proposed development:

1. Daily and peak traffic movements (classified) likely to be generated by the proposed development including the impact on nearby intersections and the need/associated funding for upgrading or road improvement works (if required).

   The key intersections to be examined / modelled include:

   - Luddenham Road / Patons Lane.
   - Luddenham Road / Mamre Road;

2. Details of heavy vehicle movements including vehicle types, frequency and anticipated routes on the major arterial and local road network.

3. An assessment of the potential increase in toxicity levels of loads transported on arterial and local roads to/from the site and consequently, the preparation of an incident management strategy for crashes involving such loads, if relevant.

4. Implementation of appropriate measures to ensure the "tracking" of material onto arterial roads is minimised.

5. Details of the proposed accesses and parking provisions associated with the proposed development, including compliance with the requirements of the DCP and relevant Australian Standards (ie: turn paths, sight distance requirements, aisle widths, etc).

Roads and Traffic Authority ABN 64 480 155 255

27-31 Argyle Street Parramatta NSW 2150
PO Box 973 Parramatta CBD NSW 2124 DX 28555 Parramatta
www.rta.nsw.gov.au | 13 17 82

Further enquiries on this matter can be directed to the nominated Assistant Planner, Edmond Platon on phone 8849 2906 or facsimile 8849 2918.

Yours sincerely

Andrew Popoff
A / Senior Land Use Planner
Transport Planning, Sydney Region

3 April 2009

Appendix B: Reduced Copy of Project Site Setting

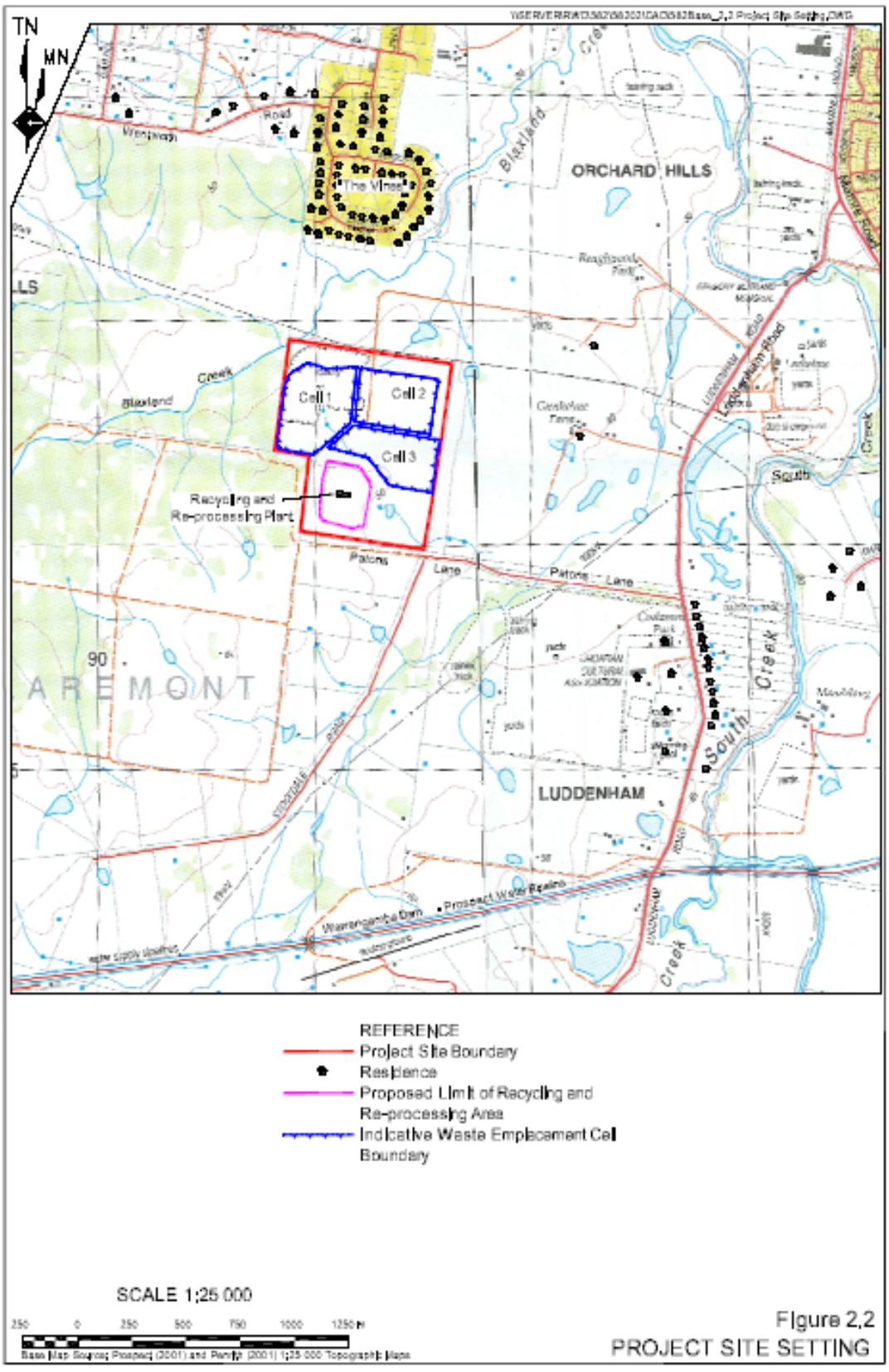


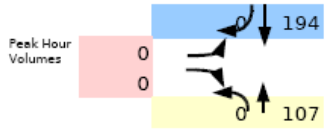
Figure 2,2
PROJECT SITE SETTING

Appendix C: Traffic Counts

Curtis Traffic Surveys

Turning movement count

Job: 090602ts
Day, date: Tue 16 Jun 09
Location: Luddenham Rd & Paton Ln
Weather: Fine
Client: Traffic Solutions



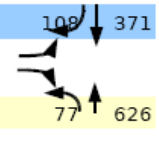
Time Period	From Luddenham Rd north: Through Light Vehicles	Through Heavy Vehicles	Right Light Vehicles	Right Heavy Vehicles	From Paton Ln: Left Light Vehicles	Left Heavy Vehicles	Right Light Vehicles	Right Heavy Vehicles	From Luddenham Rd south: Left Light Vehicles	Left Heavy Vehicles	Through Light Vehicles	Through Heavy Vehicles	Total vehicle movements	
15:00 to 15:15	35	2	0	0	0	0	0	0	0	0	28	1	66	
15:15 to 15:30	42	3	0	0	0	0	0	0	0	0	31	1	77	
15:30 to 15:45	45	4	0	0	0	0	0	0	0	0	22	1	72	
15:45 to 16:00	40	5	0	0	0	0	0	0	0	0	27	2	74	
16:00 to 16:15	51	4	0	0	0	0	0	0	0	0	22	1	78	Peak
16:15 to 16:30	55	2	0	0	0	0	0	0	0	0	16	0	73	
16:30 to 16:45	36	3	0	0	0	0	0	0	0	0	16	1	56	
16:45 to 17:00	40	0	0	0	0	0	0	0	0	0	22	1	63	
17:00 to 17:15	38	1	0	0	0	0	0	0	0	0	26	0	65	
17:15 to 17:30	43	3	0	0	0	0	0	0	0	0	31	1	78	Peak
17:30 to 17:45	31	0	0	0	0	0	0	0	0	0	18	1	50	
17:45 to 18:00	44	1	0	0	0	0	0	0	0	0	30	0	75	
Hourly Summary	500	28	0	0	0	0	0	0	0	0	289	10		
15:00 to 16:00	162	14	0	0	0	0	0	0	0	0	108	5	289	
15:15 to 16:15	178	16	0	0	0	0	0	0	0	0	102	5	301	Peak Hour
15:30 to 16:30	191	15	0	0	0	0	0	0	0	0	87	4	297	
15:45 to 16:45	182	14	0	0	0	0	0	0	0	0	81	4	281	
16:00 to 17:00	182	9	0	0	0	0	0	0	0	0	76	3	270	
16:15 to 17:15	169	6	0	0	0	0	0	0	0	0	80	2	257	
16:30 to 17:30	157	7	0	0	0	0	0	0	0	0	95	3	262	
16:45 to 17:45	152	4	0	0	0	0	0	0	0	0	97	3	256	
17:00 to 18:00	156	5	0	0	0	0	0	0	0	0	105	2	268	

Curtis Traffic Surveys

Turning movement count

Job: 090602ts
Day, date Tue 16 Jun 09
Location: Mamre Rd & Luddenham Rd
Weather: Fine
Client: Traffic Solutions

Peak Hour Volumes: 78, 30

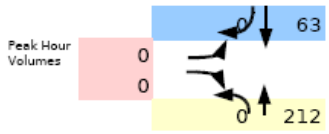


Time Period	From Mamre Rd north: Through Light Vehicles	From Mamre Rd north: Through Heavy Vehicles	From Mamre Rd north: Right Light Vehicles	From Mamre Rd north: Right Heavy Vehicles	From Luddenham Rd: Left Light Vehicles	From Luddenham Rd: Left Heavy Vehicles	From Luddenham Rd: Right Light Vehicles	From Luddenham Rd: Right Heavy Vehicles	From Mamre Rd south: Left Light Vehicles	From Mamre Rd south: Left Heavy Vehicles	From Mamre Rd south: Through Light Vehicles	From Mamre Rd south: Through Heavy Vehicles	Total vehicle movements	
15:00 to 15:15	75	6	29	0	18	1	9	0	10	0	134	5	287	
15:15 to 15:30	100	17	22	3	15	1	8	1	9	0	107	5	288	
15:30 to 15:45	94	14	28	3	23	0	8	1	17	0	133	9	330	
15:45 to 16:00	108	6	29	2	24	2	7	0	19	2	136	11	346	
16:00 to 16:15	93	4	39	2	13	0	8	0	13	11	122	6	311	
16:15 to 16:30	78	3	31	0	14	0	3	0	25	1	100	3	258	
16:30 to 16:45	86	7	21	2	14	0	5	0	15	1	149	9	309	
16:45 to 17:00	86	4	22	0	18	0	9	0	18	0	135	2	294	
17:00 to 17:15	81	5	24	1	22	0	8	0	14	0	159	2	316	
17:15 to 17:30	101	1	35	3	24	0	8	0	27	2	166	4	371	Peak
17:30 to 17:45	71	4	19	0	11	1	11	0	8	0	117	2	244	
17:45 to 18:00	91	2	32	1	15	0	9	0	13	0	130	5	298	
Hourly Summary	1064	73	331	17	211	5	93	2	188	17	1588	63		
15:00 to 16:00	377	43	108	8	80	4	32	2	55	2	510	30	1251	
15:15 to 16:15	395	41	118	10	75	3	31	2	58	13	498	31	1275	
15:30 to 16:30	373	27	127	7	74	2	26	1	74	14	491	29	1245	
15:45 to 16:45	365	20	120	6	65	2	23	0	72	15	507	29	1224	
16:00 to 17:00	343	18	113	4	59	0	25	0	71	13	506	20	1172	
16:15 to 17:15	331	19	98	3	68	0	25	0	72	2	543	16	1177	
16:30 to 17:30	354	17	102	6	78	0	30	0	74	3	609	17	1290	Peak Hour
16:45 to 17:45	339	14	100	4	75	1	36	0	67	2	577	10	1225	
17:00 to 18:00	344	12	110	5	72	1	36	0	62	2	572	13	1229	

Curtis Traffic Surveys

Turning movement count

Job: 090602ts
Day, date: Tue 16 Jun 09
Location: Luddenham Rd & Paton Ln
Weather: Fine
Client: Traffic Solutions

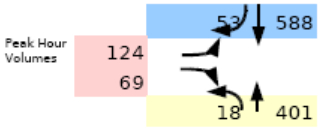


Time Period	From Luddenham Rd north: Through Light Vehicles	Through Heavy Vehicles	Right Light Vehicles	Right Heavy Vehicles	From Paton Ln: Left Light Vehicles	Left Heavy Vehicles	Right Light Vehicles	Right Heavy Vehicles	From Luddenham Rd south: Left Light Vehicles	Left Heavy Vehicles	Through Light Vehicles	Through Heavy Vehicles	Total vehicle movements	
06:30 to 06:45	28	2	0	0	0	0	0	0	0	0	38	6	74	
06:45 to 07:00	20	3	0	0	0	0	0	0	0	0	41	6	70	
07:00 to 07:15	26	1	0	0	0	0	0	0	0	0	29	1	57	
07:15 to 07:30	17	2	0	0	0	0	0	0	0	0	41	4	64	
07:30 to 07:45	14	1	0	0	0	0	0	0	0	0	58	2	75	Peak
07:45 to 08:00	15	1	0	0	0	0	0	0	0	0	53	3	72	
08:00 to 08:15	13	0	0	0	0	0	0	0	0	0	48	0	61	
08:15 to 08:30	18	1	0	0	0	0	0	0	0	0	48	0	67	
08:30 to 08:45	19	3	0	0	0	0	0	0	0	0	35	2	59	
08:45 to 09:00	16	1	0	0	0	0	0	0	0	0	21	3	41	
09:00 to 09:15	14	1	0	0	0	0	0	0	0	0	35	4	54	
09:15 to 09:30	12	3	0	0	0	0	0	0	0	0	17	1	33	
Hourly Summary	212	19	0	0	0	0	0	0	0	0	464	32		
06:30 to 07:30	91	8	0	0	0	0	0	0	0	0	149	17	265	
06:45 to 07:45	77	7	0	0	0	0	0	0	0	0	169	13	266	
07:00 to 08:00	72	5	0	0	0	0	0	0	0	0	181	10	268	
07:15 to 08:15	59	4	0	0	0	0	0	0	0	0	200	9	272	
07:30 to 08:30	60	3	0	0	0	0	0	0	0	0	207	5	275	Peak Hour
07:45 to 08:45	65	5	0	0	0	0	0	0	0	0	184	5	259	
08:00 to 09:00	66	5	0	0	0	0	0	0	0	0	152	5	228	
08:15 to 09:15	67	6	0	0	0	0	0	0	0	0	139	9	221	
08:30 to 09:30	61	8	0	0	0	0	0	0	0	0	108	10	187	

Curtis Traffic Surveys

Turning movement count

Job: 090602ts
Day, date Tue 16 Jun 09
Location: Mamre Rd & Luddenham Rd
Weather: Fine
Client: Traffic Solutions



Time Period	From Mamre Rd north: Through Light Vehicles	From Mamre Rd north: Through Heavy Vehicles	From Mamre Rd north: Right Light Vehicles	From Mamre Rd north: Right Heavy Vehicles	From Luddenham Rd: Left Light Vehicles	From Luddenham Rd: Left Heavy Vehicles	From Luddenham Rd: Right Light Vehicles	From Luddenham Rd: Right Heavy Vehicles	From Mamre Rd south: Left Light Vehicles	From Mamre Rd south: Left Heavy Vehicles	From Mamre Rd south: Through Light Vehicles	From Mamre Rd south: Through Heavy Vehicles	Total vehicle movements	
06:30 to 06:45	106	12	22	1	28	6	11	2	7	1	89	6	291	
06:45 to 07:00	104	8	14	1	30	2	10	3	5	3	64	5	249	
07:00 to 07:15	98	9	18	1	15	2	9	0	3	0	81	8	244	
07:15 to 07:30	114	9	16	0	26	2	11	1	1	0	62	1	243	
07:30 to 07:45	122	12	10	1	34	2	20	1	2	0	96	8	308	
07:45 to 08:00	165	9	17	0	34	1	17	2	3	1	73	13	335	Peak
08:00 to 08:15	129	5	7	3	31	1	16	0	4	0	85	8	289	
08:15 to 08:30	140	6	13	2	19	2	13	0	7	1	107	11	321	
08:30 to 08:45	89	7	16	1	25	1	11	0	7	0	98	11	266	
08:45 to 09:00	84	7	15	1	26	3	5	1	4	0	91	12	249	
09:00 to 09:15	45	7	13	4	23	4	7	0	2	0	92	7	204	
09:15 to 09:30	53	6	13	0	19	1	1	0	5	0	64	8	170	
Hourly Summary	1249	97	174	15	310	27	131	10	50	6	1002	98		
06:30 to 07:30	422	38	70	3	99	12	41	6	16	4	296	20	1027	
06:45 to 07:45	438	38	58	3	105	8	50	5	11	3	303	22	1044	
07:00 to 08:00	499	39	61	2	109	7	57	4	9	1	312	30	1130	
07:15 to 08:15	530	35	50	4	125	6	64	4	10	1	316	30	1175	
07:30 to 08:30	556	32	47	6	118	6	66	3	16	2	361	40	1253	Peak Hour
07:45 to 08:45	523	27	53	6	109	5	57	2	21	2	363	43	1211	
08:00 to 09:00	442	25	51	7	101	7	45	1	22	1	381	42	1125	
08:15 to 09:15	358	27	57	8	93	10	36	1	20	1	388	41	1040	
08:30 to 09:30	271	27	57	6	93	9	24	1	18	0	345	38	889	

CfeIT bob.white@cfeit.com (02) 9740 8600

Traffic Count Summary Report

Count Number	4711	Ref : TSOL	Lat/Long : S33 48 53.8 / E150 45 36.6	UBD 205 C-5
Street	LUDDENHAM ROAD, ST MARYS : From MAMRE ROAD to PATONS LANE : SOUTH BOUND			
Location	North of Patons Lane, Property 182, on 60km sign			*Carriageway*

TOTAL COUNT MATRIX

Start Date	18-JUN-09
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	77
Weekly 85th Percentile Speed	88
Five Day AADT	1689
Seven Day AADT	1608

	MON *22ND*	TUE *23RD*	WED *24TH*	THU *18TH*	FRI *19TH*	SAT *20TH*	SUN *21ST*	5 Dav Total	5 Dav Average	7 Dav Total	7 Dav Average
Midnight - 1am	10	7	14	6	9	16	15	46	9	77	11
1am - 2am	3	3	6	1	2	14	11	15	3	40	6
2am - 3am	2	5	6	8	5	9	8	26	5	43	6
3am - 4am	3	1	4	3	2	4	6	13	3	23	3
4am - 5am	6	5	2	4	4	6	6	21	4	33	5
5am - 6am	55	65	63	62	61	26	14	306	61	346	49
6am - 7am	91	91	74	83	88	56	28	427	85	511	73
7am - 8am	74	96	80	81	91	67	35	422	84	524	75
8am - 9am	102	75	89	71	79	73	48	416	83	537	77
9am - 10am	79	70	109	90	73	96	82	421	84	599	86
10am - 11am	53	68	56	63	57	95	92	297	59	484	69
11am - Midday	62	66	63	66	71	108	115	328	66	551	79
Midday - 1pm	79	66	73	73	79	122	120	370	74	612	87
1pm - 2pm	75	70	79	87	104	103	131	415	83	649	93
2pm - 3pm	84	96	109	99	117	117	75	505	101	697	100
3pm - 4pm	133	153	150	158	159	117	110	753	151	980	140
4pm - 5pm	169	189	175	176	204	115	108	913	183	1136	162
5pm - 6pm	202	202	200	168	184	137	92	956	191	1185	169
6pm - 7pm	96	123	117	128	138	70	50	602	120	722	103
7pm - 8pm	66	91	91	84	84	50	36	416	83	502	72
8pm - 9pm	47	53	58	82	48	37	29	288	58	354	51
9pm - 10pm	35	54	23	57	37	29	30	206	41	265	38
10pm - 11pm	22	32	46	28	42	35	25	170	34	230	33
11pm - Midnight	12	11	34	17	37	32	13	111	22	156	22
Total	1560	1692	1721	1695	1775	1534	1279	8443	1688	11256	1608

Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

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Traffic Count Summary Report

Count Number	4711	Ref : TSOL	Lat/Long : S33 48 53.8 / E150 45 36.6 UBD 205 C-5
Street	LUDDENHAM ROAD, ST MARYS : From PATONS LANE to MAMRE ROAD : NORTH BOUND		
Location	North of Patons Lane, Property 182, on 60km sign		*Carriageway*

TOTAL COUNT MATRIX

Start Date	18-JUN-09
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	74
Weekly 85th Percentile Speed	84
Five Day AADT	1634
Seven Day AADT	1554

	MON *22ND*	TUE *23RD*	WED *24TH*	THU *18TH*	FRI *19TH*	SAT *20TH*	SUN *21ST*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	10	5	2	6	4	8	24	27	5	59	8
1am - 2am	4	3	2	4	2	10	11	15	3	36	5
2am - 3am	6	5	11	4	6	5	9	32	6	46	7
3am - 4am	7	6	4	4	5	5	3	26	5	34	5
4am - 5am	21	25	23	26	22	13	4	117	23	134	19
5am - 6am	72	86	80	78	81	32	9	397	79	438	63
6am - 7am	112	150	138	127	112	43	13	639	128	695	99
7am - 8am	178	172	167	190	160	53	22	867	173	942	135
8am - 9am	159	169	163	159	161	75	39	811	162	925	132
9am - 10am	101	89	103	87	113	86	53	493	99	632	90
10am - 11am	66	62	59	62	63	107	81	312	62	500	71
11am - Midday	72	75	61	77	84	91	79	369	74	539	77
Midday - 1pm	80	70	78	79	60	92	120	367	73	579	83
1pm - 2pm	77	58	86	77	84	123	89	382	76	594	85
2pm - 3pm	84	74	97	103	102	96	93	460	92	649	93
3pm - 4pm	120	118	138	96	139	121	99	611	122	831	119
4pm - 5pm	108	101	124	109	126	109	134	568	114	811	116
5pm - 6pm	127	132	107	120	107	114	161	593	119	868	124
6pm - 7pm	58	62	69	68	92	76	72	349	70	497	71
7pm - 8pm	39	44	41	54	44	32	65	222	44	319	46
8pm - 9pm	28	39	23	29	35	28	43	154	31	225	32
9pm - 10pm	23	38	16	40	41	35	33	158	32	226	32
10pm - 11pm	14	16	35	28	27	38	16	120	24	174	25
11pm - Midnight	4	15	16	17	27	33	13	79	16	125	18
Total	1570	1614	1643	1644	1697	1425	1285	8168	1633	10878	1554

Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

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Appendix D: Evaluation of the Results of INTANAL

EVALUATION OF THE RESULTS OF INTANAL

LEVEL OF SERVICE

The level of service for traffic signals, roundabouts and sign control intersections is shown below, this is based on the average delay in seconds per vehicle:

Average Delay per Vehicle	Level of Service	Traffic Signals & Roundabouts	Sign Control
< 14	a	good	good
15 - 28	b	good with minimal delays and spare capacity	acceptable delays and spare capacity
29 - 42	c	satisfactory with spare capacity	satisfactory but accident study required
43 - 56	d	satisfactory but operating near capacity	near capacity and accident study required
57 - 70	e	at capacity: at signals incidents would cause excessive delays, roundabouts require another control mode	at capacity and requires another control mode
> 70	f	unsatisfactory	unsatisfactory

DEGREE OF SATURATION

The Degree of Saturation is another measure of the operational performance of individual intersections.

For traffic signal controlled intersections both queue length and delay increase rapidly as the Degree of Saturation approaches 1.0, and it is usually attempted to keep it below 0.9.

For roundabouts or sign controlled intersections, oversaturation is indicated by a value in excess of 0.8.

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AVERAGE VEHICLE DELAY

The average vehicle delay provides a measure of the operational performance of an intersection as indicated in the above table. The average vehicle delays in the table should be used as a guide only as longer delays could be tolerated in some locations.