Time of Day	Management Level $L_{Aeq,15min}$ dB(A)	How to Apply
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

All construction work on this Project will occur only during the recommended standard hours of work, ie. between 7.00am-6.00pm, Monday to Friday and 8.00am-1.00pm on Saturday, Public Holidays excluded.

Based on the Rating Background Levels (RBL's) determined for the Project the specific construction noise criteria for the Project is outlined in **Table 5.2**.

Table 5.2 Project Construction Noise Criteria at Residences

Time Period	Construction Noise Criteria, $L_{Aeq,15min}$ dB(A)		
	The Vines	Roughwood Park Bates Residence	Luddenham Rd
Day	44	44	47

The construction noise criteria detailed in Table 4.2 remain unchanged from the criteria detailed in the Modified Preferred Project Report.

5.2 Operational Noise Criteria

Once the Project enters its operational phase, the assessment of the site's noise emissions is undertaken in two parts:

- noise from on-site operations (including any on-site traffic) is assessed under the Industrial Noise Policy (INP); and
- noise from off-site traffic associated with the Project is assessed under the Environmental Criteria for Road Traffic Noise (ECRTN).

5.2.1 Criteria for Noise from On-Site Activities

The NSW Industrial Noise Policy (INP) sets out a two-part noise criterion for operational noise emanating from within the site. The final criteria are established by adopting whichever is the more stringent of the Intrusiveness or Amenity criteria.

It has been determined that the intrusiveness criterion governs the Project's overall operational noise criteria. Applicable operation noise criteria, derived from long term noise logging and established in accordance with the NSW Office of Environment and Heritages' Industrial Noise Policy are detailed in **Table 5.3**. In addition surrounding receivers identified as a result of site investigations and joint conferencing are detailed in this table.

Table 5.3 Site Specific Operational Noise Criteria – $L_{Aeq(15minutes)}$

Residence	Daytime Noise Criterion dB(A)
9 Verdehlo Way	39
3 Chablis Pl	39
15 Cabernet Cct	39
11 Cabernet Cct	39
Bates Residence "Roughwood Park"	39
Newham Residence	39
210 Luddenham Rd	42
216 Luddenham Rd	42
230 Luddenham Rd	42
262 Luddenham Rd	42
229 Luddenham Rd*	42

* (Next to the Croatian Club)

The operational noise criteria detailed in Table 5.3 remain unchanged from the criteria detailed in the Modified Preferred Project Report. The last location, 229 Luddenham Road, was identified and included as a result of joint conferencing.

5.2.2 Criteria for Noise from Off-Site Traffic

The traffic noise criteria for "land use developments with potential to create additional traffic on local roads" are that noise from traffic associated with the Project should not exceed:

For Local Roads

- Daytime (7.00am-10.00pm) $L_{Aeq,1hr}$ = 55dB(A)
- Night Time (10.00pm-7.00am) $L_{Aeq,1hr}$ = 50dB(A)

These criteria relate to the level of noise from Project traffic as measured external to the most affected building façade of the nearest affected residence.

Where existing traffic noise levels already exceed these values, the ECRTN indicates that:

> "Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments.

> In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dB."

The traffic noise criteria remain unchanged from the criteria detailed in the Modified Preferred Project Report.

6 NOISE MODELLING

Noise levels throughout the life of the Project have been determined through computer modelling using the Environmental Noise Model (ENM) software with the principal input variables being topography within and surrounding the Project Site, equipment noise levels and seasonal meteorological conditions. This section reviews each of these variables and how they have been incorporated into the modelling through the nominated noise scenarios.

- **Topographic information used in noise modelling** – The topographical information for the Project Site and the surrounding land used in the noise modelling was provided by RW Corkery & Co Pty Ltd (Noise Models 1-4 & 11) and GHD Pty Ltd (Noise Models 5-10).
- **Equipment Noise Levels Used in Noise Modelling – Table 6.1** lists all equipment included in noise modelling and the assumed sound power levels.

Table 6.1 Modelled Equipment & Sound Power Levels

Equipment	Source Description	$L_{Aeq,15min}$ SWL dB(A)[3]
Truck [1]	Truck (no mitigation) in motion	107
	Water Truck with noise mitigation	104
Compactor [1]	Compacting earth on final landform Fitted with noise mitigation	106
FEL [1]	Earthworks & loading trucks Fitted with noise mitigation	108
Scraper [1]	Earthworks Fitted with noise mitigation	104
Excavator[1]	Earthworks	102
Bulldozer [1]	Earthworks Fitted with noise mitigation	112
Jaw Crusher[2]	Processing recyclable materials Crusher housed in acoustic enclosure	111
Impact Crusher [2]	Processing recyclable materials	117
Trommel[2]	Processing recyclable materials Trommel housed within enclosure	100
Shredder[2]	Processing recyclable materials	112
Picking Stn[2]	Small conveyor used for sifting/sorting	100

Notes:
(1) Sound power levels for acoustically-treated mobile plant were determined by Hushpak Engineering Pty Limited based on plant inspections and noise measurements undertaken in January 2011, and reductions nominated by them to be achievable.
(2) Sound power level based on realistically-achievable values, as advised by the Proponent. Where the equipment is in a full enclosure, a 10dB reduction is assumed.
(3) The sound power levels detailed in Table 6.1 are the same for the MPPR and FMPPR.

- **Seasonal Meteorological Conditions** – The INP requires that in predicting operational noise levels, wind speed and direction should be taken into account if wind speeds of up to 3m/s in the source to receiver direction occur more than 30% of the time in any season. In cases where consideration of meteorological conditions is required, Wilkinson Murray has developed a procedure for addressing meteorological conditions which is considered to be consistent with the intent of the INP, and is more realistic than the procedure of adopting a single condition for assessment (although more difficult to implement). This involves calculating the noise level exceeded for 10% of all day, evening or night periods in each season, using the range of meteorological conditions present at the site. The highest of these 10% exceedance values for any season is taken as the value to be compared with the intrusiveness criterion.

  This procedure has been accepted by OEH in previous assessments, and has been used to calculate noise levels from the Project Site.

7 OPERATIONAL NOISE MODELLING & PREDICTIONS

Operational noise impacts from the Further Modified Preferred Project have been modelled for ten scenarios. That is, four scenarios representing typical worst-case periods during the proposed operations of the Facility which were presented with the FMPPR submission and a further 6 models that reflect other stages of the FMPPR development.

The latter six stages have been developed by GHD to correlate to the revised operational stages presented in Appendix F of the Overview Report prepared for the FMPPR. The following **Table 7.1** details the noise models and their correlations with the Staging plans for the project

Table 7.1 Relationship between Noise Models and Operational Stages

Noise Model	Operational Stage*
1	Approximately Stage 3
2	Approximately Stage 6
3	Approximately Stage 8
4	Approximately Stage 10
5	Stage 0
6	Stage 2
7	Stage 4
8	Stage 5
9	Stage 7
10	Stage 9

*Noise models 1-4 were prepared to assess "typical worst case" noise scenarios from the facility and, as such, are not identical to the operational stages presented in the FMPP overview report. These models have been reviewed with respect to the project operational stages to determine the stages to which they are most similar, hence the term "approximately'.

Noise models 1 to 4 are the same noise models as presented in the FMPPR with a modification to the height of equipment in the contingency stockpile area. This height of equipment in the contingency stockpile area has been changed to reflect the findings of the joint conference relating to resource extraction / utilisation. That is the equipment has been raised in height from RL 46 m to RL 54 m.

Appendix A details these models. Changes in height of equipment in the contingency stockpile area have been highlighted in yellow. A description of noise models 1 to 4, as previous advised in the FMPPR, are detailed as follows:

Noise Model 1:

This scenario represents the beginning of extraction in Cell 2B, in combination with deeper extraction in Cell 2A and filling in Cell 1. The filling is at a level close to the final landform, and therefore this scenario represents worst-case impacts from both filling in Cell 1 and extraction in Cell 2B. The central acoustic mound extends in front of the filling operation. Equipment in the filling area must be no more than 50m from the central acoustic bund at any time. This means the central bund will be relocated as operations move to the south.

Noise Model 2:

This represents the beginning of extraction in Cell 3B, in combination with deeper extraction in

Cell 3A and filling in Cell 2. The central acoustic mound extends in front of the filling operation. Note that the western section of the 'Southern Acoustic Mound' shown in Appendix A was added after our modelling was completed. The result of this is expected to be minor and would be expected to reduce noise levels if anything.

Noise Model 3:

This represents the beginning of extraction in Cell 3A, in combination with deeper extraction in Cell 3B and filling in Cell 3C. The central acoustic mound has been removed and the southern acoustic mound is located in front of the filling and extraction operations.

Noise Model 4:

This represents filling in Cell 3A, after the cessation of extraction operations. The southern acoustic mound is located in front of the filling operations. The eastern face (at RL 57) will be in place until filling operations finish. The eastern face will ultimately need to be removed from behind (that is the facility side), as for all other bunds.

In the case of Noise Models 5-10, the noise models are as per the stages detailed in **Table 7.1**. These models were developed by GHD and as such reflect the contingency stockpile area equipment heights as determined in the joint conference relating to resource extraction / utilistation. Appendix A details all the noise models.

Noise levels were calculated using the procedures as described in Section 5, including calculation of the 10th percentile exceedance value over all meteorological conditions for each receiver. Results of noise modelling are shown in **Table 7.2** as follows.

Table 7.2 Predicted L_{Aeq} Operational Noise Levels Exceeded for 10% of 15-Minute Periods (daytime periods, 7am to 6pm)

Receiver	Address	Noise Model 1 Stage 3	Noise Model 2 Stage 6	Noise Model 3 Stage 8	Noise Model 4 Stage 10*	Noise Model 5 Stage 0	Noise Model 6 Stage 2	Noise Model 7 Stage 4	Noise Model 8 Stage 5	Noise Model 9 Stage 7	Noise Model 10 Stage 9	Noise Criterion (reference Table 5.3)
1	9 Verdelho Way	38	38	38	37	36	36	36	34	34	35	39
2	3 Chablis Pl	38	37	38	36	36	37	37	37	35	35	39
3	15 Cabernet Cct	38	37	39	38	37	37	37	36	36	35	39
4	11 Cabernet Cct	39	38	39	38	37	37	37	35	36	36	39
5	Roughwood Park Bates Residence	39	39	39	37	39	39	38	38	38	38	39
6	Newham Residence	38	39	39	38	39	38	38	38	38	38	39
7	210 Luddenham Rd	35	36	36	34	34	34	34	34	34	34	42
8	216 Luddenham Rd	36	36	36	34	34	34	34	34	34	34	42
9	230 Luddenham Rd	31	32	31	30	29	30	29	29	30	29	42
10	262 Luddenham Rd	30	31	30	29	29	29	29	29	29	29	42
11	229 Luddenham Rd	38	39	38	37	36	35	36	35	36	35	42

The calculated noise levels are within applicable noise criteria in all cases, provided procedures established in the FMPPR assessment and joint conferencing, as described below in this report, are adopted.

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7.1 Construction Noise during Site Establishment

There will be a construction period of approximately six months during which shaping of the northern and eastern faces will occur, as well as other works within the site. Procedures used during this process will be as described for the construction period as summarised below, including the use of 4m high movable barriers to shield any plant working outside the northern face, with plant working only at ground heights up to 1m above the ground height beneath the barrier, and barriers being moved sequentially as shaping progresses.

Table 7.3 indicates the predicted noise levels that will be received at residences during worst case site establishment activities (Scenario 11 as indicated in **Appendix A**) for neutral and worst case prevailing meteorological conditions. The results presented include the acoustic benefit of the presence of a 4m-high mobile barrier in the immediate vicinity of earthmoving equipment working on the external (northern) face of the northern face.

Table 7.3 Predicted $L_{Aeq,15min}$ Noise Levels at Residences during Site Establishment Construction Works

Residence	All Plant Operating ($L_{Aeq,15min}$ dB(A))		Construction Noise Management Level dB(A)
	Neutral Met Conditions	Adverse Met Conditions	
9 Verdehlo Way	35	39	44
3 Chablis Pl	39	41	44
15 Cabernet Cct	39	43	44
11 Cabernet Cct	39	43	44
Roughwood Park Bates Residence	35	39	44
Newham Residence	35	39	44
210 Luddenham Rd	<30	35	47
216 Luddenham Rd	<30	34	47
230 Luddenham Rd	<30	30	47
262 Luddenham Rd	<30	<30	47
229 Luddenham Rd*	30	37	47

A review of results in **Table 7.3** indicates that construction noise will comply with the construction noise management levels at all times for earthmoving equipment operating on external slopes during the construction of the northern and eastern faces. The mobile acoustic barrier will be positioned so as to screen residences in The Vines at all times during works on the external faces. The faces will be developed such that the outermost sections of the slope under construction are established first so as to accommodate the mobile acoustic barrier, with back-filling following. This configuration will be repeated as the elevation of the face is increased.

This section is unchanged from the MPPR report with the exception of the residence at 229 Luddenham Road which was identified and assessed as a result of joint conferencing.

8 PREDICTION OF NOISE FROM THE PROJECT'S OFF-SITE TRAFFIC

This section is reproduced from the MPPR assessment and is applicable as there are no changes to the Traffic Noise assessment.

8.1 Transportation Routes

Figure 8.1 indicates the proposed transportation routes for the delivery of waste, and the despatch of clay/shale and recycled and re-processed products. All vehicles will 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 will not travel on local roads between the Project Site and the M4 Western Motorway or Westlink M7 except when materials are being received from/delivered to those areas.

It is predicted that 80% of the truck movements to and from the Project Site would occur via Mamre Road northwards whilst the remainder of truck movements would occur via Mamre Road southwards.

8.2 Existing Traffic

Data relating to existing traffic movements in the vicinity of the Project Site have been collected (in June 2009by surveys at the intersections of:

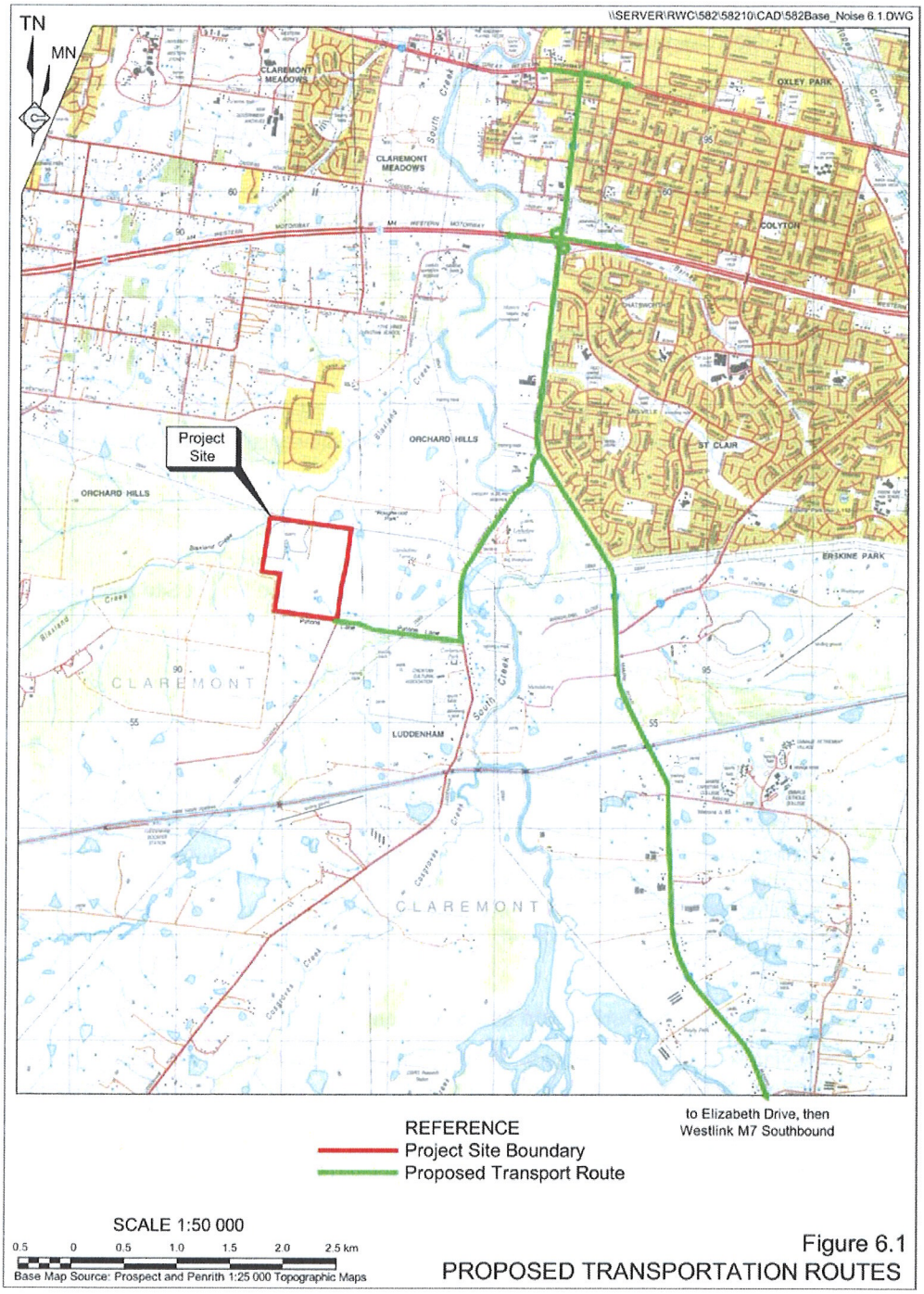
- Mamre Road and Luddenham Road, Orchard Hills, and
- Luddenham Road and Patons Lane, Orchard Hills.

In summary, the traffic assessment resolved that the highest existing hourly traffic flow on Luddenham Road is approximately 300 vehicles/hour (in the afternoon peak hour). This is inclusive of the total number of vehicles, including trucks, travelling in either direction along Luddenham Road. The percentage of heavy vehicles (>3 tonnes) within this flow was reported to range up to approximately 7%. The traffic assessment also determined the Annual Average Daily Traffic (AADT) count to be approximately 3200 vehicles per day, with 5% heavy vehicles, and an 85-percentile speed of 84km/h.

8.3 Traffic during Site Establishment Phase

Traffic impacts from the Project, if any, will be dictated by traffic generation during its operational phase, rather during its construction phase, when a significantly lower number of trucks will access the site. Where it can be shown that traffic impacts during the operational phase will be acceptable, then it will follow that noise to residences from construction traffic will also comply with the relevant criteria.

Figure 8.1 Proposed Transportation Routes



8.4 Traffic during Operational Phase

For the purposes of the assessments of impacts of heavy vehicles delivering waste to the Project Site, two levels of waste deliveries are proposed which, based on an average load of 30 tonnes, would generate the heavy vehicle movements indicated in Table 8.1

Table 8.1 Projected Waste Heavy Vehicle Movements

Annual Waste Deliveries	Average Daily Movements*
300 000t	72
450 000t	110

*Assumes receipts on Saturday = 50% weekday quantities

Clay/shale Despatch

Most trucks transporting clay/shale from the Project Site will be truck and dog trailers carrying an average 30t load. For the purpose of assessing the impact of heavy vehicles transporting clay/shale from the Project Site, two production levels are proposed which, based on an average load of 30 tonnes, would generate the heavy vehicle movements indicated in **Table 8.2**. It is noted that whilst back loading would be undertaken wherever possible, for assessment purposes it is assumed that no back loading would be undertaken.

Table 8.2 Projected Clay/Shale Heavy Vehicle Movements

Annual Clay/shale Despatched	Average Daily Movements*
120 000t	32
160 000t	44

* Assumes clay/shale despatched Mondays to Fridays only

For the assessment of noise in Scenarios 2, 3 and 4, the maximum level of clay/shale despatched has been assumed.

Recycling / Re-processing Product Despatch

The products produced by the recycling and re-processing plant will be despatched from site, with a small proportion as backloads in heavy vehicles carrying an average 30t load. For assessment purposes, two production levels are considered. The production levels and their corresponding average daily movements are indicated in **Table 8.3**.

Table 8.3 Projected Heavy Vehicle Movements relating to Product Despatch

Recycling/Re-processing Products Despatched	Average Daily Movements#
190 000t	46
245 000t	60

Assumes products despatched on Saturday = 50% weekday quantities

In order to determine a realistic cap for overall heavy vehicle traffic levels, the operational scenarios listed in **Table 8.4** and their heavy vehicle movements were considered.

Table 8.4 Cumulative Heavy Vehicle Transport Scenarios

Scenario	Waste Deliveries		Clay/Shale Despatched		Recycled / Re-processed Products Despatched		Total Truck Movements
	Quantity	Av. Daily Movements	Quantity	Av. Daily Movements	Quantity	Av. Daily Movements	
1	450 000	110	160 000	44	245 000	60	214
2	300 000	72	120 000	32	190 000	46	150

Table 8.4 indicates that the maximum average number of truck loads on any day (during the Site's maximum operating capacity) for all incoming and outgoing materials would be approximately 107 loads (214 movements). Given there will be daily variations in the various heavy vehicle movements and the deliveries of consumables to site, the Proponent has nominated an upper level of heavy vehicles at 250 per day.

Based on an 11 hour day, this would equate to an average of **approximately 12 heavy vehicle loads (24 movements) per hour**.

The number of light vehicles travelling to and from the Project Site daily would vary between 20 and 30 (ie, 40 and 60 light vehicle movements per day). These movements would be concentrated at the beginning and end of each operational day. Between 10 and 15 vehicle movements would occur during each of the first and last operational hours of the day, with the remainder of movements spread throughout the remainder of the day.

8.5 Prediction of Transportation Noise Impacts

L_{Aeq} noise levels associated with existing traffic, and the proposed additional traffic, were calculated using the CoRTN prediction procedure. Worst-case assumptions, as outlined above, were made with regard to traffic generated by the Project. For existing traffic, although the maximum traffic volume in any hour was recorded as 300 per hour, a lower volume of 250 per hour was assumed for a typical hour during the daytime.

The receivers potentially most affected by traffic noise from the proposal are set back from Luddenham Road, and of these, the most-affected is located approximately 60m from the nearest point of the route (the intersection of Luddenham Road, and Patons Lane) taken by trucks arriving to the site from the north.

Other parameters used in the model are shown in **Table 8.5**.