



NOISE & DUST IMPACT ASSESSMENT
PROPOSED CONCRETE BATCHING PLANT
ABBOTSFORD ROAD
BOWEN HILLS

PLANS AND DOCUMENTS
referred to in the PDA APPROVAL

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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

MWA Environmental has been engaged by Hanson Construction Materials Pty Ltd to prepare a Noise & Dust Impact Assessment for a proposed concrete batching plant at Bowen Hills.

The report has been commissioned to support an application to Department of State Development and Infrastructure Planning (DSDIP) for development approval. The development application is made under the *Economic Development Act 2012* in a Priority Development Area (PDA) – Bowen Hills Urban Development Area Development Scheme (Precinct 9).

The assessment has been conducted in accordance with the methodology agreed with DSDIP as per the following documents:

- *Proposed Concrete Batching Plant at Abbotsford Road, Bowen Hills - Assessment Methodology – Noise* (MWA Environmental ref. L06214/BH/14-026, 28 February 2014); and
- *Proposed Concrete Batching Plant at Abbotsford Road, Bowen Hills - Assessment Methodology – Air Quality* (MWA Environmental ref. L06114/BH/14-026, 28 February 2014).

The report addresses the potential impact of noise and dust emissions from the proposed concrete batching plant activities on surrounding sensitive land uses with reference to the relevant regulatory noise limits and air quality objectives.

The assessment has been based upon detailed noise propagation and dust dispersion modelling and provides recommendations for measures required to mitigate potential impacts at surrounding sensitive receptors.

1.2 SITE DESCRIPTION

The site has a street address of 236 Abbotsford Road, Bowen Hills but also has vehicular access via Gebbie Street.

The subject site has a real property description of:

- Lot 22 RP46694;
- Lots 16 to 21 RP48712;
- Lots 33 to 37 RP 55484; and
- Lot 314 SP268648.

The location of the subject site is shown on **Figure 1**.

The site is located within an industrial zoned land use area. The land use zoning of the locality is shown on **Figure 2**.

The site has previously operated as a Brisbane City Council bus depot including hardstand, workshop, refuelling and office facilities.

An aerial photograph of the subject site and local area is included as **Figure 3**.

1.3 SURROUNDING LAND USES

The subject site is located within a predominantly industrial area with some commercial / office uses.

The nearest sensitive land use areas (based upon zoning) are summarised as follows:

- Albion residential area (north of Crosby Road) approximately 350 metres to the north
- Albion residential area (east of Royal Terrace) approximately 530 metres to the east
- Windsor residential area (west of McDonald Road) approximately 500 metres to the northwest
- Windsor residential area (south of Somerset Street) approximately 530 metres to the west

These nearest sensitive land use areas are shown on the aerial photograph included as **Figure 4**.

The site is well separated from sensitive land use areas (i.e. residential and educational zoned land).

In addition to the sensitive land use areas, rates information mapping provided by Brisbane City Council identified a number of properties scattered within the local industrial area classified as 'residential' for the purpose of rating categories.

For the purposes of this assessment, the 'residential' category rated properties identified by Brisbane City Council have only been considered as sensitive receptors where there is not a dual use (i.e. commercial or industrial use) of the property.

The following properties within 300 metres of the subject site were identified by the Brisbane City Council rates database as being for 'residential' land use without any dual use:

- 115 Sandgate Road, Albion
- 91 Sandgate Road, Albion
- 61 Nariel Street, Albion
- 63 Nariel Street, Albion
- 8 Immarna Street, Albion
- 10 Immarna Street, Albion
- 1 Tate Street, Albion
- 19 Bimbil Street, Albion
- 12 Gore Street, Albion
- 10 Gore Street, Albion

Based upon site inspection and aerial photograph analysis, MWA Environmental has considered the following properties as dual use (i.e. not sensitive receptors) and therefore not assessed as sensitive receptors:

- 115 Sandgate Road, Albion - Considered to be industrial or dual use based upon vehicle storage and integration of yard areas with two adjoining industrial properties.
- 91 Sandgate Road, Albion – Considered to be commercial or dual use based upon business signage for ‘Portfolio Projects’ office

Several other properties identified by Brisbane City Council rating information are also likely to be dual use based upon sale and leasing advertising noted at the properties. Due to uncertainty regarding other properties, they have been considered as sensitive places for the purposes of this assessment.

The representative sensitive receptor locations considered in the assessment, including within the industrial precinct, are shown on the aerial photograph included as **Figure 5**.

1.4 PROPOSED DEVELOPMENT

It is proposed to develop the subject site as a modern concrete batching plant.

Heavy vehicle access to and from the site is proposed to be via driveways at the northern end of the site to Gebbie Street. Staff carparking is proposed to be accessed via a driveway at the southern end of the site from Abbotsford Road

The proposed site plan is shown on **Figure 6**.

The design of the plant incorporates specific features to minimise noise and dust emissions including:

- Three loading (batching) points and six slump stands located within a building with an opening only to the eastern side. Fast-acting roller doors will remain closed at the southern entry to the loading bays aside from opening as required to allow trucks to enter. The building will be constructed with concrete lower wall and Trimdek (or similar) upper wall and roof areas. Absorptive acoustic insulation will be incorporated to the inside of the building to minimise noise emission.
- Provision for two cement/flyash tanker delivery points within the slumping building
- Wash bays located within an existing steel sheeted building with an opening created on the eastern façade for truck access.
- Drive-over aggregate and sand delivery point i.e. no above-ground delivery of sand and aggregate
- Enclosed bulk aggregate and sand store within building i.e. no external storage of sand and aggregate
- Covered conveyors for transfer of sand and aggregate between delivery point, bulk store and batching building
- No requirement for front-end loader to input raw materials

The existing brick façade building to part of the Abbotsford Road frontage is to be retained and will shield noise emissions towards the west. It is proposed to construct a minimum 3 metre high solid wall to the balance of the western boundary north of the existing building. The wall will be constructed of gap-free materials achieving a minimum surface density of 12.5kg/m² to act as an acoustic barrier.

Approval is sought for the concrete batching plant to operate on a 24 hour / 7 day basis as necessary to meet market demands.

2.0 NOISE IMPACT ASSESSMENT

2.1 AMBIENT NOISE LEVELS

In order to characterise the existing acoustic environment at the surrounding sensitive receptors, noise monitoring has been undertaken during the day, evening and night periods at representative locations.

The noise monitoring locations are described as follows and shown on **Figure 7**:

Bowen Hills Local Area

- Centrally located on subject site
- Period 24 February 2014 to 2 March 2014
- Rion NL-42 sound level meter pre-calibrated to 94 dB at 1 kHz
- Free-field monitoring location shielded from Abbotsford Road and Sandgate Road traffic noise by existing building structures and solid fencing
- Location representative of locations within the local commercial / industrial area which are reasonably separated and/or shielded from major roadways
- Noise environment primarily affected by local and distant road traffic noise, mechanical plant noise from within the industrial/commercial precinct

Windsor Residential Area

- Bowen Street, Windsor
- Period 28 February 2014 to 6 March 2014
- Rion NL-21 sound level meter pre-calibrated to 94 dB at 1 kHz
- Free-field monitoring location within residential property
- Location representative of quieter areas within the Windsor residential precinct
- Noise environment primarily affected by local and distant road traffic noise

Albion Residential Area

- Royal Terrace, Albion
- Period 13 to 14 March 2014
- ARL EL-215 noise datalogger pre-calibrated to 94 dB at 1 kHz
- Free-field monitoring location within park adjacent to residential properties, well setback from roadways
- Location representative of less elevated, quieter areas within the Albion residential precinct
- Noise environment primarily affected by local and distant road traffic noise

Noise datalogger traces and statistical noise level data is provided in **Attachment 1**.

The Rating Background Level (RBL) has been extracted from the monitoring data for each monitoring location for each distinct operational period of the plant. RBLs have been calculated in accordance with the methods proposed in the *Ecoaccess Guideline: Planning for Noise Control*. Variations from the *Ecoaccess Guideline: Planning for Noise Control* RBL calculation procedure were required as follows:

- Given that plant activity is expected to increase from 5am and ambient background noise levels (i.e. road traffic) also increase at this time in urban areas, the 5am to 7am period has been assessed as separate to the quieter night period 10pm to 5am. For the 5am to 7am period, the minimum recorded 1 hour L_{A90} noise levels have been analysed as no RBL can be calculated for this period.
- For the Albion residential area noise monitoring the minimum L_{90} (1 hour) noise levels recorded for each period have been applied as the monitoring period was not sufficient to extract RBLs. This is considered to be a conservative assessment method.

Table 1 below summarises the conservative background noise levels adopted for the purposes of this assessment (i.e. RBLs and minimum L_{90} (1 hour) noise levels).

Table 1: Summary of Adopted Background Noise Levels – L_{A90} dB(A)

PERIOD	ADOPTED BACKGROUND NOISE LEVEL - dB(A)		
	BOWEN HILLS LOCAL AREA	ALBION RESIDENTIAL AREA	WINDSOR RESIDENTIAL AREA
5am to 7am	47	41	41
7am to 6pm	50	42	47
6pm to 10pm	47	42	40
10pm to 5am	42	36	35

The measured noise levels have been compared to noise measurements previously conducted by MWA Environmental and others at other locations within the Windsor and Albion residential areas, as follows:

- Noise monitoring conducted by MWA Environmental on McDonald Road, Windsor in 2010 recorded higher day, evening and night background noise levels than those recorded at Bowen Street, Windsor in 2014. This indicates that the Windsor residential area noise monitoring data adopted for the purposes of this assessment will provide a conservative basis for the determination of planning noise criteria.

- Noise monitoring conducted by Noise Measurement Services¹ on Lapraik Street, Albion (north of Crosby Road) in 2008 recorded higher day, evening and night background noise levels than those recorded at Royal Terrace, Albion in 2014. This indicates that the Albion residential area noise monitoring data adopted for the purposes of this assessment will provide a conservative basis for the determination of planning noise criteria.

2.2 RELEVANT NOISE CRITERIA

In accordance with the agreed assessment methodology² the relevant noise criteria for assessment of impacts at sensitive receptors have been determined based upon the Queensland *Environmental Protection (Noise) Policy 2008* 'controlling background creep' management intent for time-varying noise, as follows:

10 Controlling background creep

- (1) *This section states the management intent for an activity involving noise.*

Note—

See section 51 of the Environmental Protection Regulation 2008.

- (2) *To the extent that it is reasonable to do so, noise from an activity must not be—*

- (b) *for noise that varies over time measured by $L_{Aeq,adj,T}$ - more than 5dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.*

For activities that will occur between 10pm and 7am potential sleep disturbance impacts at dwellings will be considered based upon a design indoor noise level of L_{Amax} 45 dB(A) and assuming a sound transmission loss of 7 dB(A) through a façade with an open window.

The relevant *Environmental Protection (Noise) Policy 2008* 'controlling background creep' criteria for time-varying noise are summarised in **Table 2** below.

¹ *Noise Assessment Report for Residential Development 9-35 Burdett Street, Albion* (Noise Measurement Services, 9 September 2010)

² *Proposed Concrete Batching Plant at Abbotsford Road, Bowen Hills - Assessment Methodology – Noise* (MWA Environmental ref. L06214/BH/14-026, 28 February 2014)

Table 2: Relevant EP(Noise)P 2008 'Controlling Background Creep' Criteria For Sensitive Receptors – L_{Aeq} dB(A)

PERIOD	ADOPTED BACKGROUND - L_{A90} - dB(A)			ADOPTED SENSITIVE RECEPTOR NOISE LIMIT – $L_{Aeq,adj,T}$ - dB(A)		
	BOWEN HILLS LOCAL AREA	ALBION RESIDENTIAL AREA	WINDSOR RESIDENTIAL AREA	BOWEN HILLS LOCAL AREA	ALBION RESIDENTIAL AREA	WINDSOR RESIDENTIAL AREA
5am to 7am	47	41	41	52	46	46
7am to 6pm	50	42	47	55	47	52
6pm to 10pm	47	42	40	52	47	45
10pm to 5am	42	36	35	47	41	40

As the site will operate during the night period (10pm to 7am) it is appropriate to consider the potential for sleep disturbance within residential dwellings. The *Ecoaccess Guideline: Planning for Noise Control* provides the following in relation to sleep disturbance planning criteria:

Research has shown that the ability to get to sleep and, when asleep, the probability of experiencing a change of sleep state or ultimately of awakening are related to both the ambient and maximum instantaneous noise levels at the ear of the sleeper and the number of events during the night time period (WHO 1999). As a rule in planning for short-term or transient noise events, for good sleep over eight hours, the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45dBA maxLpA more than 10-15 times per night. The corresponding external noise level, assuming partially closed windows, is 52dBA maxLpA, measured in the free field.

As such, a sleep disturbance criteria of L_{Amax} 52 dB(A) external to dwellings with an open window has been applied for the purposes of night operations.

Based upon measurements conducted by MWA Environmental at the existing Hanson Lytton concrete batching plant, no tonal or impulsive adjustment is warranted. For further details refer to **Attachment 2**.

2.3 NOISE MODELLING

2.3.1 NOISE MODELLING METHODOLOGY

To enable assessment of noise from the proposed concrete batching plant operations a detailed noise model has been established using the SoundPLAN 7.3 software applying the ISO9613 standard. This model is an accepted regulatory model that allows input of site-specific terrain data and source noise data as sound power level spectra.

The noise modelling undertaken considered meteorological conditions as per the methodology of the ISO9613 standard, with a temperature of 10 degrees Celsius and 70% humidity, a temperature inversion and the following wind conditions as per the adverse meteorological assumptions of ISO9613:

Downwind propagation conditions for the method specified in this part of ISO 9613 are as specified in 5.4.3.3 of ISO 1996-2:1987, namely

- *Wind direction within an angle of $\pm 45^\circ$ of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region, with the wind blowing from source to receiver, and*
- *Wind speed between approximately 1m/s and 5m/s, measured at a height of 3m to 11m above the ground.*

As such, given the above adverse meteorological assumptions, it is considered that the results of the noise modelling represent the resultant noise levels of the proposed concrete batching plant activities during worst-case noise propagation conditions.

The SoundPLAN 7.3 model has been setup to represent noise emissions from the proposed concrete batching plans as per the site plan shown on **Figure 6**. The model layout and the source locations are shown on the drawings included in **Attachment 3**.

The model was established over an area of approximately 1500 metres by 1100 metres surrounding the site which is of sufficient area to include the potentially affected sensitive receptors in the Bowen Hills local area, the Windsor residential area and the Albion residential area.

The modelling has considered two operational scenarios, as follows:

Peak Operations – 5am to 10pm

Absolute peak operations scenario based upon the plant operating continuously to the design production limit and peak raw material delivery rates. This scenario is only applicable to the core business hours of 5am to 10pm.

Night Operations – 10pm to 5am

Expected peak night operations scenario based upon the plant operating at a production rate to supply concrete to an inner city night pour operating two concrete pumps³. Peak sand and aggregate delivery rates for early night period and up to two cement / flyash deliveries per hour.

The noise sources represented for each scenario are described in **Section 2.3.2** below. The modelling considered the resultant noise levels at the surrounding receptors with all noise sources operating simultaneously.

Given that dwellings at the locality are generally of highset construction, the model was setup to predict the resultant noise levels across the model domain for Upper Level (+4.3m) receptors.

2.3.2 SOURCE NOISE DATA

The sources represented in the SoundPLAN 7.3 model were as per the following **Table 3**.

³ 100m³ per hour pour rate at 6.5m³ per agitator truck => 15 agitator trucks per hour production rate

Table 3: Noise Sources Used in SoundPLAN 7.3 Modelling

MODELLED NOISE SOURCE		MODELLED SOURCE TYPE
PEAK OPERATIONS (5am to 10pm)	NIGHT OPERATIONS (10pm to 5am)	
Loading Agitator Truck at Batching Point (3 simultaneously)	Loading Agitator Truck at Batching Point	Indoor Point Sources Within Industrial Building Source
Agitator Truck at Slump Stand (6 simultaneously)	Agitator Truck at Slump Stand (2 simultaneously)	Indoor Point Sources Within Industrial Building Source
Unloading Bulk Cement (2 simultaneously)	Unloading Bulk Cement	Indoor Point Sources Within Industrial Building Source
Agitator Truck at Washout Pit (2 simultaneously)	Agitator Truck at Washout Pit	Indoor Point Sources Within Industrial Building Source
Batching Building	Batching Building	Industrial Building Source
Bulk Aggregate Store	Bulk Aggregate Store	Industrial Building Source
Delivery Conveyor System	Delivery Conveyor System	Point Source
Building Extraction Fan	Building Extraction Fan	Point Source
Agitator Trucks (60 per hour)	Agitator Trucks (15 per hour)	Line Source (as Moving Point Source)
Aggregate / Sand Delivery Trucks (7 per hour)	Aggregate / Sand Delivery Trucks (7 per hour)	Line Source (as Moving Point Source)
Cement/Flyash Delivery Trucks (4 per hour)	Cement/Flyash Delivery Trucks (1 per hour)	Line Source (as Moving Point Source)
Bag Filter Fan (x4)	Bag Filter Fan (x4)	Point Sources

Sound power data for the noise sources was derived from measurements conducted by MWA Environmental at the existing Hanson concrete batching plant at Lytton. Supplementary noise data was input for trucks and cement deliveries based upon from previous measurements at Hanson concrete batching plants. The source noise data and a plan showing the modelled source locations are provided in **Attachment 3**.

The Sound Transmission Loss (STL) through the walls, roofs and open doors of the proposed buildings was input to the model as follows:

Table 4: Modelled Building Component Sound Transmission Loss

CONSTRUCTION ELEMENT	SOUND TRANSMISSION LOSS - dB(A)										Rw
	FREQUENCY BAND (Hz)										
	32	63	125	250	500	1	2	4	8	16	
	Hz	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz	kHz	
Concrete wall sections	-	22	36	36	41	51	59	65	65	-	48
Steel sheeting wall sections	-	10	14	16	20	25	29	23	20	-	25
Steel sheeting wall sections with insulation to interior	-	-	15	20	28	37	43	40	-	-	32
Doorway (Open)	0	0	0	0	0	0	0	0	0	0	0

2.3.3 NOISE CONTROL MEASURES

Based upon the plant design features and recommendations of MWA Environmental the following noise control measures shall be implemented at the concrete batching plant:

- **Location of slump stands, loading bays and cement tanker unloading points within a building** with openings aside from the eastern facade being closed using fast-closing doors aside from allowance for vehicle access. Building to be constructed of concrete lower wall with Trimdek upper wall and roof construction (or other materials achieving equivalent or higher sound transmission loss). Absorptive insulation to inside faces of wall and roof to reduce reverberant noise levels.
- **Location of wash bays within a building** with opening to the eastern façade. Building to be constructed of Trimdek (or similar) wall and roof materials (or other materials achieving equivalent or higher sound transmission loss).
- Pneumatic actuators to weigh hoppers etc. are to be fitted with effective **silencers**.
- Agitator trucks owned or contracted to Hanson shall be fitted with **broadband reversing alarms** and not tonal beepers.
- **Minimum 3 metre high acoustic barrier to the western site boundary** to the north of the existing brick façade building (refer **Figure 8**).
- **Minimum 4 metre high acoustic barrier to the east of the slumping building** extending at least 15 metres north from the eastern point of the building (refer Site Plan and **Figure 8**).

The recommended acoustic barriers and buildings/enclosures are shown on **Figure 8**.

The above noise control measures have been represented in the noise modelling presented in this report.

2.3.4 NOISE MODELLING RESULTS

The results of the SoundPLAN 7.3 modelling are provided in **Attachment 4** as contours of predicted resultant L_{Aeq} and L_{Amax} noise levels over an aerial photograph base showing the representative receptor locations.

Table 5 below summarises the predicted resultant noise levels at the nominated sensitive receptors in the Bowen Hills local area, the Windsor residential area and the Albion residential area.

**Table 5: Summary of Model Results for Nominated Residences – dB(A)
Upper Level Receivers**

RECEPTOR # (refer Figure 5)	LOCATION	PREDICTED RESULTANT NOISE LEVEL - dB(A)		
		5am to 10pm	10pm to 5am	24 hour
		$L_{Aeq,adj,T}$	$L_{Aeq,adj,T}$	$L_{Amax,adj,T}$
1	Royal Terrace (Albion Residential Area)	38	34	40
2	Crosby Road (Albion Residential Area)	40	35	42
3	Grafton Street (Windsor Residential Area)	35	33	37
4	Albany Street (Windsor Residential Area)	35	33	38
5	Nariel Street (Bowen Hills Industrial Area)	48	45	50
6	Immarna Street (Bowen Hills Industrial Area)	40	36	42
7	Tate Street (Bowen Hills Industrial Area)	41	37	42
8	Bimbil Street (Bowen Hills Industrial Area)	40	38	42

The results of the modelling indicate that, with the proposed noise control measures, the resultant noise levels at surrounding sensitive receptor locations will comply with the relevant noise criteria for 24 hour operations.

3.0 DUST IMPACT ASSESSMENT

3.1 AMBIENT DUST CONCENTRATIONS

Ambient air quality monitoring was generally sourced from the Queensland DEHP as contained in *Ambient Air Quality in Queensland 2012 Annual Summary and Trend Report*. A summary of the ambient dust data applied to this assessment is provided in **Table 6** below.

Table 6: Ambient Dust Data Applied to Assessment

POLLUTANT	AVERAGING TIME	AMBIENT ($\mu\text{g}/\text{m}^3$)*	SOURCE
TSP	Annual Average	31.0	Conservative assumption of double Springwood Year 2012 PM ₁₀ 75 th percentile
PM ₁₀	24 Hour Average	15.5	24-hour average 75 th percentile for 2012 at Springwood
PM _{2.5}	24 Hour Average	5.5	24-hour average 75 th percentile for 2012 at Springwood
PM _{2.5}	Annual Average	3.7	24-hour average 50 th percentile for 2012 at Springwood
Deposition	Monthly average expressed as a rate per day	40 mg/m ² /day	Typical regional value

* unless stated otherwise

3.2 RELEVANT DUST GUIDELINES

In accordance with the agreed assessment methodology⁴ the relevant air quality objectives for assessment of impacts at sensitive receptors have been determined based upon the Queensland *Environmental Protection (Air) Policy 2008* Air Quality Objectives, as per **Table 7** below.

⁴ *Proposed Concrete Batching Plant at Abbotsford Road, Bowen Hills - Assessment Methodology – Air Quality* (MWA Environmental ref. L06114/BH/14-026, 28 February 2014)

Table 7: Applicable Air Quality Objectives

POLLUTANT	AVERAGING PERIOD	GUIDELINE
TSP	Annual Average	90 µg/m ³
PM ₁₀	24 Hour Average (6 th highest)	50 µg/m ³
PM _{2.5}	Annual Average	8 µg/m ³
PM _{2.5}	24 Hour Average	25 µg/m ³
Dust Deposition	Monthly Average	120 mg/m ² /day ⁵

3.3 DUST MODELLING

3.3.1 DUST MODELLING METHODOLOGY

To enable assessment of dust concentrations and deposition rates from the proposed concrete batching plant operations at sensitive receptor locations, detailed dispersion modelling has been conducted using the regulatory approved AUSPLUME 6.0 Atmospheric Dispersion Model.

The AUSPLUME model was setup to represent a 1600 metre x 1300 metre area incorporating the proposed concrete batching plant and sensitive receptors within the Bowen Hills local area, the Windsor residential area and the Albion residential area. A 50 metre grid resolution was modelled to produce contours for gridded receptors within the model domain. Terrain effects were considered within the model area.

AUSPLUME defaults were used for Urban areas with a surface roughness of 0.4 based upon the land use at the locality and the proposed development and surrounding land uses. The model has been run using the meteorological data file for Brisbane, which is considered to be the DEHP meteorological data set most applicable to the subject site. Whilst the local meteorology will be slightly different, the overriding regional influences are considered appropriate for the purpose of the modelling.

The model-predicted dust concentrations / deposition rates due to emissions from the proposed concrete batching plant activities were added to the ambient concentrations presented in **Table 6** above to assess the cumulative dust exposure at sensitive receptors.

In order to assess the potential dust deposition from the concrete batching plant it was necessary to model a particle size distribution. It is considered reasonable to apply a generalised particle size distribution for the purposes of this modelling.

⁵ Assessed as annual average

The modelled particle size distribution was derived from the USEPA AP42 *Appendix B.2 Generalized Particle Size Distributions*⁶ for concrete batching.

A detailed summary of the particle size distributions input to the TSP, PM₁₀ and PM_{2.5} models is provided as **Attachment 5**.

3.3.2 RECOMMENDED DUST CONTROL MEASURES

Based upon the plant design features and recommendations of MWA Environmental the following dust control measures shall be implemented at the concrete batching plant:

- Aggregate and sand is to be delivered to **drive-over bins** and transferred directly to the bulk aggregate store building via **covered conveyors**.
- Loading of agitator trucks to occur in an **enclosure with an appropriate dust collection and filtration system**
- Cement and flyash **storage silos will incorporate effective dust filter systems** (e.g. reverse pulse bag filters) with filter medium breakthrough alarms, low level relief points and automatic cut-off and/or high level alarms to silos to prevent overfilling
- The **site is to be sealed and regularly cleaned** to minimise silt loading and potential dust emissions from wind erosion and vehicle manoeuvring

3.3.3 DUST EMISSION SOURCES

The following dust emission sources were represented as a combined area source in the AUSPLUME Dispersion Model:

- Wheel generated dust from vehicle movements onsite (paved road)
- Dust emissions from transfer of aggregate and sand
- Cement unloading to silo
- Supplement unloading to silo
- Loading of agitator trucks with cement, aggregate and sand

Wind erosion from stockpiles is not an emission source for the proposed plant as there is no external storage of raw materials. Aggregate and sand is to be delivered to drive-over bins and then transferred directly to the bulk aggregate storage building (enclosed).

⁶ USEPA (2006) Compilation of Air Pollutant Emission Factors – Volume 1: Stationary Point and Area Sources, AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles, United States Environmental Protection Agency.

Emissions rates for each of the above sources have been calculated using published emission factors from the following references:

- NPI *Emission Estimation Technique Manual for Mining v2.3*, Environment Australia (2001)
- USEPA AP42 Chapter 13.2.1 *Paved Roads* (2011)
- USEPA AP42 Chapter 11.12 *Concrete Batching* (2006)

Emission rates are related to the production rate at the plant. Ultimately production rates are dictated by market demand. For the purposes of this assessment, the daily production rate has been based upon the historical production rates from an existing inner city Hanson plant (two loading points) and up-scaled by 50% to account for the additional loading point at the proposed plant. This is considered to be a conservative basis for the assessment of emission rates from the proposed plant.

The dust emission rates have been calculated considering the proposed dust emission control measures outlined in **Section 3.3.2** above:

Dust emissions from site activities have been represented in the model as varying by hour of day based upon a 24 hour operational profile based upon an existing inner city Hanson plant.

Detailed emission rate calculations are included as **Attachment 6**.

3.3.4 DUST MODELLING RESULTS

Dispersion modelling has been undertaken for gridded receptors within the model domain. The gridded receptor results have been plotted using a contouring package to provide a graphical representation of the extent of dust concentrations and deposition rates, whilst discrete receptor models provide predicted concentrations at the representative sensitive receptors.

A tabulated summary of the model-predicted dust concentrations and deposition rates at the representative sensitive residences (refer **Figure 5**) is provided in **Table 8** below. The tabulated concentrations include the ambient concentrations presented in **Table 6** above.

Gridded receptor model results are presented in **Attachment 7** as contours over an aerial photograph base. The plotted concentrations / deposition rates include the ambient concentrations specified in **Table 6** above.

Complete electronic model input and output files are available to DSDIP by request to mail@mwaenviro.com.au

Table 8: Model-Predicted Dust Exposure at Representative Sensitive Receptors (including ambient)

RECEPTOR (refer Figure 5)	PREDICTED CONCENTRATION (INCLUDING AMBIENT) - $\mu\text{g}/\text{m}^3$				DUST DEPOSITION (INCLUDING AMBIENT) - $\text{mg}/\text{m}^2/\text{day}$	COMPLIANCE ?
	TSP (ANNUAL AVERAGE)	6 th HIGHEST PM ₁₀ (24 HR AVERAGE)	HIGHEST PM _{2.5} (24 HR AVERAGE)	PM _{2.5} (ANNUAL AVERAGE)	DEPOSITION (ANNUAL AVERAGE)	
R1	31.4	18.3	5.5	3.7	41	YES
R2	33.6	23.5	5.5	3.7	43.8	YES
R3	32.1	19.9	5.5	3.7	42.2	YES
R4	32.1	21	5.5	3.7	41.8	YES
R5	35.8	36.7	5.5	3.7	46.8	YES
R6	38.8	38.6	5.5	3.7	57.7	YES
R7	38.2	39.6	5.5	3.7	51.8	YES
R8	33.9	24	5.5	3.7	46.3	YES
GUIDELINE	90	50	25	8	120	

The modelling conducted demonstrates that, with the proposed dust control measures (refer **Section 3.3.2**), the proposed 24 hour operation concrete batching plant will readily comply with the air quality objectives of the Queensland *Environmental Protection (Air) Policy 2008* at surrounding sensitive receptors.

5.0 CONCLUSION

MWA Environmental has been engaged by Hanson Construction Materials Pty Ltd to prepare a Noise & Dust Impact Assessment for a proposed concrete batching plant at Bowen Hills. The report addresses the potential impact of noise and dust emissions from the proposed concrete batching plant activities on surrounding sensitive land uses with reference to the relevant regulatory noise limits and air quality objectives.

The proposed concrete batching plant incorporates a high standard of noise and dust control. Approval is sought for the concrete batching plant to operate on a 24 hour / 7 day basis as necessary to meet market demands.

Consideration has been given to sensitive receptors within the Bowen Hills local industry area, the Windsor residential area and the Albion residential area.

Ambient noise monitoring and detailed computer noise modelling of the proposed concrete batching plant demonstrates that, with the proposed noise control measures, the resultant noise levels at surrounding sensitive receptor locations will comply with the relevant noise criteria for 24 hour operations.

The following noise control measures shall be implemented at the concrete batching plant:

- **Location of slump stands, loading bays and cement tanker unloading points within a building** with openings aside from the eastern facade being closed using fast-closing doors aside from allowance for vehicle access. Building to be constructed of concrete lower wall with Trimdek upper wall and roof construction (or other materials achieving equivalent or higher sound transmission loss). Absorptive insulation to inside faces of wall and roof to reduce reverberant noise levels.
- **Location of wash bays within a building** with opening to the eastern façade. Building to be constructed of Trimdek (or similar) wall and roof materials (or other materials achieving equivalent or higher sound transmission loss).
- Pneumatic actuators to weigh hoppers etc. are to be fitted with effective **silencers**.
- Agitator trucks owned or contracted to Hanson shall be fitted with **broadband reversing alarms** and not tonal beepers.
- **Minimum 3 metre high acoustic barrier to the western site boundary** to the north of the existing brick façade building (refer **Figure 8**).
- **Minimum 4 metre high acoustic barrier to the east of the slumping building** extending at least 15 metres north from the eastern point of the building (refer Site Plan and **Figure 8**).

Detailed dust dispersion modelling of the proposed concrete batching plant demonstrates that, with the proposed dust control measures, compliance with the relevant air quality objectives can be achieved at surrounding sensitive receptors.

The following dust control measures shall be implemented at the concrete batching plant:

- Aggregate and sand is to be delivered to **drive-over bins** and transferred directly to the bulk aggregate store building via **covered conveyors**.
- Loading of agitator trucks to occur in an **enclosure with an appropriate dust collection and filtration system**
- Cement and flyash **storage silos will incorporate effective dust filter systems** (e.g. reverse pulse bag filters) with filter medium breakthrough alarms, low level relief points and automatic cut-off and/or high level alarms to silos to prevent overfilling
- The **site is to be sealed and regularly cleaned** to minimise silt loading and potential dust emissions from wind erosion and vehicle manoeuvring

In summary, the noise and dust impact assessment has concluded that, with appropriate management measures and physical emission controls, the proposed 24 hour operation concrete batching plant shall not cause unreasonable amenity impacts at sensitive receptors.

MWA Environmental
10 April 2014

FIGURES

LEGEND
SITE BOUNDARY

DRAWING REFERENCES
- © THE STATE OF QUEENSLAND 2013 QLD GLOBE
- GOOGLE EARTH PRO, 2012.



CLIENT
Hanson Construction Materials Pty Ltd
c/o Groundwork Plus

PROJECT

BOWEN HILLS
Noise and Dust
Impact Assessment

Proposed Concrete Batching Plant
Abbotsford Road Bowen Hills Qld

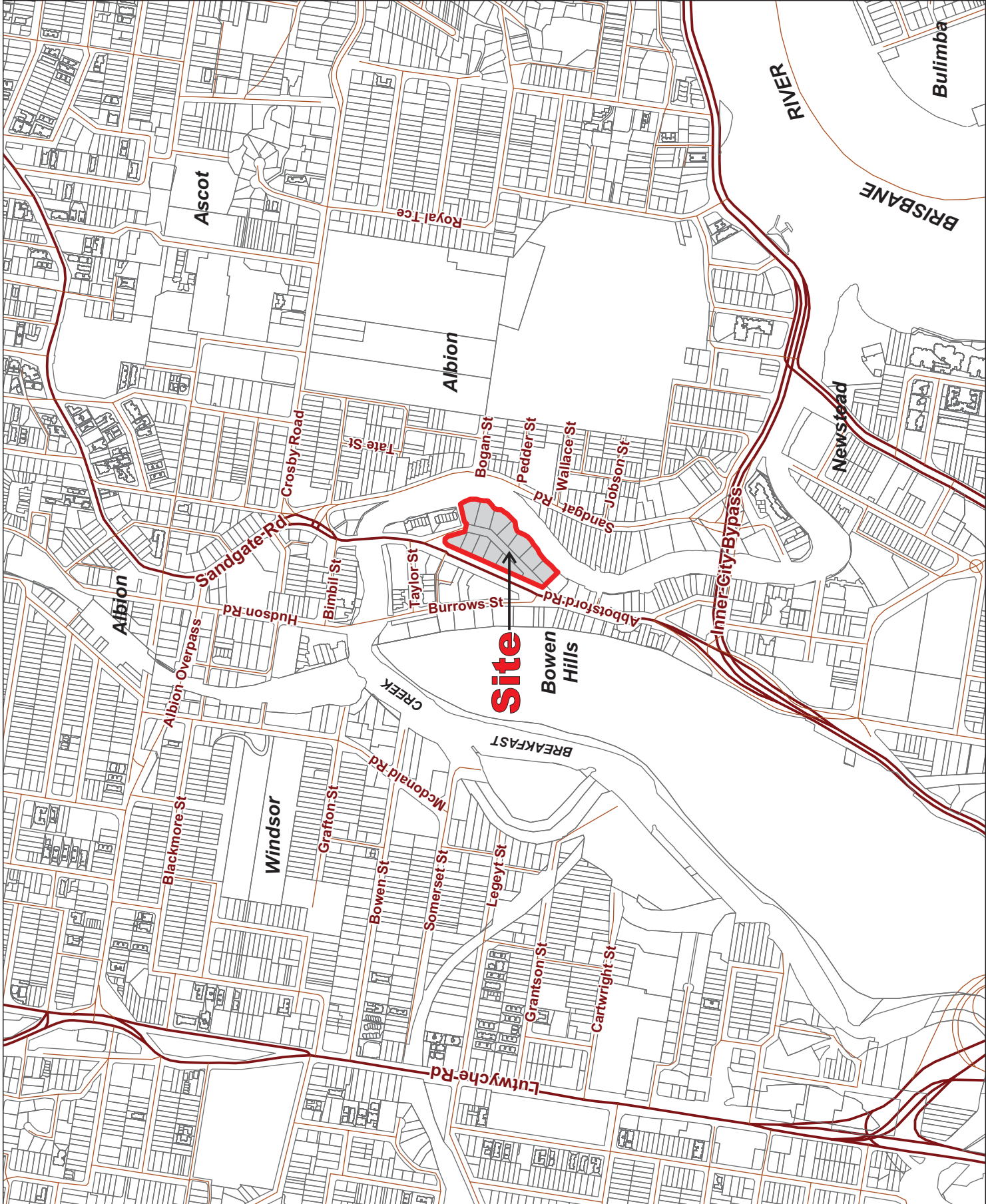
TITLE

GENERAL
SITE LOCATION

FIGURE 1	
JOB NO.	BOWEN HILLS
JOB NO.	14-026
DATE	10/04/14
SCALE	1:10,000 (A4)
REV.	14-026-1



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Legend

Suburb Boundary

Street Name 2500

Area Classification

Conservation

Character Residential

Community Use Area

Emerging Communities Area

Extractive Industry Area

Environmental Protection Area

Future Industry Area

General Industry Area

Heavy Industry Area

High Density Residential Area

Investigation Area

Light Industry Area

Low-Medium Density Residential Area

Low Density Residential Area

Multi Purpose Centre City Centre MP1

Multi Purpose Centre Major Centre MP2

Multi Purpose Centre Suburban Centre MP3

Multi Purpose Centre Convenience Centre MP4

Medium Density Residential Area

Park Land Area

Rural Area

Special Purpose Centre

Sport And Recreation Area

CLIENT
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PROJECT
BOWEN HILLS
Noise and Dust
Impact Assessment
Proposed Concrete Batching Plant
Abbotsford Road Bowen Hills Qld

TITLE

BCC PDONLINE
AREA CLASSIFICATION

FIGURE 2	
JOB NO.	BOWEN HILLS
JOB NO.	14-026
DATE	10/04/14
SCALE	NOT TO SCALE
REV.	14-026-2

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LEGEND
SITE BOUNDARY

DRAWING REFERENCES
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PROJECT

BOWEN HILLS
Noise and Dust
Impact Assessment

Proposed Concrete Batching Plant
Abbottsford Road Bowen Hills Qld

TITLE

AERIAL PHOTOGRAPH
LOCAL AREA

FIGURE 3	
JOB NO.	BOWEN HILLS
JOB NO.	14-026
DATE	10/04/14
SCALE	1:4,000 (A4)
REV.	14-026-3



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LEGEND
SITE BOUNDARY

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PROJECT

BOWEN HILLS
Noise and Dust
Impact Assessment

Proposed Concrete Batching Plant
Abbotsford Road Bowen Hills Qld

TITLE

AERIAL PHOTOGRAPH
STUDY REGION

FIGURE 4	
JOB NO.	BOWEN HILLS
JOB NO.	14-026
DATE	10/04/14
SCALE	1:7 000 (A4)
REV.	14-026-4



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LEGEND

SITE BOUNDARY
REPRESENTATIVE SENSITIVE
RECEPTOR LOCATIONS (1-8)

(R8)

DRAWING REFERENCES

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PROJECT

BOWEN HILLS
Noise and Dust
Impact Assessment

Proposed Concrete Batching Plant
Abbotsford Road Bowen Hills Qld

TITLE

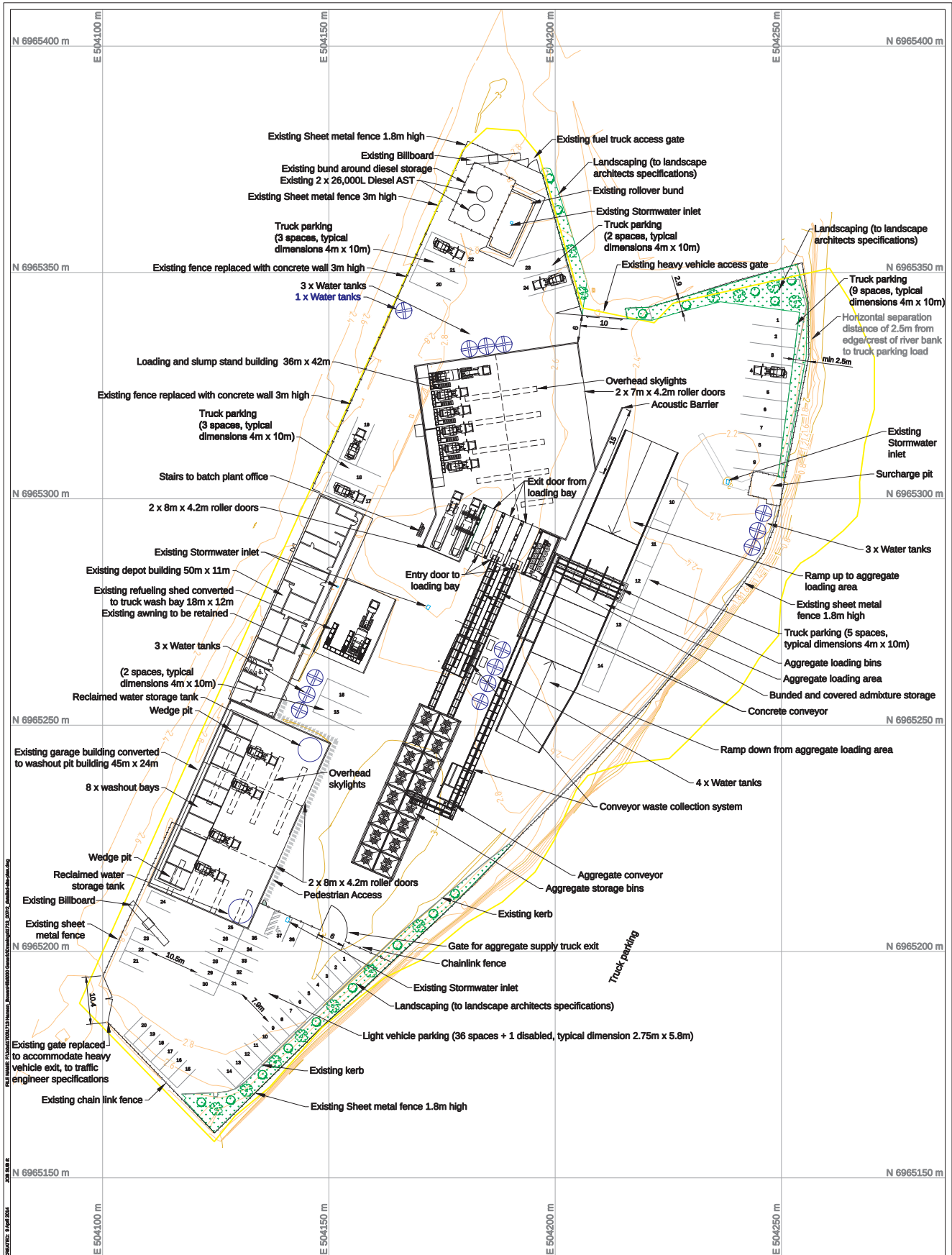
REPRESENTATIVE
SENSITIVE RECEPTOR
LOCATIONS

FIGURE 5	
JOB NO.	BOWEN HILLS
JOB NO.	14-026
DATE	10/04/14
SCALE	1:7 000 (A4)
REV.	14-026-5



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REV	DESCRIPTION	DATE	BY
1	Changes to design based on new survey info and traffic sign input	07/04/24	LF
2	Revising landscaping and truck parking to north west corner	08/04/24	LF

Legend:
Site Boundary



PROJECT
Bowen Hills Concrete Batching Plant
CLIENT
Hanson Construction Materials Pty Ltd

TITLE
Detailed Site Layout
SCALE
1:750
DRAWING NUMBER
14-026
REVISION
DATE
10/04/14
SCALE
1:1200 (A4)



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PROJECT
BOWEN HILLS
Noise and Dust Impact Assessment
Proposed Concrete Batching Plant - Abbotsford Road Bowen Hills Qld
CLIENT
Hanson Construction Materials Pty Ltd c/o Groundwork Plus
DRAWING REFERENCE
Groundwork Plus

TITLE
GENERAL SITE LAYOUT
JOB
BOWEN HILLS
JOB NO.
14-026
DATE
10/04/14
SCALE
1:1200 (A4)
FIGURE 6
DRAWING NUMBER
14-026-6

LEGEND
 SITE BOUNDARY
 NOISE DATALOGGER LOCATIONS (1-3)

DRAWING REFERENCES
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PROJECT
BOWEN HILLS
 Noise and Dust
 Impact Assessment
 Proposed Concrete Batching Plant
 Abbotsford Road Bowen Hills Qld

TITLE

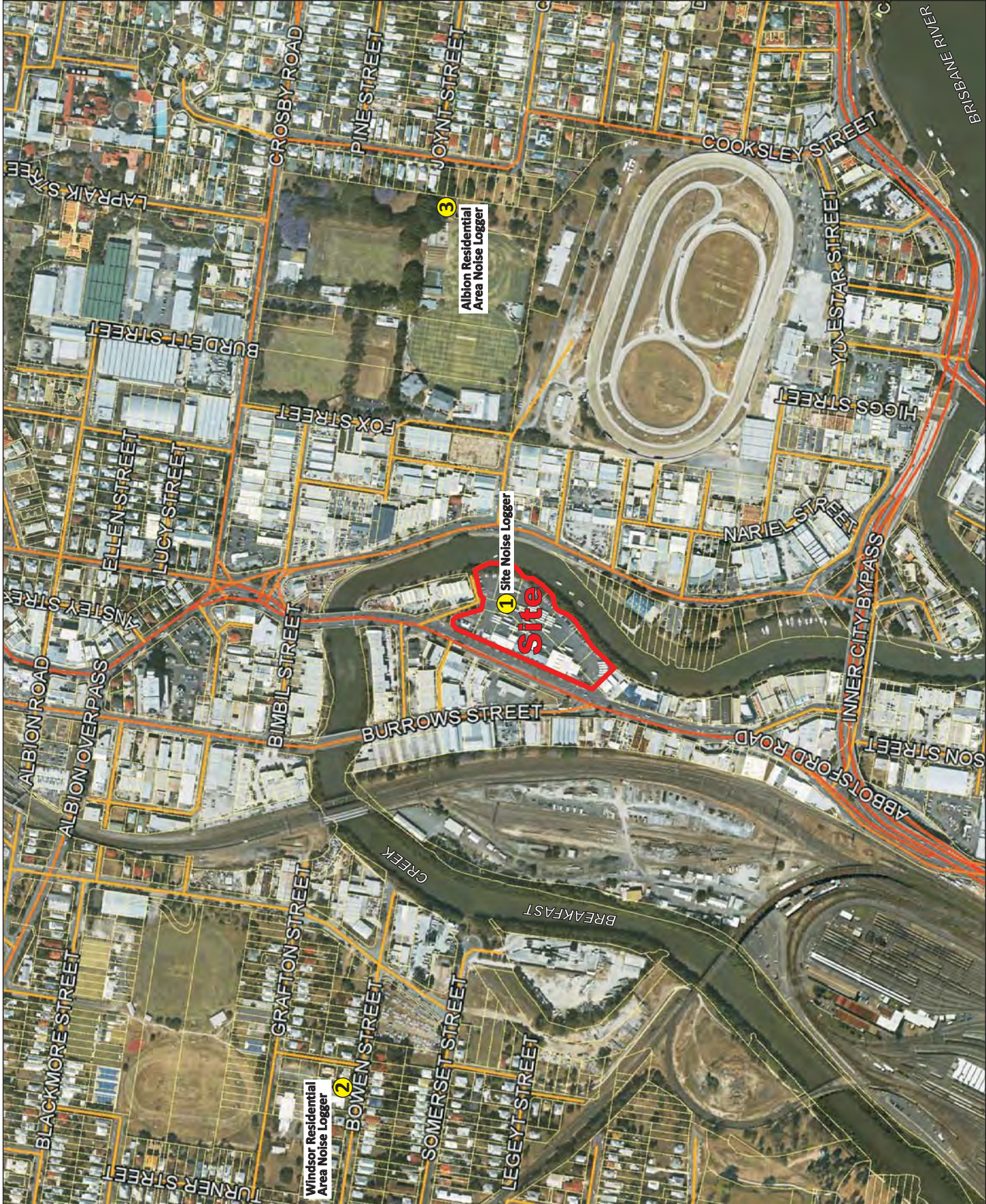
NOISE MONITORING LOCATIONS

FIGURE 7		
JOB NO.	BOWEN HILLS	
DATE	14-02-16	
SCALE	1:7 000 (A4)	
REV.		

DRAWING NUMBER	14-026-7
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**Slumping Building
(Sheet Steel or Higher
Sound Transmission
Loss and Acoustic
Absorptive Internal Lining)**

**Acoustic Barrier
Height 3m**

Opening

**Acoustic Barrier
Height 4m Minimum
Length 15m**

Opening

**Wash Bay Building
(Sheet Steel or Higher STL)**

REV	DESCRIPTION	DATE	BY
01	Changes to design based on noise survey info and traffic sign input	09/04/14	LY
02	Revising landscaping and truck parking to match aerial context	09/04/14	LY

Legend:
Site Boundary



PROJECT
**Bowen Hills Concrete
Batching Plant**
CLIENT
**Hanson Construction Materials
Pty Ltd**

GROUNDWORK
plus
PH: +61 7 3871 0411
WWW.GROUNDWORKPLUS.COM.AU

Detailed Site Layout

SCALE: 1:750
0 15
DRAWING NUMBER: 14-026
REVISION:
DATE: 10/04/14
CHECKED: 9 April 2014
MWA



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PROJECT

CLIENT
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DRAWING REFERENCE
Groundwork Plus

TITLE

NOISE CONTROL MEASURES

JOB
BOWEN HILLS
JOB NO.
14-026
DATE
10/04/14
SCALE
1:1200 (A4)

FIGURE 8

DRAWING NUMBER
14-026-8

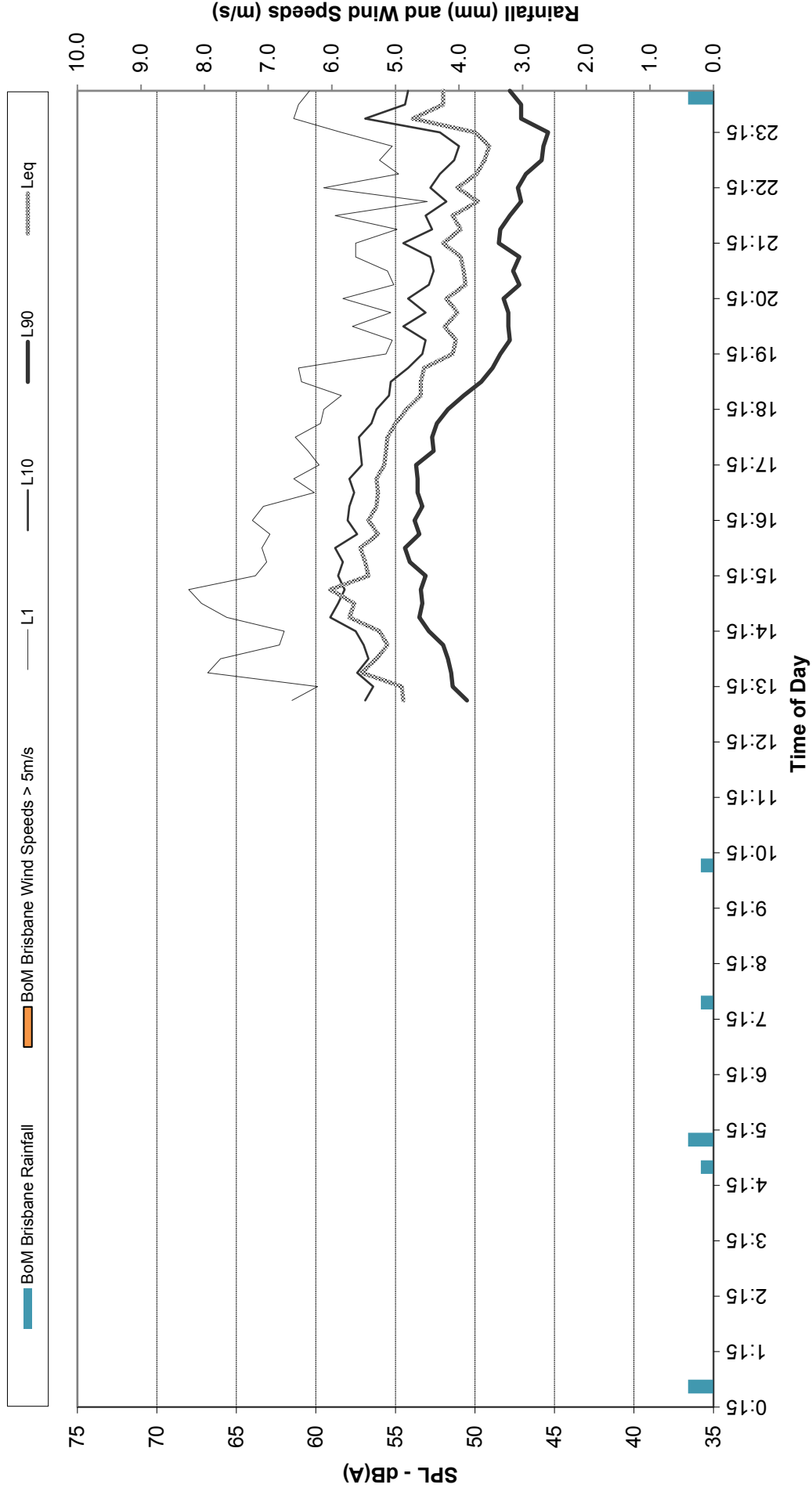
ATTACHMENT 1

Summary of Noise Monitoring Data

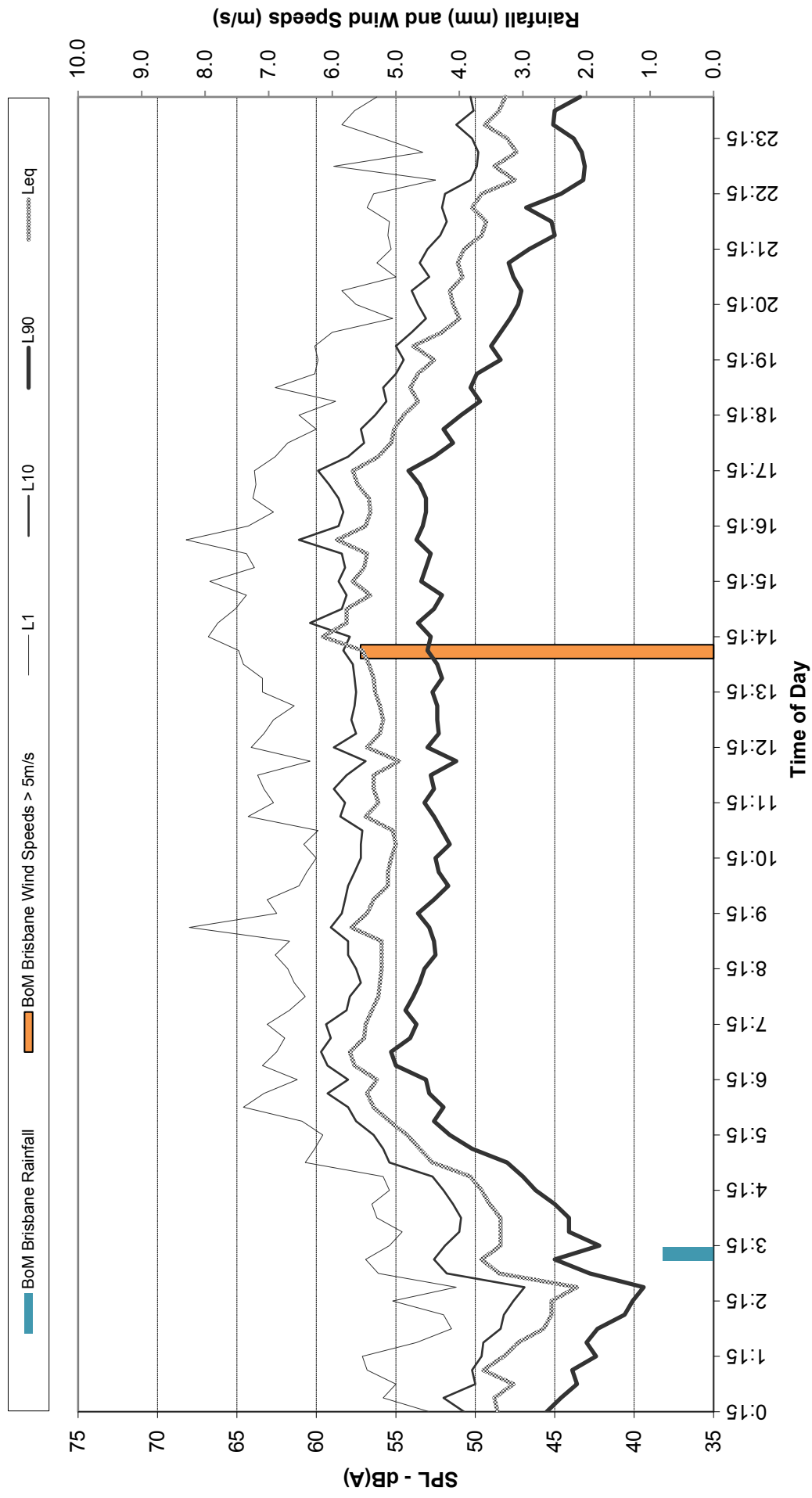
Bowen Hills Industrial Area (subject site)
Albion Residential Area (Royal Terrace)
Windsor Residential Area (Bowen Street)

BOWEN HILLS LOCAL AREA

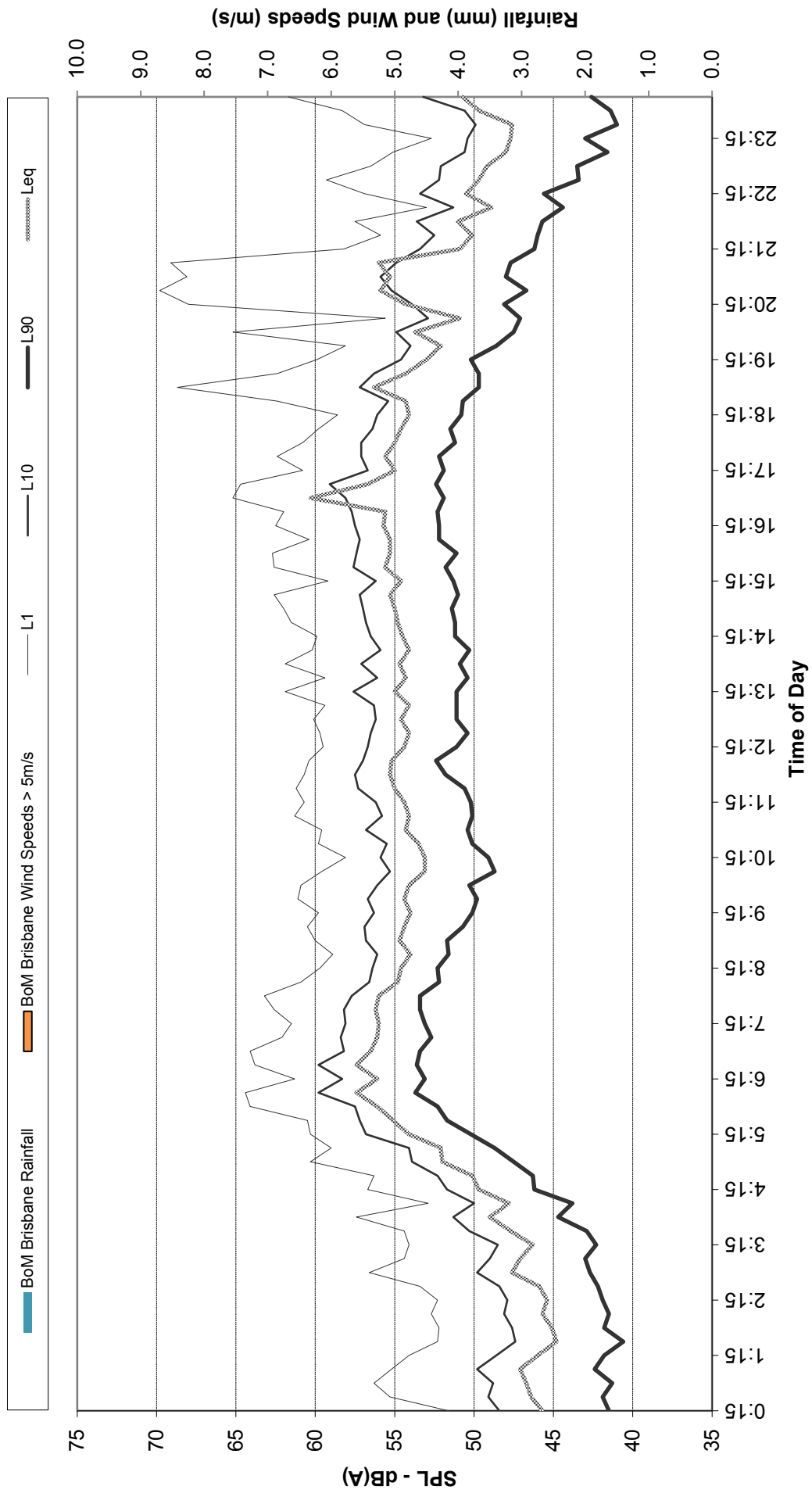
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 24-Feb-2014 - Monday



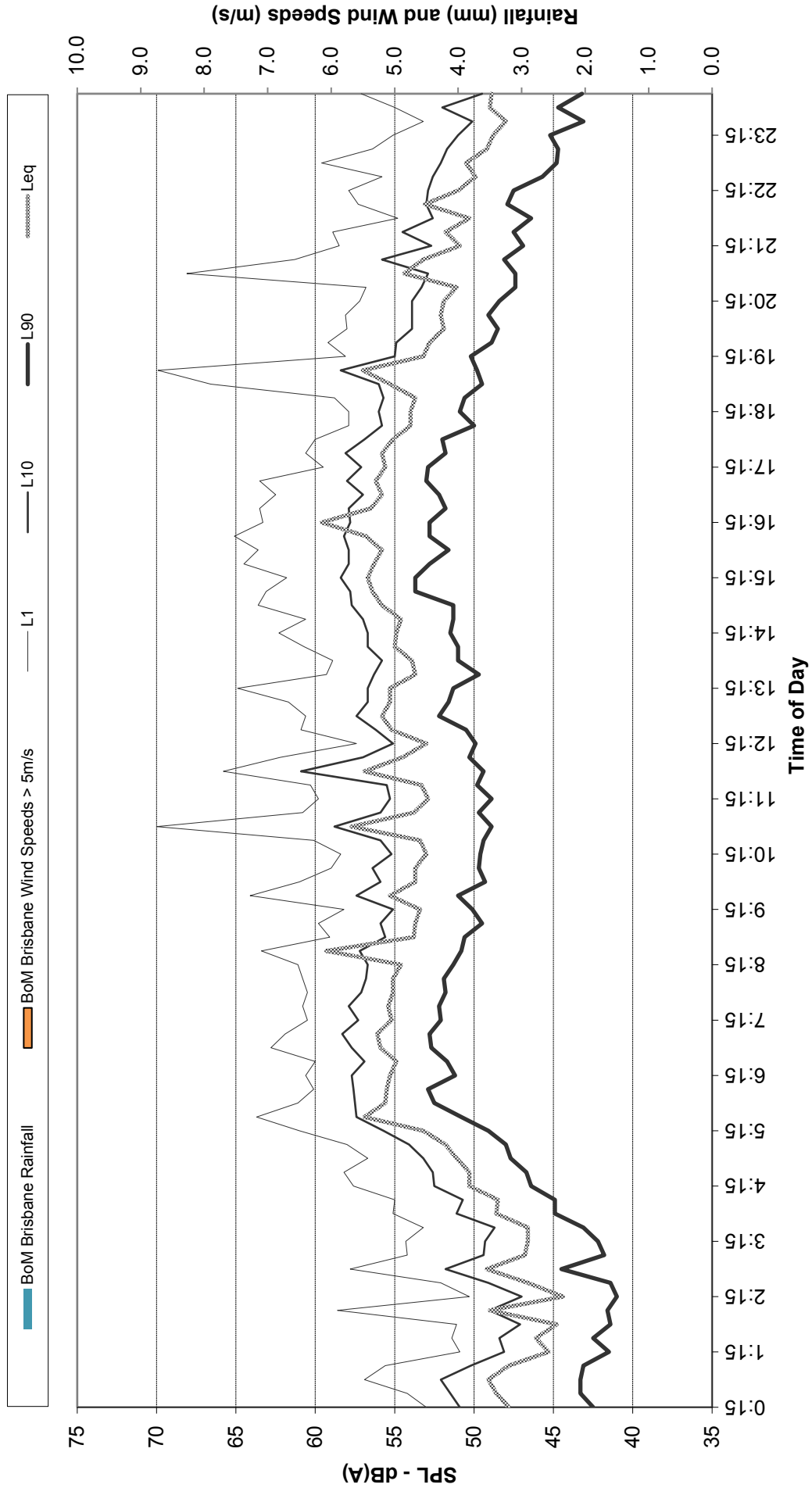
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 25-Feb-2014 - Tuesday



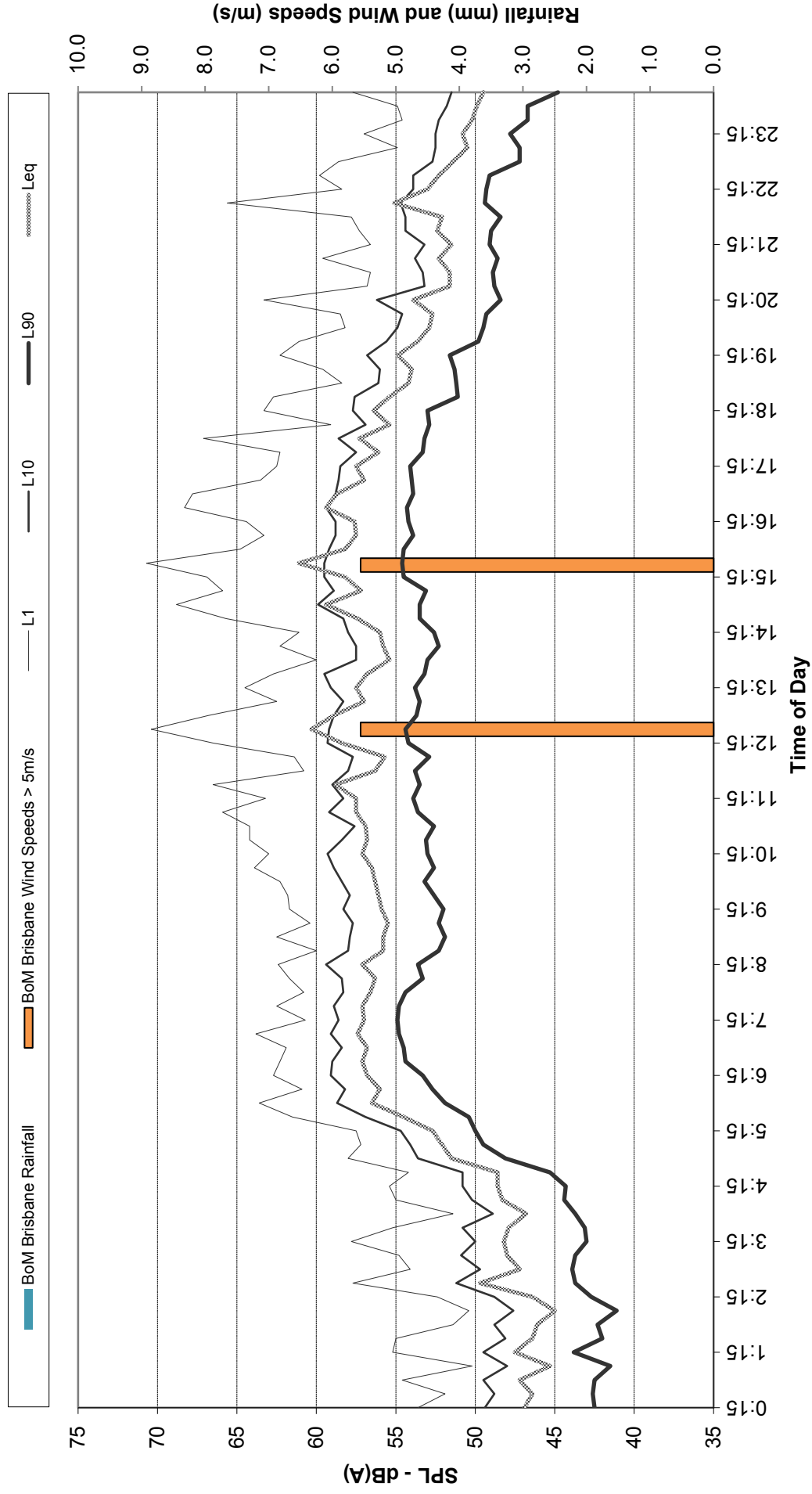
**Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 26-Feb-2014 -
Wednesday**



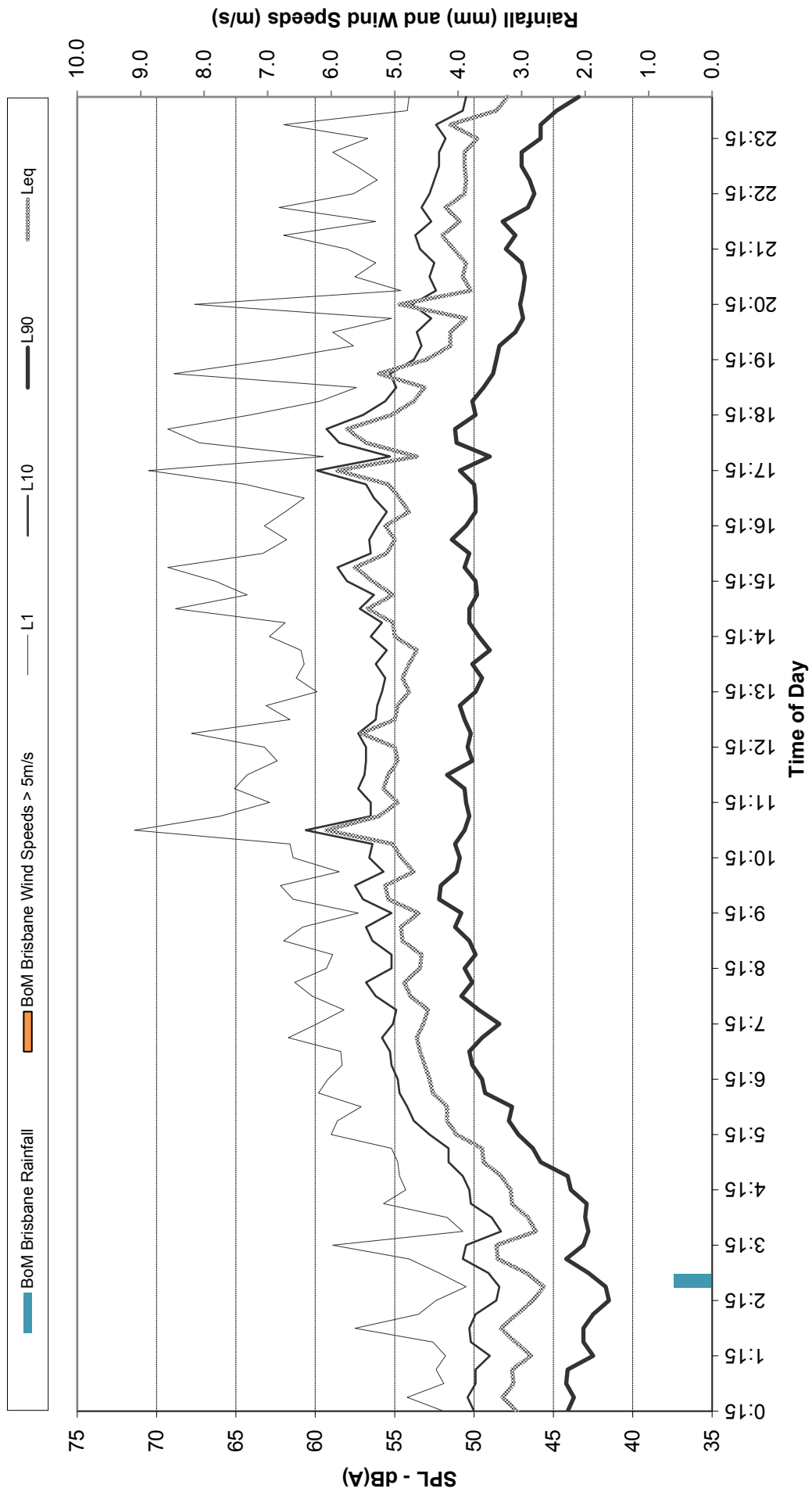
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 27-Feb-2014 - Thursday



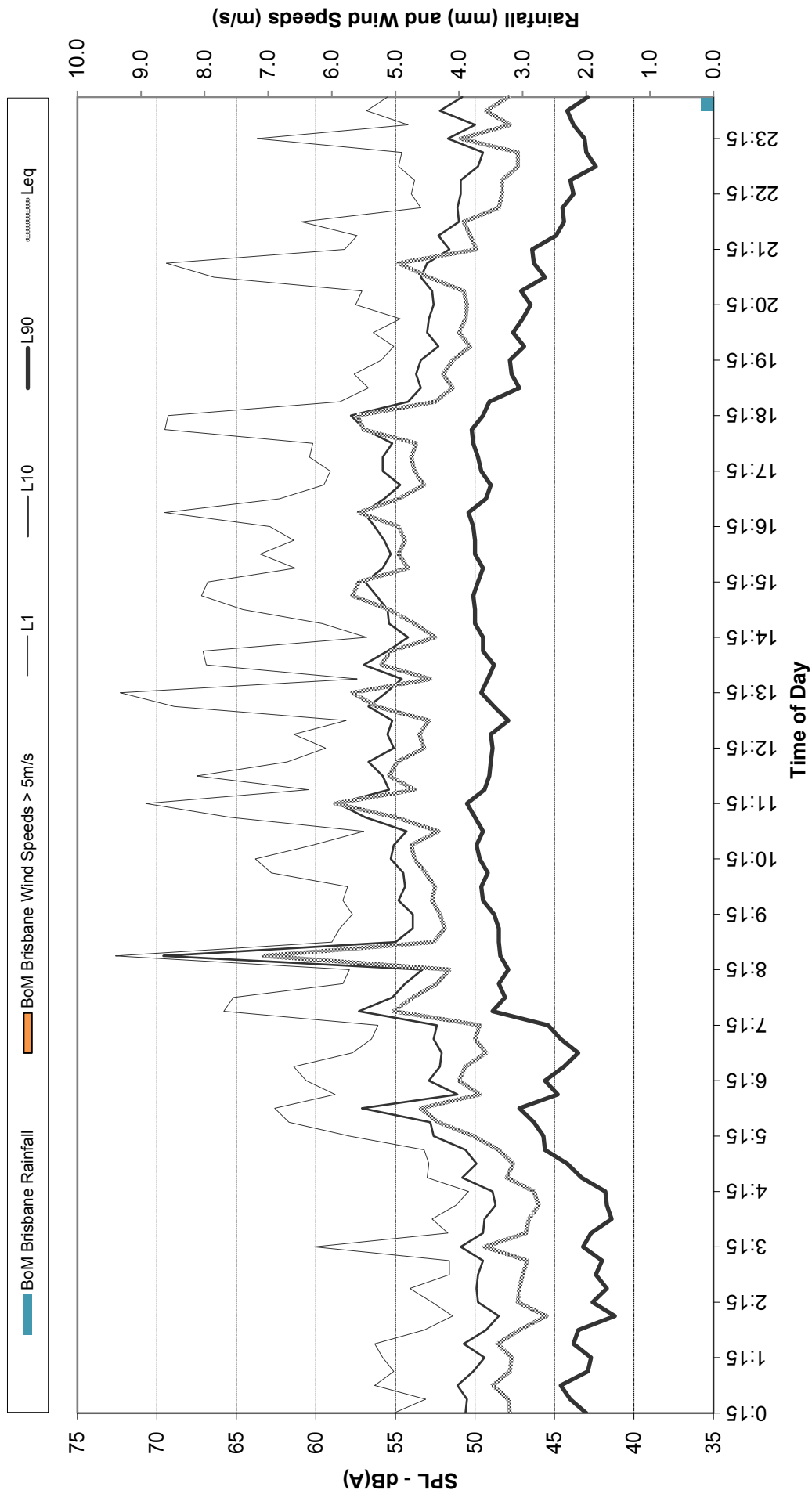
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 28-Feb-2014 - Friday



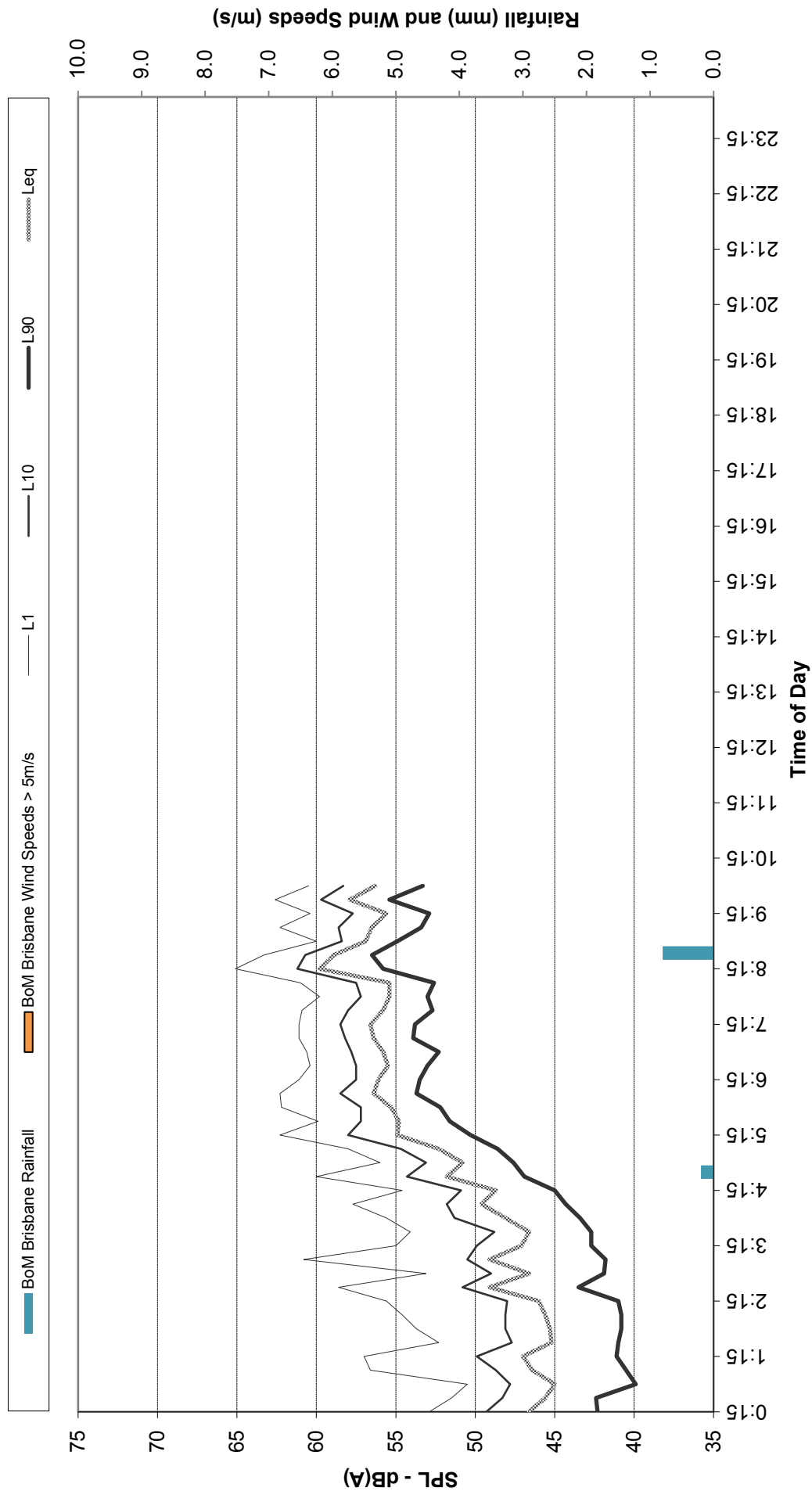
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 01-Mar-2014 - Saturday



Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 02-Mar-2014 - Sunday

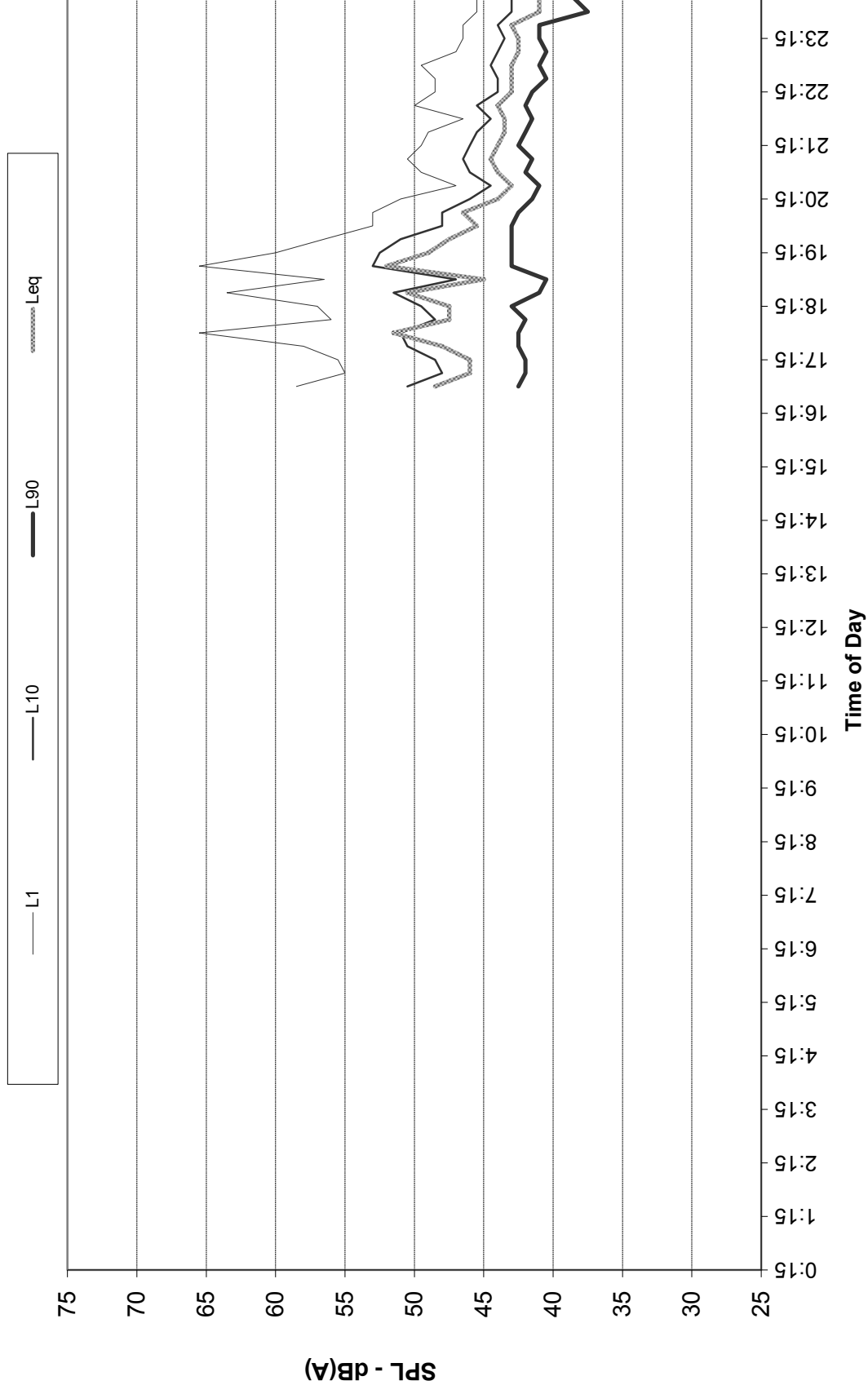


Recorded Statistical Noise Levels for Bowen Hills 14-026 - Abbotsford Road Site - 03-Mar-2014 - Monday

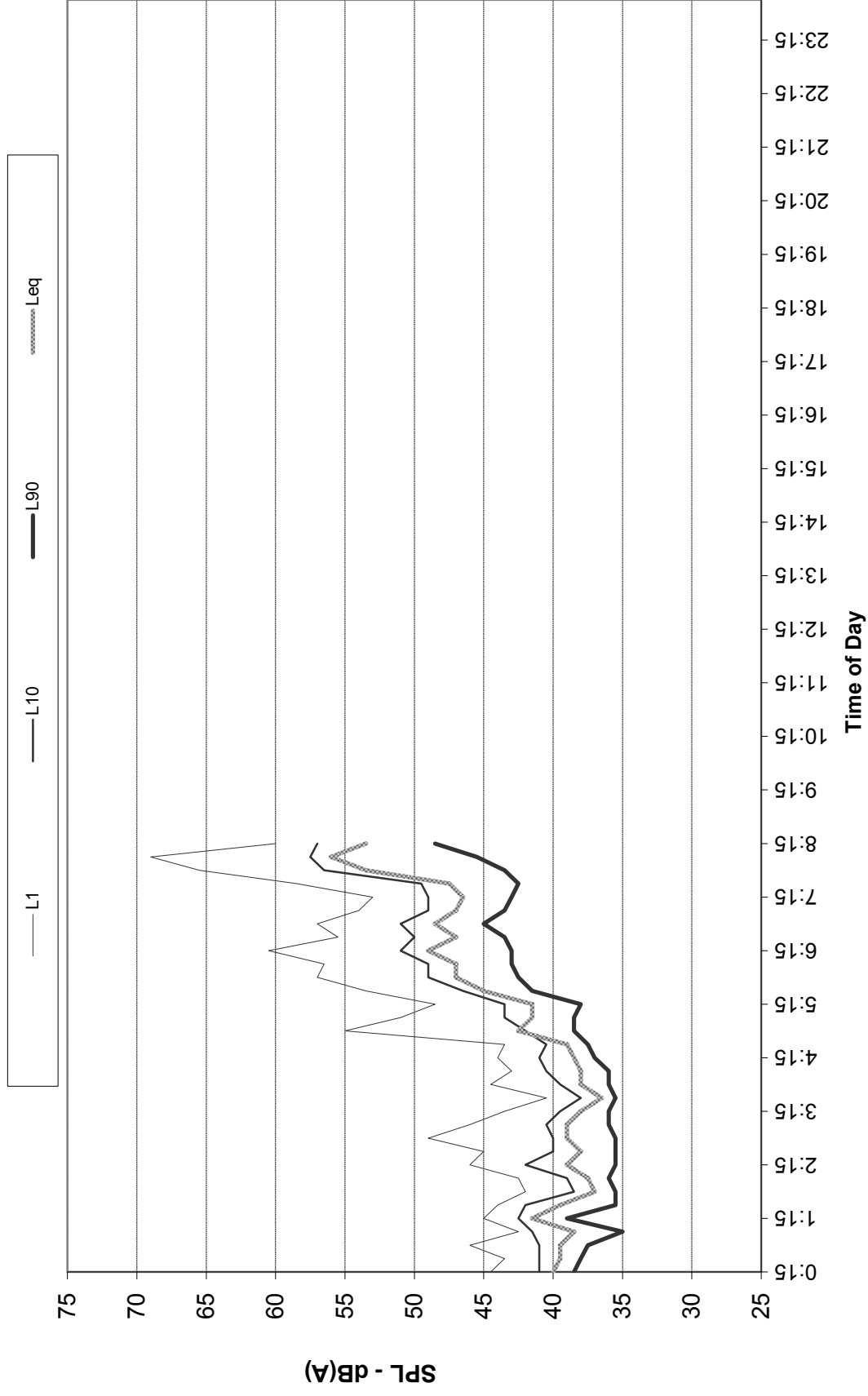


ALBION RESIDENTIAL AREA

Recorded Statistical Noise Levels for Bowen Hills 14-026 - Royal Tce, Albion - 13-Mar-2014

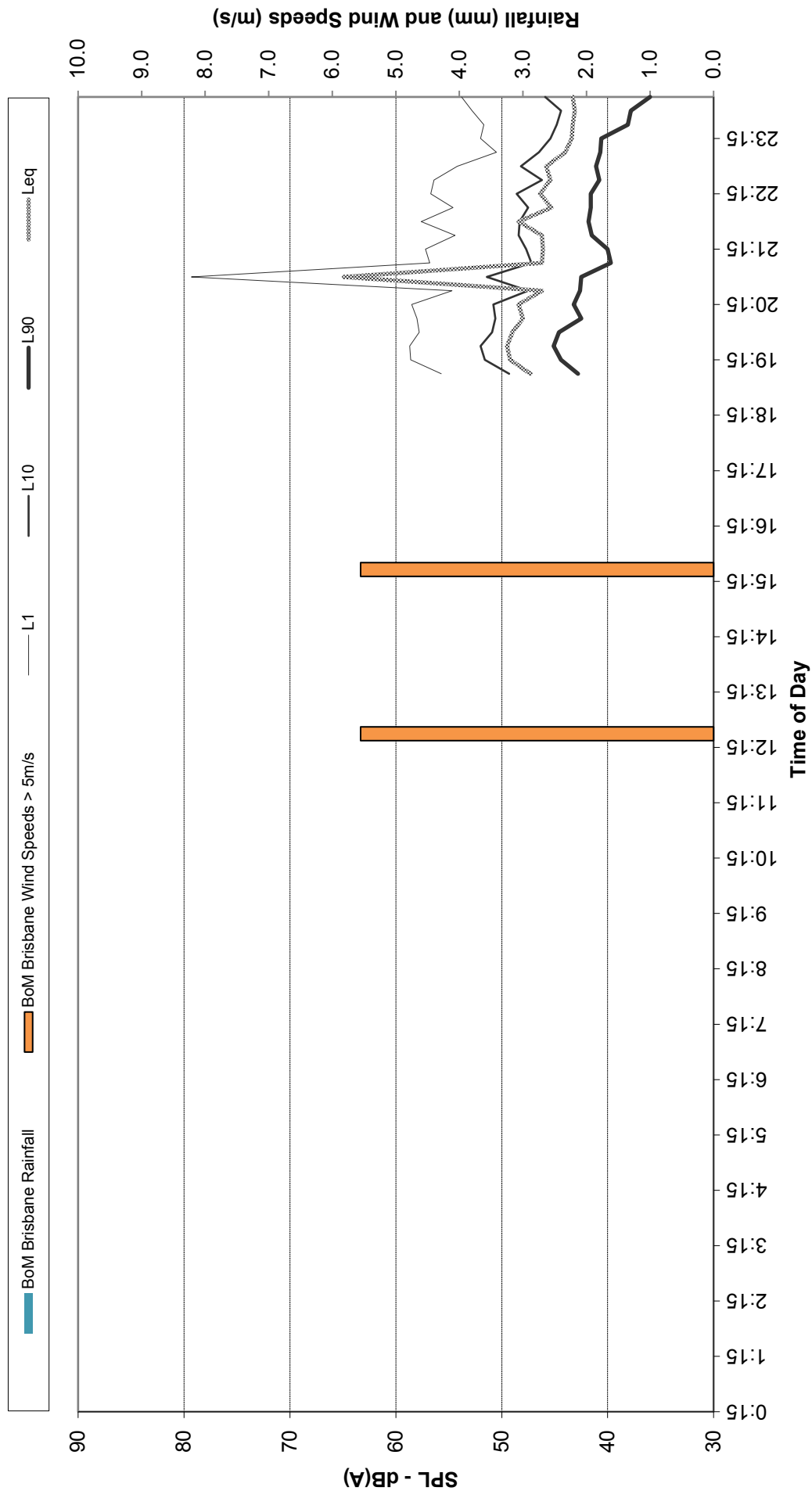


Recorded Statistical Noise Levels for Bowen Hills 14-026 - Royal Tce, Albion - 14-Mar-2014

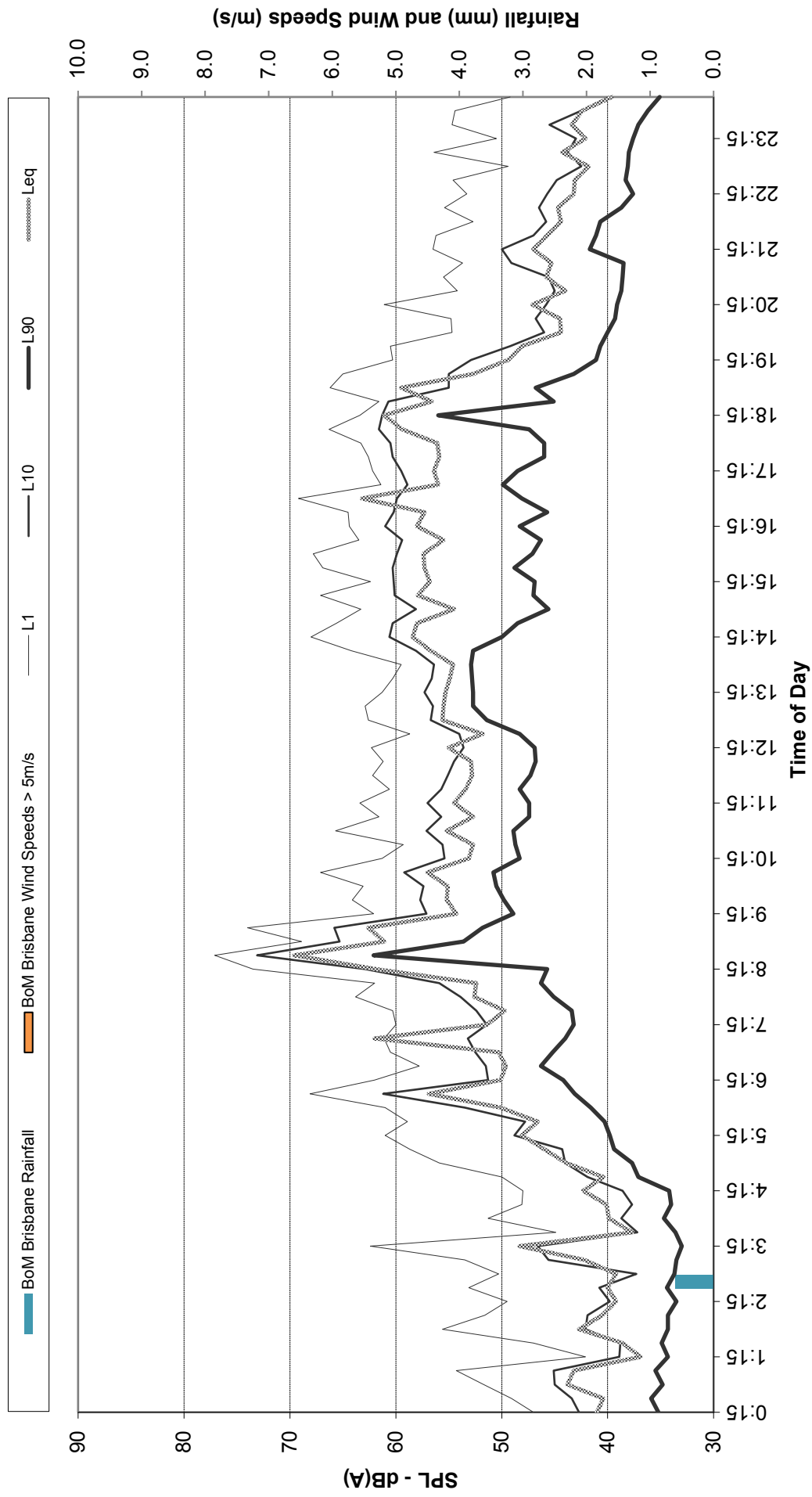


WINDSOR RESIDENTIAL AREA

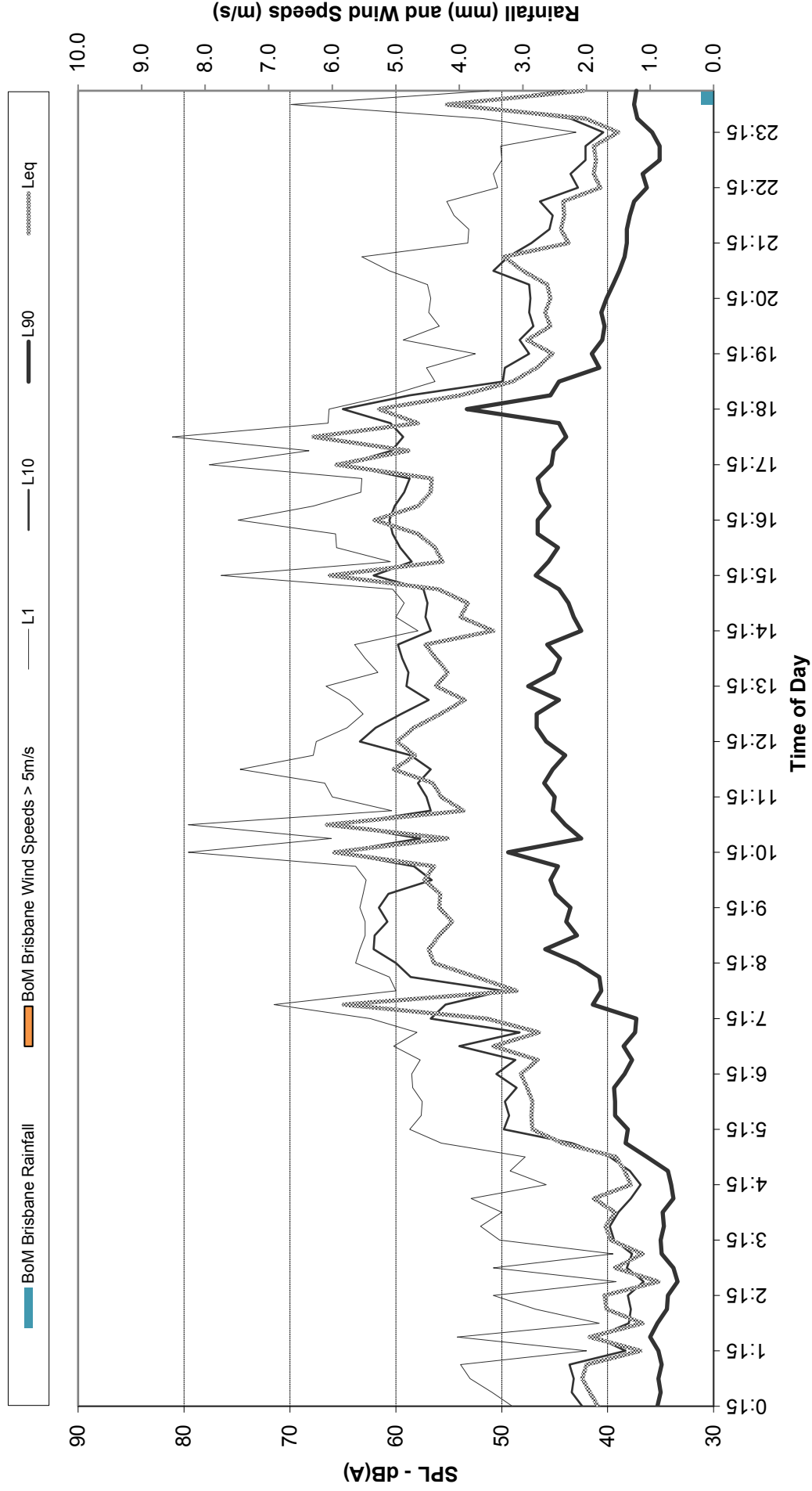
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 28-Feb-2014 - Friday



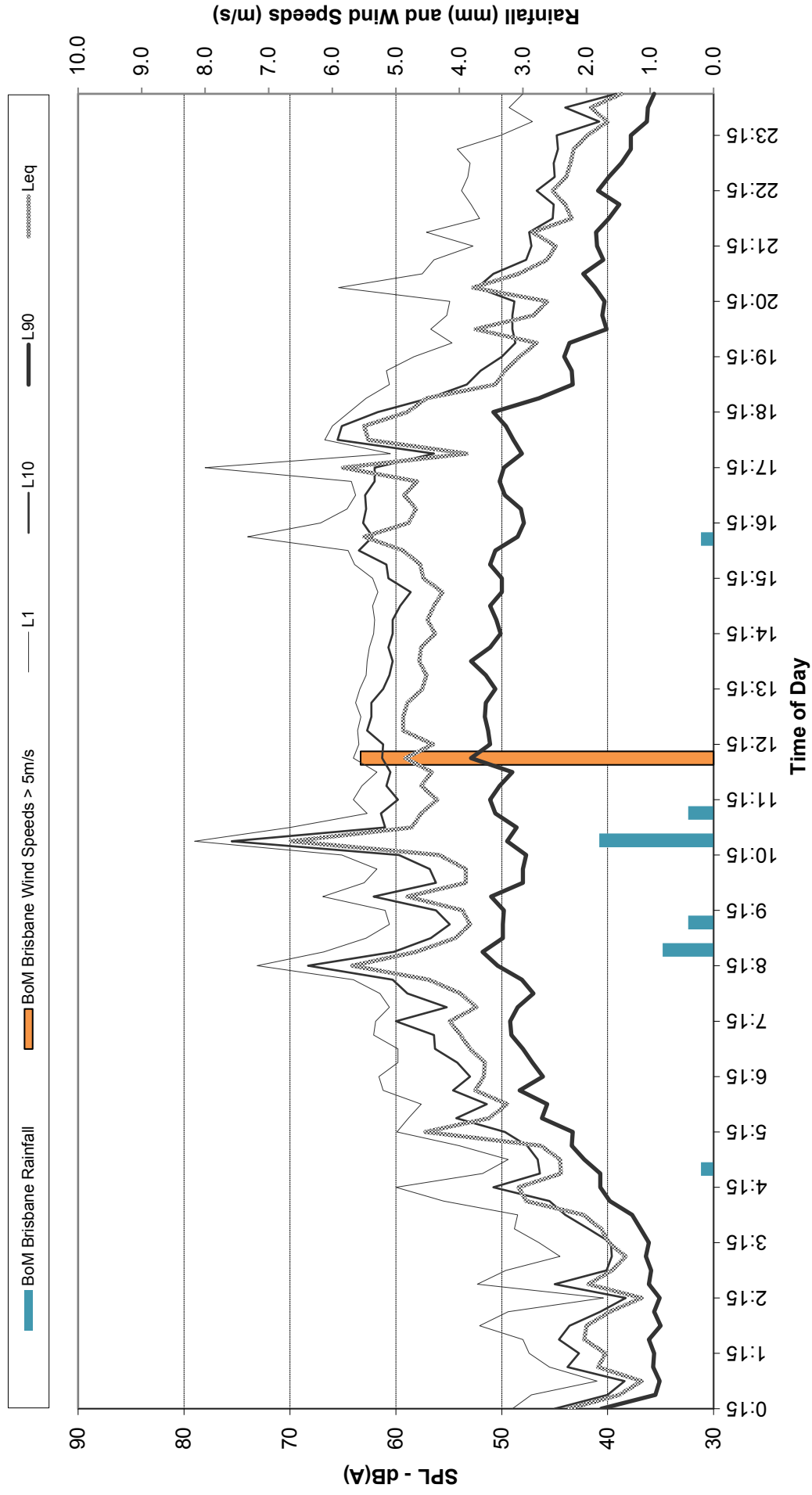
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 01-Mar-2014 - Saturday



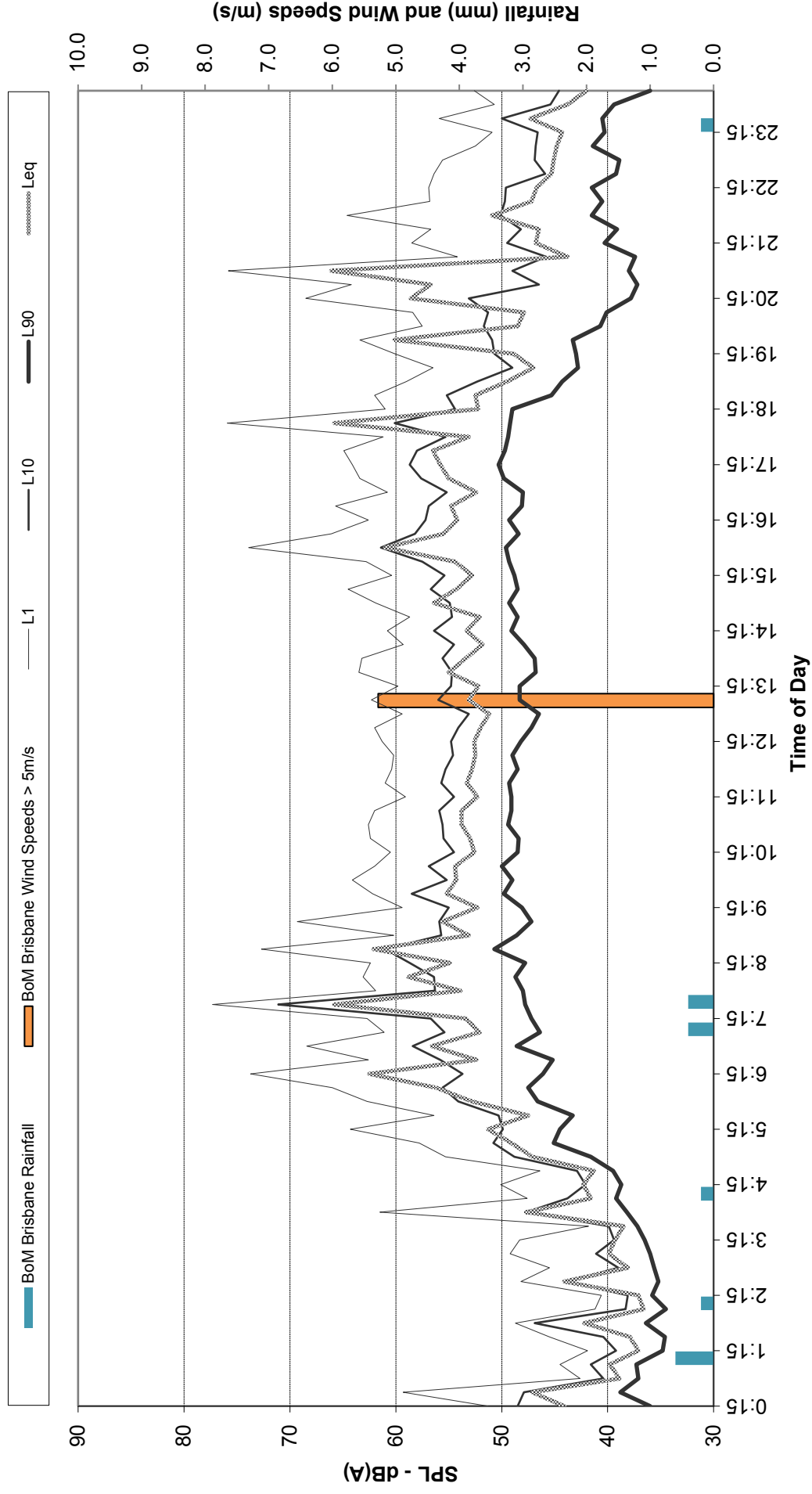
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 02-Mar-2014 - Sunday



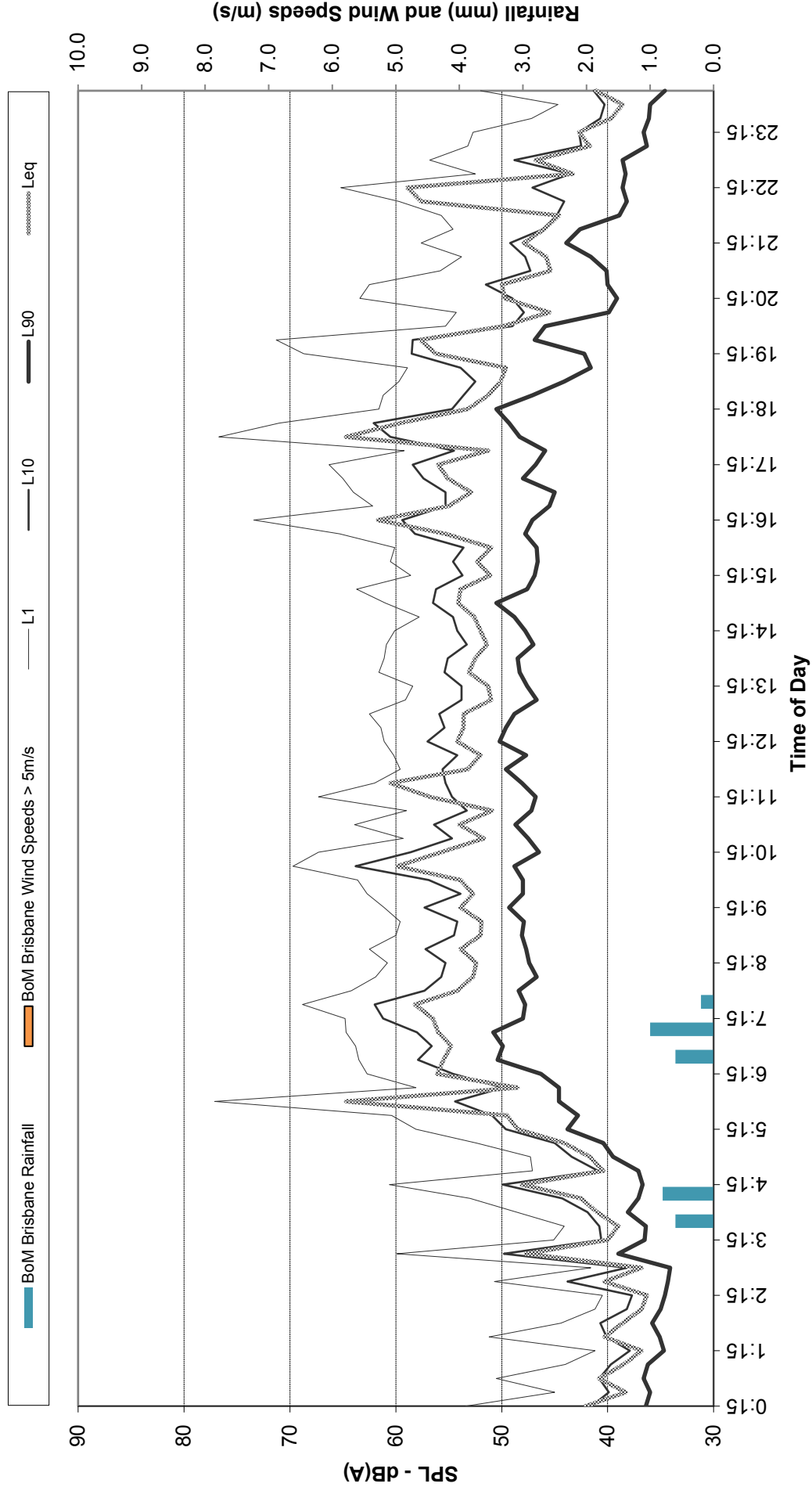
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 03-Mar-2014 - Monday



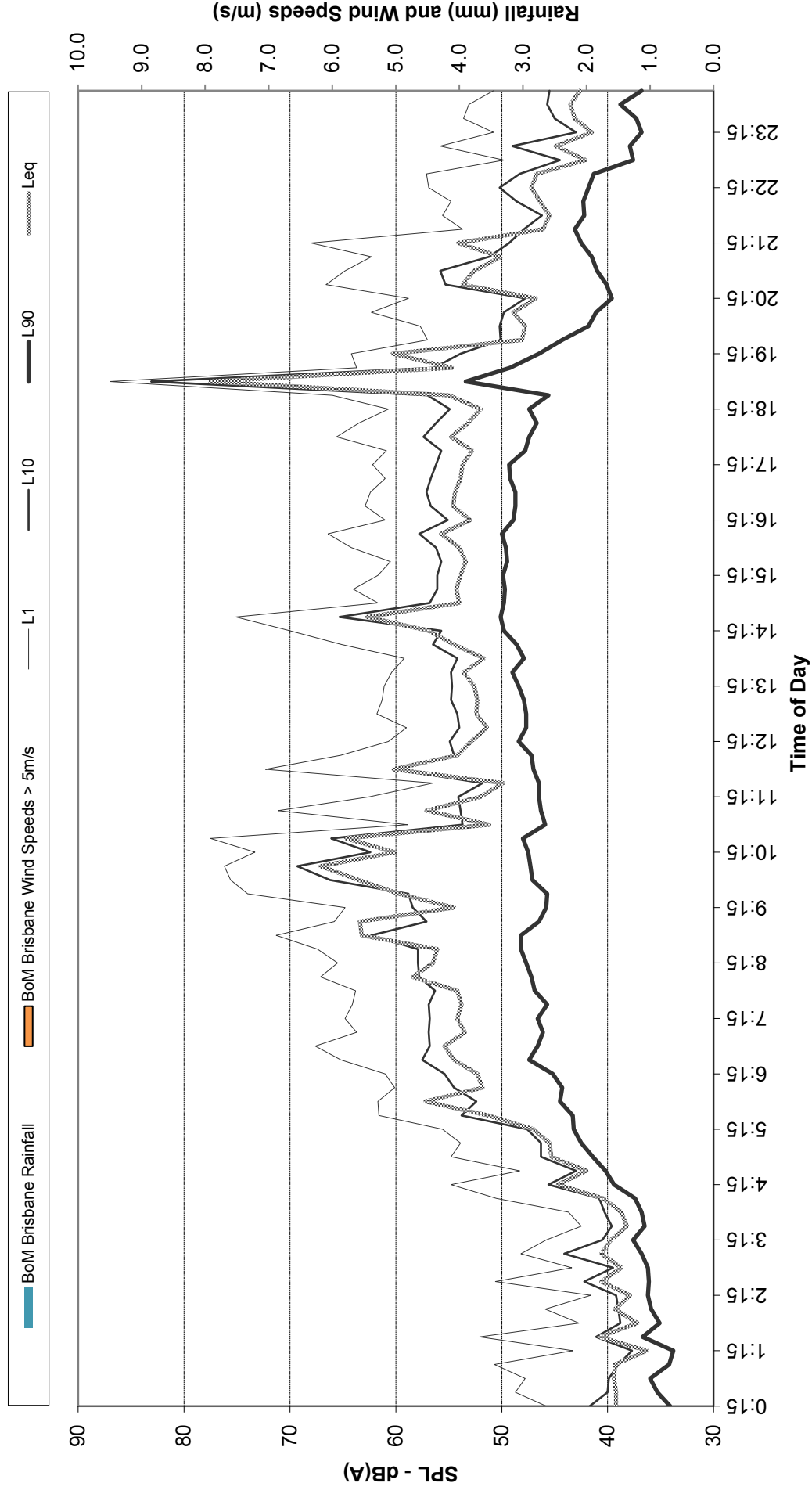
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 04-Mar-2014 - Tuesday



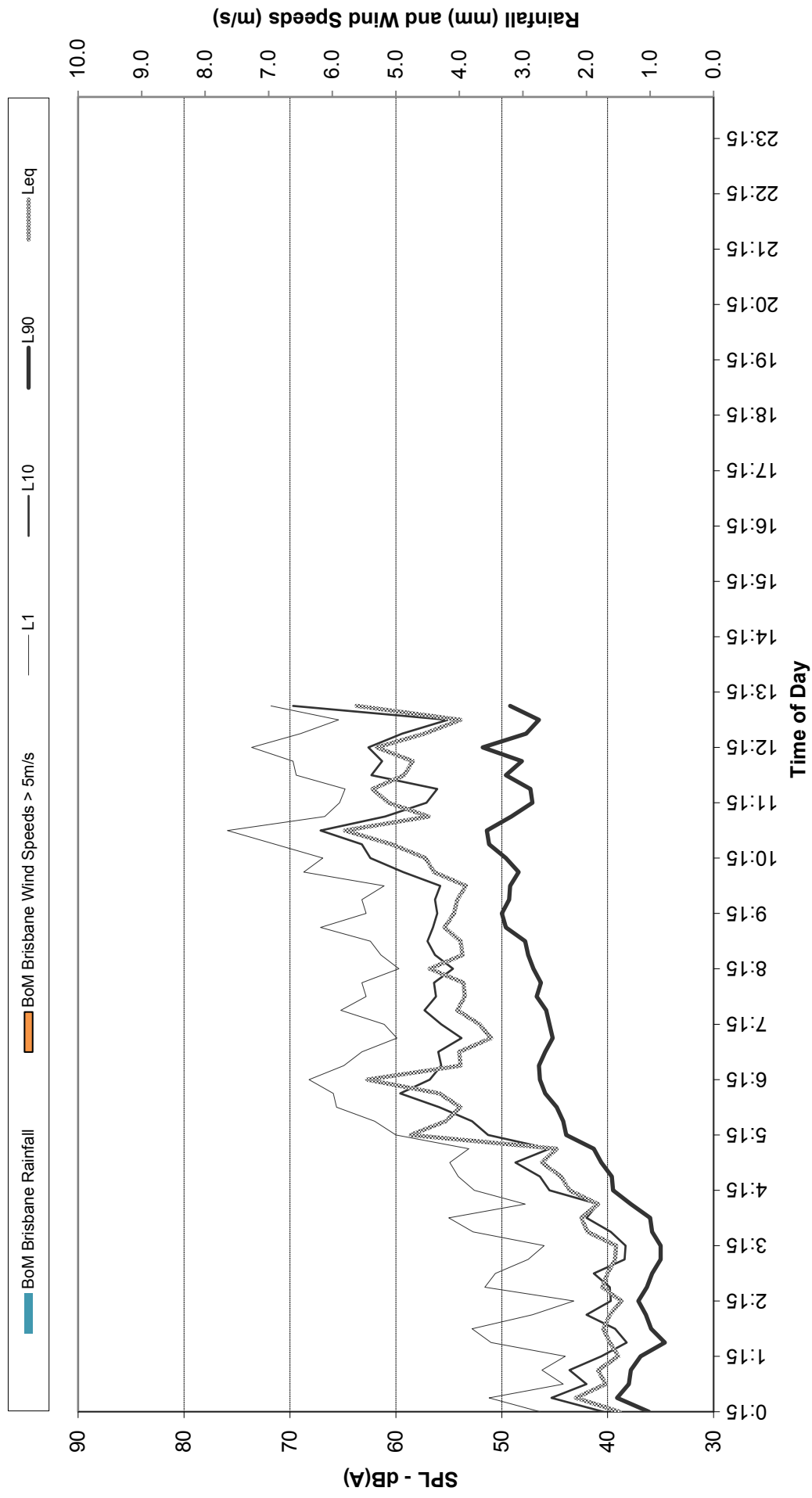
Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 05-Mar-2014 - Wednesday



Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 06-Mar-2014 - Thursday



Recorded Statistical Noise Levels for Bowen Hills 14-026 - Windsor site - 07-Mar-2014 - Friday

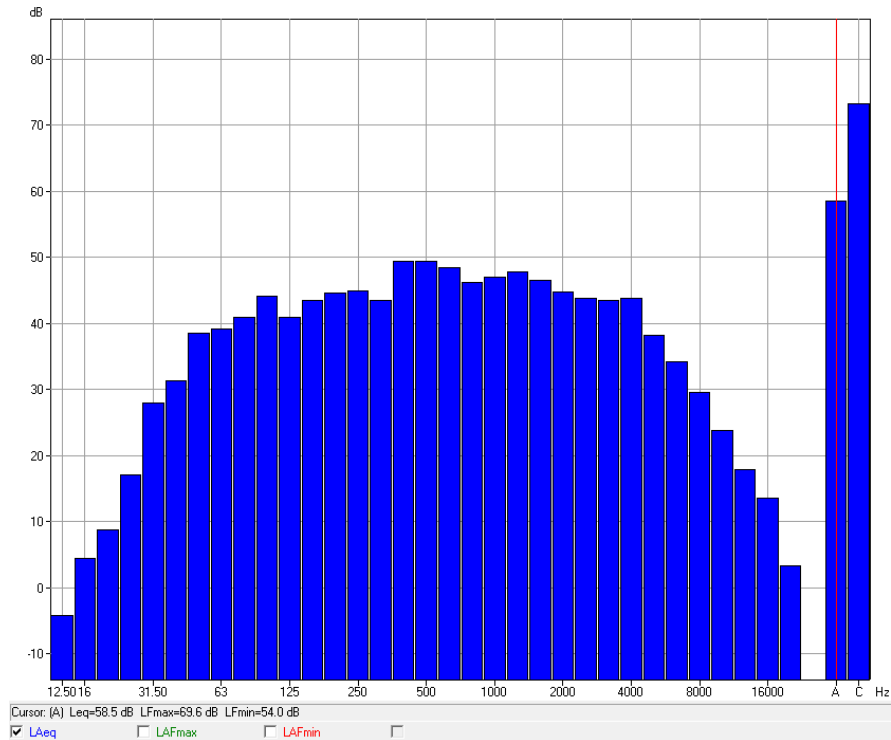


ATTACHMENT 2

Assessment of Tonality and Impulsiveness

TONALITY ASSESSMENT

Measured 1/3rd Octave Band L_{Aeq} Spectrum at 50 metres from Hanson Lytton Concrete Batching Plant



No octave band levels exceed both adjacent bands by 5 dB(A).

Therefore no tonal adjustment warranted.

IMPULSE ASSESSMENT

Measured Fast and Impulse Time-Weighting L_{Aeq} Noise Levels at 50 metres from Hanson Lytton Concrete Batching Plant

$$L_{Aeq} = 58.5 \text{ dB(A)}$$

$$L_{Aeq} = 59.6 \text{ dB(A)}$$

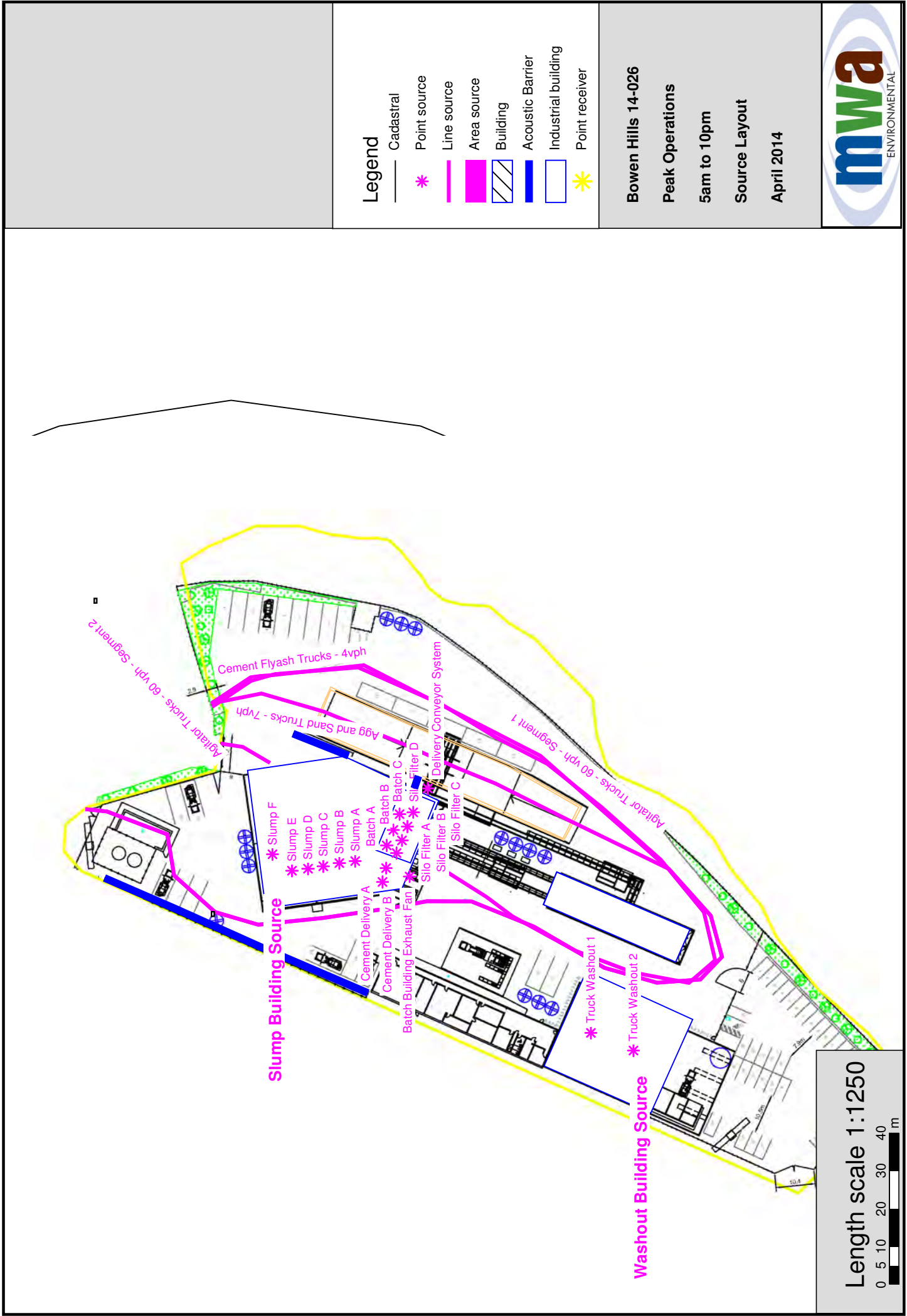
L_{Aeq} is not more than 2 dB(A) greater than the L_{Aeq} noise level.

Therefore no impulse adjustment warranted.

ATTACHMENT 3

SoundPlan 7.3

*Model Layout Plans
Sound Power Level Data*



--	--	--	--	--	--	--	--	--	--	--	--	--	--

No.	Element name	Unit	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	16 kHz	Sum
1	Washout	SWL dB(A)/unit	46.8	71.4	70.8	78.1	86.3	95.3	94.9	89.1	83.0	69.4	106.9
			56.9	68.0	75.4	81.3	103.5	98.7	96.1	88.4	79.3	64.3	
			57.8	78.1	84.5	81.4	91.6	94.1	92.3	85.8	73.7	56.3	
14	Slump	SWL dB(A)/unit	47.4	69.4	77.1	83.9	92.7	96.8	99.7	96.1	88.7	74.6	109.4
			57.3	74.8	82.0	89.3	102.5	101.0	97.6	94.0	84.8	70.0	
			59.7	81.8	83.9	86.0	96.8	101.5	97.4	90.9	79.7	64.7	
15	Batching Truck	SWL dB(A)/unit	55.6	77.6	82.0	93.3	101.7	105.7	104.4	102.4	96.0	82.8	116.0
			62.8	76.2	87.5	101.8	109.1	106.0	107.6	100.0	92.2	76.2	
			66.5	84.0	90.2	99.2	104.4	104.0	103.1	97.8	88.1	69.1	
16	Agg Store Base Int Level	Indoor SPL dB(A)/level	25.1	59.1	54.2	59.3	63.6	67.0	69.3	71.4	80.1	70.3	86.6
			38.7	46.6	52.6	59.8	66.9	67.8	70.9	74.0	75.1	66.0	
			45.4	50.5	57.3	62.8	67.3	68.9	70.9	82.2	74.7	62.1	
17	Agg Store Top Int Level	Indoor SPL dB(A)/level	12.2	25.9	35.5	51.3	56.8	59.9	63.2	73.2	81.3	75.6	87.7
			18.5	28.9	40.5	54.0	59.5	60.3	66.7	76.1	81.6	69.3	
			23.3	33.3	47.3	56.5	61.5	61.3	70.0	79.1	79.7	60.7	
19	Exhaust Fan	SWL dB(A)/unit	38.5	75.0	76.6	80.8	95.2	93.7	93.7	86.5	77.7	64.5	102.9
			42.9	62.4	75.3	83.9	93.9	92.3	90.3	84.2	74.0	58.7	
			56.5	68.5	77.2	86.2	91.5	92.8	89.4	80.9	69.5	52.8	
20	Drive Over Bin Outloading	SWL dB(A)/unit	44.8	75.1	76.0	79.3	87.7	92.1	90.2	87.6	91.0	84.6	102.5
			49.9	63.6	72.2	81.8	91.2	91.4	88.5	88.4	89.9	79.1	
			66.2	72.0	79.9	85.4	94.4	91.1	87.9	90.3	88.1	72.0	
23	Batch Building Internal	Indoor SPL dB(A)/level	29.3	52.4	59.4	63.8	71.3	74.6	74.1	75.3	73.1	65.4	86.1
			34.2	43.3	62.0	70.0	75.0	74.4	75.4	74.1	71.9	59.5	
			46.3	50.8	60.1	70.2	74.2	74.0	75.7	73.2	69.4	52.2	
24	Bag Filter Fan	SWLdB(A)/unit		52.8	62.9	69.4	79.8	80.0	77.2	69.0	60.9		84.3
25	Unloading Bulk Cement - Truck Mount	SWL dB/unit	89.7	94.7	102.7	102.7	100.7	99.7	100.7	95.7	90.7		109.0

	Max Winders & Associates Pty Ltd GPO Box 3137 Brisbane QLD 4000 AUSTRALIA	1 / 1
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ATTACHMENT 4

SoundPlan 7.3

Predicted Noise Contour Plots

5am to 10pm Peak Operations L_{Aeq}

10pm to 5am Night Operations L_{Aeq}

L_{Amax}

Noise level
L_{Aeq,T}
in dB(A)



Legend

- Cadastral
- * Point source
- Line source
- Area source
- ▨ Building
- ▬ Acoustic Barrier
- Industrial building
- * Point receiver

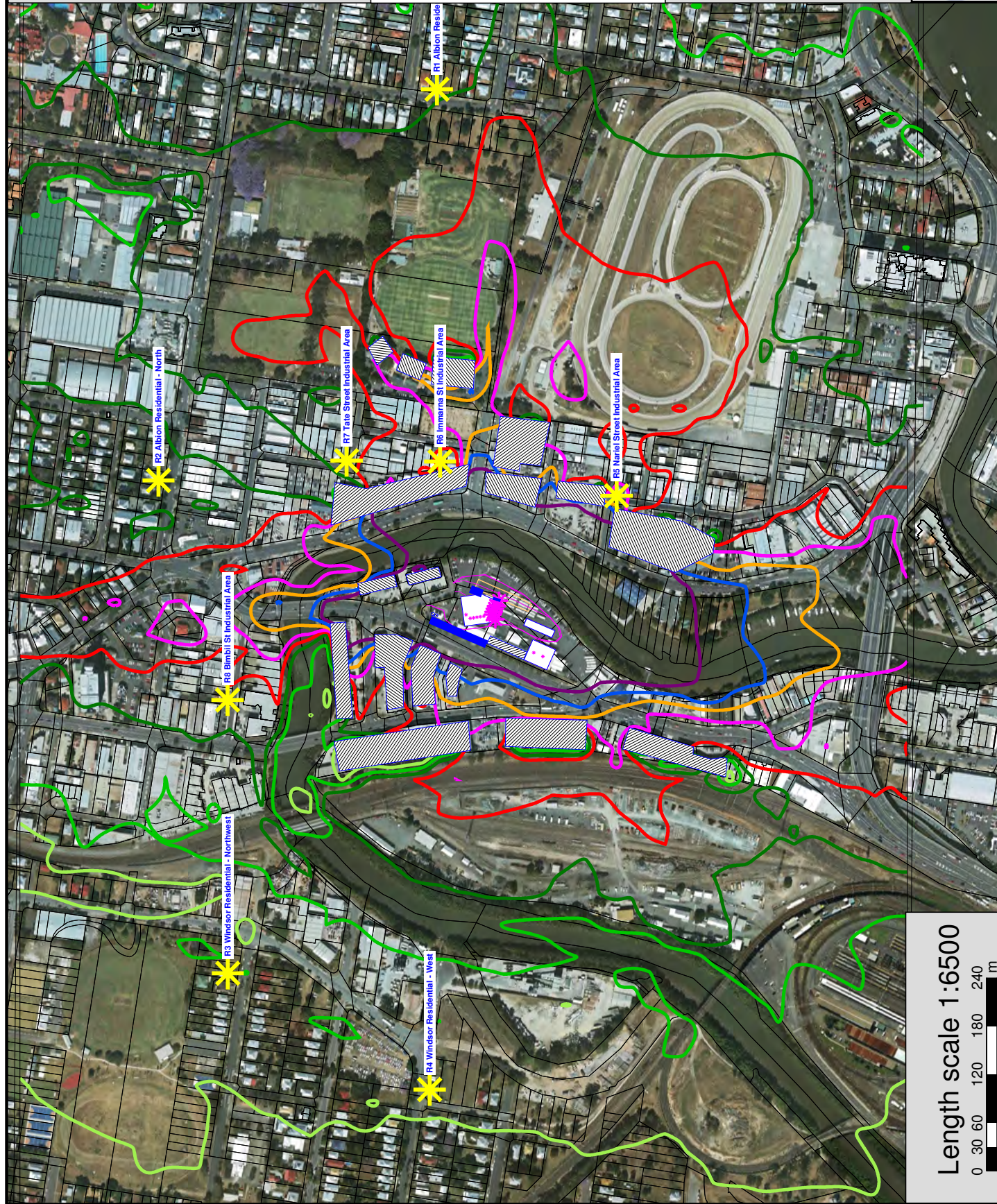
Bowen Hills 14-026

Peak Operations

5am to 10pm

All Sources Operating

March 2014



Length scale 1:6500



Noise level
L_{Aeq,T}
in dB(A)



Legend

- Cadastral
- * Point source
- Line source
- Area source
- Building
- Acoustic Barrier
- Industrial building
- * Point receiver

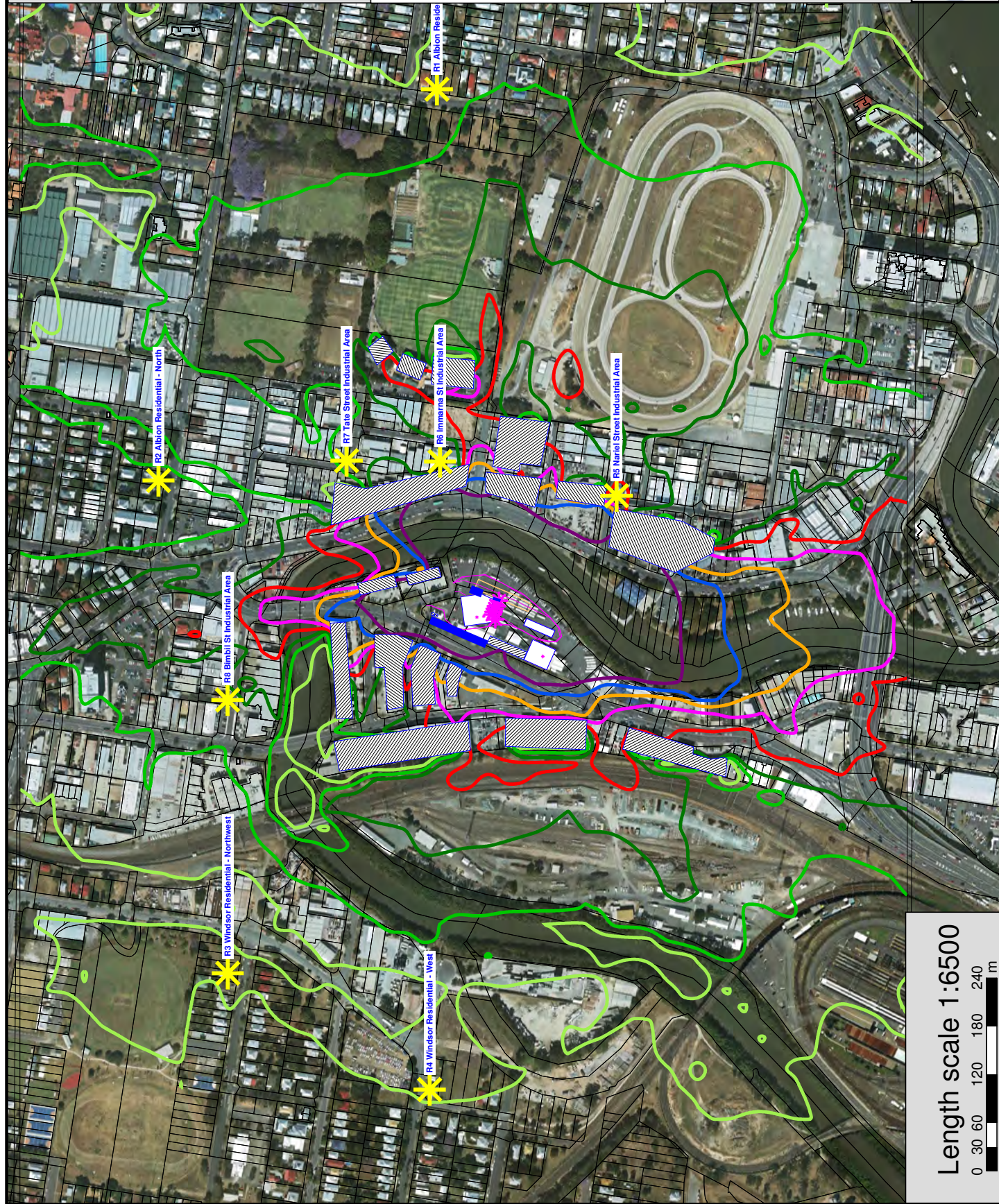
Bowen Hills 14-026

Night Operations

10pm to 5am

All Sources Operating

March 2014



Length scale 1:6500



Noise level
L_{Amax,T}
in dB(A)



Legend

- Cadastral
- * Point source
- Line source
- Area source
- Building
- Acoustic Barrier
- Industrial building
- * Point receiver

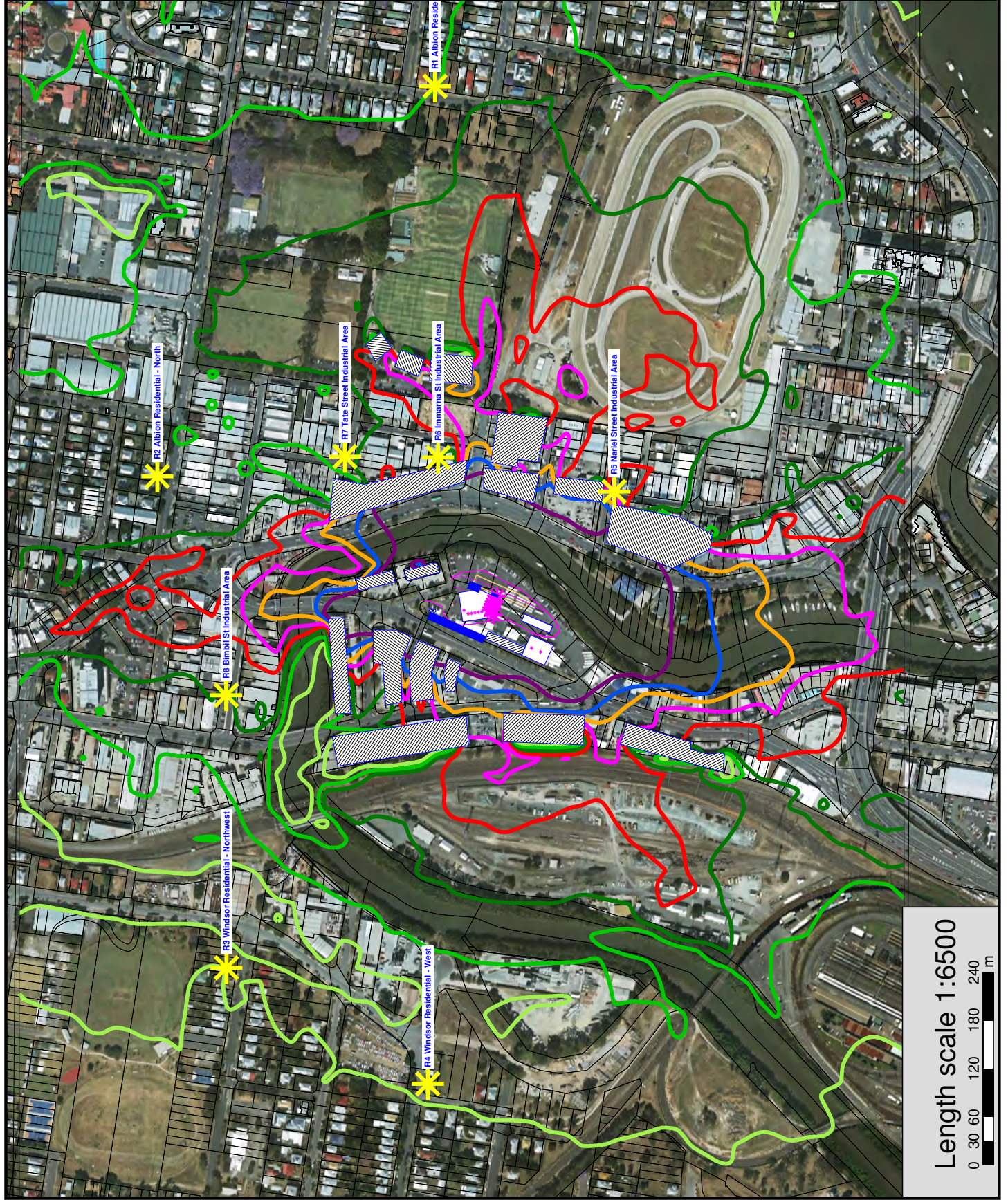
Bowen Hills 14-026

Peak Operations

5am to 10pm

All Sources Operating

March 2014



Length scale 1:6500



ATTACHMENT 5

Modelled Dust Particle Size Distribution

AP-42 Appendix B.2 Generalized Particle Size Distributions -
Category 3 for Concrete Batching

Particle Size μm	Cumulative %
1	4
2	11
2.5	15
3	18
4	25
5	30
6	34
10	51

Pollutant	% in range
TSP	49
PM_{10}	36
$\text{PM}_{2.5}$	15

TSP	Centre Size	2.5	7.5	20
	% in range	(anything lower than 30.0)	(anything between 10 and $5\mu\text{m}$)	(anything over $10\mu\text{m}$)
		30.0	21.0	49.0

PM_{10}	Centre Size	2	5	8
	% in range	(anything lower than $4\mu\text{m}$)	(anything between $4\mu\text{m}$ and $10\mu\text{m}$)	(anything between 10 and $6\mu\text{m}$)
		49.0	17.6	33.3

$\text{PM}_{2.5}$	Centre Size	0.5	1.5	2.25
	% in range	(anything lower than $1\mu\text{m}$)	(anything between $1\mu\text{m}$ and $2.5\mu\text{m}$)	(anything between 2.5 and $1\mu\text{m}$)
		26.7	46.7	26.7

ATTACHMENT 6

Dust Emission Rate Calculations

JOB: **Bowen Hills 14-026**

AREA EMISSIONS FROM PROPOSED SITE - AVERAGE HOUR

SOURCE	g/sec		
	PM _{2.5}	PM ₁₀	TSP
By Hour	0.056	0.225	0.851
By Day	1.3	5.4	20.4

Area of source 5892 m²

SOURCE	g/m ² /sec		
	PM _{2.5}	PM ₁₀	TSP
Area Source (by hour)	0.000009	0.000038	0.000145

JOB:**Bowen Hills 14-026****SCENARIO:**

Proposed Concrete Batching Plant

EMISSIONS ESTIMATION INPUT SUMMARY

<u>Parameter</u>	<u>Value</u>	<u>Units</u>	<u>Comments</u>
Operating Hours:	24	per day	1713_305_001 DSDIP meeting minutes 20140213
Paved Road Silt Loading (sL):	6	g/m ²	USEPA AP42 Chapter 13.2.1 mean concrete batching (50% Control for plant
Density of wet concrete	2.3	t/m ³	
Days of rainfall > 0.25mm (p):	90	days	Typical data for region
<u>Aggregate & Sand Truck Movements</u>			
Mean Vehicle Mass (W):	39	tonnes	Typical data for concrete plant
Average Payload:	30.6	tonnes	MWA Calc Based on Traffic Information
Trips per Day:	76	#	MWA Calc Based on Traffic Information
Average Trip Length:	0.320	km	Digitised in Mapinfo
<u>Cement and Flyash Truck Movements</u>			
Mean Vehicle Mass (W):	39	tonnes	Typical data for concrete plant
Average Payload:	26.6	tonnes	MWA Calc Based on Traffic Information
Trips per Day:	16	#	MWA Calc Based on Traffic Information
Average Trip Length:	0.320	km	Digitised in Mapinfo
<u>Agitator Truck Movements</u>			
Mean Vehicle Mass (W):	15.2	tonnes	Typical data for concrete plant
Average Payload:	5.6	m ³	MWA Calc Based on Traffic Information
Trips per Day:	224	#	MWA Calc Based on Traffic Information
Average Trip Length:	0.360	km	Digitised in Mapinfo
<u>Aggregate Transfer</u>			
Material Component:	46%		Based on Concrete Composition
Material Usage:	1338	t/day	MWA Calc
<u>Sand Transfer</u>			
Material Component:	36%		Based on Concrete Composition
Material Usage:	1025	t/day	MWA Calc
<u>Cement Unloading to Silo</u>			
Material Component:	12%		Based on Concrete Composition
Material Usage:	353	t/day	MWA Calc
<u>Cement Supplement Unloading to Silo</u>			
Material Component:	2%		Based on Concrete Composition
Material Usage:	52	t/day	MWA Calc
<u>Loading agitator trucks</u>			
Control Efficiency:	98%		Enclosure with dust collection
<u>AREAS</u>			
Modelling area	5892	m2	

Production Profile

Hour Start	Hour End	Agitator truck movements	Agg & Sand deliveries	Cement and Flyash deliveries
0:00	1:00	2.24	0.00	0.00
1:00	2:00	2.34	0.00	0.03
2:00	3:00	2.31	0.00	0.14
3:00	4:00	2.35	0.00	0.06
4:00	5:00	2.45	0.00	0.55
5:00	6:00	3.44	0.00	2.79
6:00	7:00	4.13	0.00	5.69
7:00	8:00	20.44	0.00	1.70
8:00	9:00	22.48	0.00	0.76
9:00	10:00	23.01	0.00	0.59
10:00	11:00	24.29	0.00	0.69
11:00	12:00	23.33	0.00	0.65
12:00	13:00	21.41	6.87	0.60
13:00	14:00	20.03	6.87	0.46
14:00	15:00	17.14	6.87	0.35
15:00	16:00	12.19	7.48	0.20
16:00	17:00	5.76	8.68	0.05
17:00	18:00	0.53	4.21	0.10
18:00	19:00	2.62	7.06	0.08
19:00	20:00	2.30	6.77	0.00
20:00	21:00	2.30	7.37	0.02
21:00	22:00	2.28	4.47	0.01
22:00	23:00	2.31	7.18	0.10
23:00	0:00	2.33	2.52	0.26
Total Trucks		224	76	16
Average Trucks		9.3	3.2	0.7

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

PAVED ROADS

Emission Source: Aggregate and Sand Truck Movements

Data Source: USEPA AP42 Chapter 13.2.1 Paved Roads (2011)

Emission Factor Formula:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$$

Silt Loading (sL): 6 g/m² USEPA AP42 Chapter 13.2.1 mean concrete batching (50% Control for plant design)

Mean Vehicle Mass (W): 39 tonnes

Days of rainfall > 0.25mm (p): 90 days

Constants (PM2.5): k = 0.15

Constants (PM10): k = 0.62

Constants (TSP): k = 3.23

(USEPA AP42 Chapter 13.2.2 Tables 13.2.1-1)

Emission Factor (PM2.5): EF= 30.2 g/VKT

Emission Factor (PM10): EF= 124.7 g/VKT

Emission Factor (TSP): EF= 649.5 g/VKT

Operating Hours: 24 per day

Trips per Day: 76

Average Trip Length (two way): 0.32 km

Controlled Emission Rate:	PM2.5:	0.008526 grams/second	24-hours
	PM10:	0.035241 grams/second	
	TSP:	0.183593 grams/second	

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

PAVED ROADS

Emission Source: Cement and Flyash Truck Movements

Data Source: USEPA AP42 Chapter 13.2.1 Paved Roads (2011)

Emission Factor Formula:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$$

Silt Loading (sL): 6 g/m² USEPA AP42 Chapter 13.2.1 mean concrete batching (50% Control for plant design)

Mean Vehicle Mass (W): 39 tonnes

Days of rainfall > 0.25mm (p): 90 days

Constants (PM2.5): k = 0.15

Constants (PM10): k = 0.62

Constants (TSP): k = 3.23

(USEPA AP42 Chapter 13.2.2 Tables 13.2.1-1)

Emission Factor (PM2.5): EF= 30.2 g/VKT

Emission Factor (PM10): EF= 124.7 g/VKT

Emission Factor (TSP): EF= 649.5 g/VKT

Operating Hours: 24 per day

Trips per Day: 16

Average Trip Length (two way): 0.32 km

Controlled Emission Rate:	PM2.5:	0.001776 grams/second	24-hours
	PM10:	0.007342 grams/second	
	TSP:	0.038248 grams/second	

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

PAVED ROADS

Emission Source: Agitator Truck Movements

Data Source: *USEPA AP42 Chapter 13.2.1 Paved Roads (2011)*

Emission Factor Formula:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$$

Silt Loading (sL): 6 g/m² USEPA AP42 Chapter 13.2.1 mean concrete batching (50% Control for plant design)

Mean Vehicle Mass (W): 15.2 tonnes

Days of rainfall > 0.25mm (p): 90 days

Constants (PM2.5): k = 0.15

Constants (PM10): k = 0.62

Constants (TSP): k = 3.23

(USEPA AP42 Chapter 13.2.2 Tables 13.2.1-1)

Emission Factor (PM2.5): EF= 11.5 g/VKT

Emission Factor (PM10): EF= 47.7 g/VKT

Emission Factor (TSP): EF= 248.4 g/VKT

Operating Hours: 24 per day

Trips per Day: 224

Average Trip Length (two way): 0.36 km

Controlled Emission Rate:	PM2.5:	0.010769 grams/second	24-hours
	PM10:	0.044512 grams/second	
	TSP:	0.231892 grams/second	

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

MATERIAL HANDLING

Emission Source: Aggregate Transfer

Data Source: *USEPA AP42 Chapter 11.12 Concrete Batching (2006)*

Emission Factor (PM10): EF= 1.70E-03 kg/tonne (Table 11.12.1 USEPA AP42)

Emission Factor (TSP): EF= 3.50E-03 kg/tonne (Table 11.12.1 USEPA AP42)

Material Usage: 1338 t/day
Operating Hours: 24 per day

Emission Rate (PM2.5): EF= 0.6 kg/day Assume 25% of PM10

Emission Rate (PM10): EF= 2.3 kg/day

Emission Rate (TSP): EF= 4.7 kg/day

Emission Rate:	PM2.5:	0.0066	grams/second	24-hours
	PM10:	0.0263	grams/second	
	TSP:	0.0542	grams/second	

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

MATERIAL HANDLING

Emission Source: Sand Transfer

Data Source: *USEPA AP42 Chapter 11.12 Concrete Batching (2006)*

Emission Factor (PM10): EF= 1.10E-03 kg/tonne (Table 11.12.1 USEPA AP42)

Emission Factor (TSP): EF= 5.10E-04 kg/tonne (Table 11.12.1 USEPA AP42)

Material Usage: 1025 t/day
Operating Hours: 24 per day

Emission Rate (PM2.5): EF= 0.3 kg/day Assume 25% of PM10

Emission Rate (PM10): EF= 1.1 kg/day

Emission Rate (TSP): EF= 0.5 kg/day

Emission Rate:	PM2.5:	0.0033	grams/second	24-hours
	PM10:	0.0130	grams/second	
	TSP:	0.0060	grams/second	

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

MATERIAL HANDLING

Emission Source: Cement Unloading to Silo

Data Source: *USEPA AP42 Chapter 11.12 Concrete Batching (2006)*

Controlled Emission Factor (PM10): EF= 1.10E-03 kg/tonne (Table 11.12.1 USEPA AP42)

Controlled Emission Factor (TSP): EF= 5.10E-04 kg/tonne (Table 11.12.1 USEPA AP42)

Material Usage: 353 t/day
Operating Hours: 24 per day

Emission Rate (PM2.5): EF= 0.10 kg/day Assume 25% of PM10
Emission Rate (PM10): EF= 0.39 kg/day
Emission Rate (TSP): EF= 0.18 kg/day

Emission Rate:	PM2.5:	0.0011	grams/second	24-hours
	PM10:	0.0045	grams/second	
	TSP:	0.0021	grams/second	

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

MATERIAL HANDLING

Emission Source: Cement Supplement Unloading to Silo

Data Source: USEPA AP42 Chapter 11.12 Concrete Batching (2006)

Controlled Emission Factor (PM10): EF= 2.40E-03 kg/tonne (Table 11.12.1 USEPA AP42)

Controlled Emission Factor (TSP): EF= 4.50E-03 kg/tonne (Table 11.12.1 USEPA AP42)

Material Usage: 52 t/day

Operating Hours: 24 per day

Emission Rate (PM2.5): EF= 0.03 kg/day Assume 25% of PM10

Emission Rate (PM10): EF= 0.13 kg/day

Emission Rate (TSP): EF= 0.23 kg/day

Emission Rate:	PM2.5:	0.0004	grams/second	24-hours
	PM10:	0.0014	grams/second	
	TSP:	0.0027	grams/second	

JOB: Bowen Hills 14-026

SCENARIO: Proposed Concrete Batching Plant

MATERIAL HANDLING

Emission Source: Loading agitator trucks

Data Source: USEPA AP42 Chapter 11.12 Concrete Batching (2006)

Emission Factor (PM10): EF= 1.39E-01 kg/tonne (Table 11.12.1 USEPA AP42)

Emission Factor (TSP): EF= 4.98E-01 kg/tonne (Table 11.12.1 USEPA AP42)

Control Efficiency: 98% (3-sided and roofed enclosure with dust collection)

Average Payload: 5.6 m³

Number of trucks per day: 224 #

Operating Hours: 24 per day

Emission Rate (PM2.5): EF= 2.01 kg/day Assume 25% of PM10

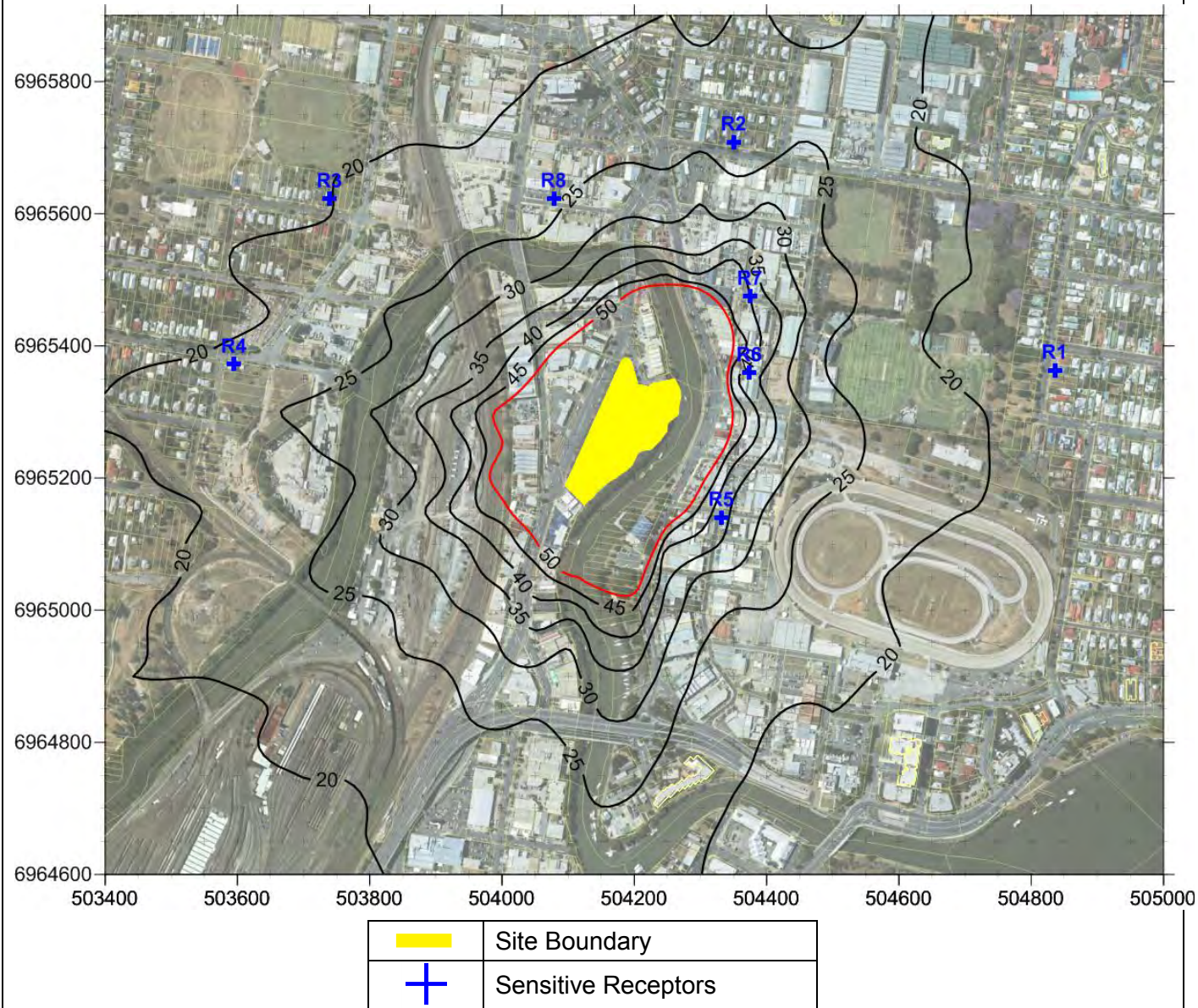
Emission Rate (PM10): EF= 8.02 kg/day

Emission Rate (TSP): EF= 28.74 kg/day

Emission Rate:	PM2.5:	0.0232	grams/second	24-hours
	PM10:	0.0928	grams/second	
	TSP:	0.3327	grams/second	

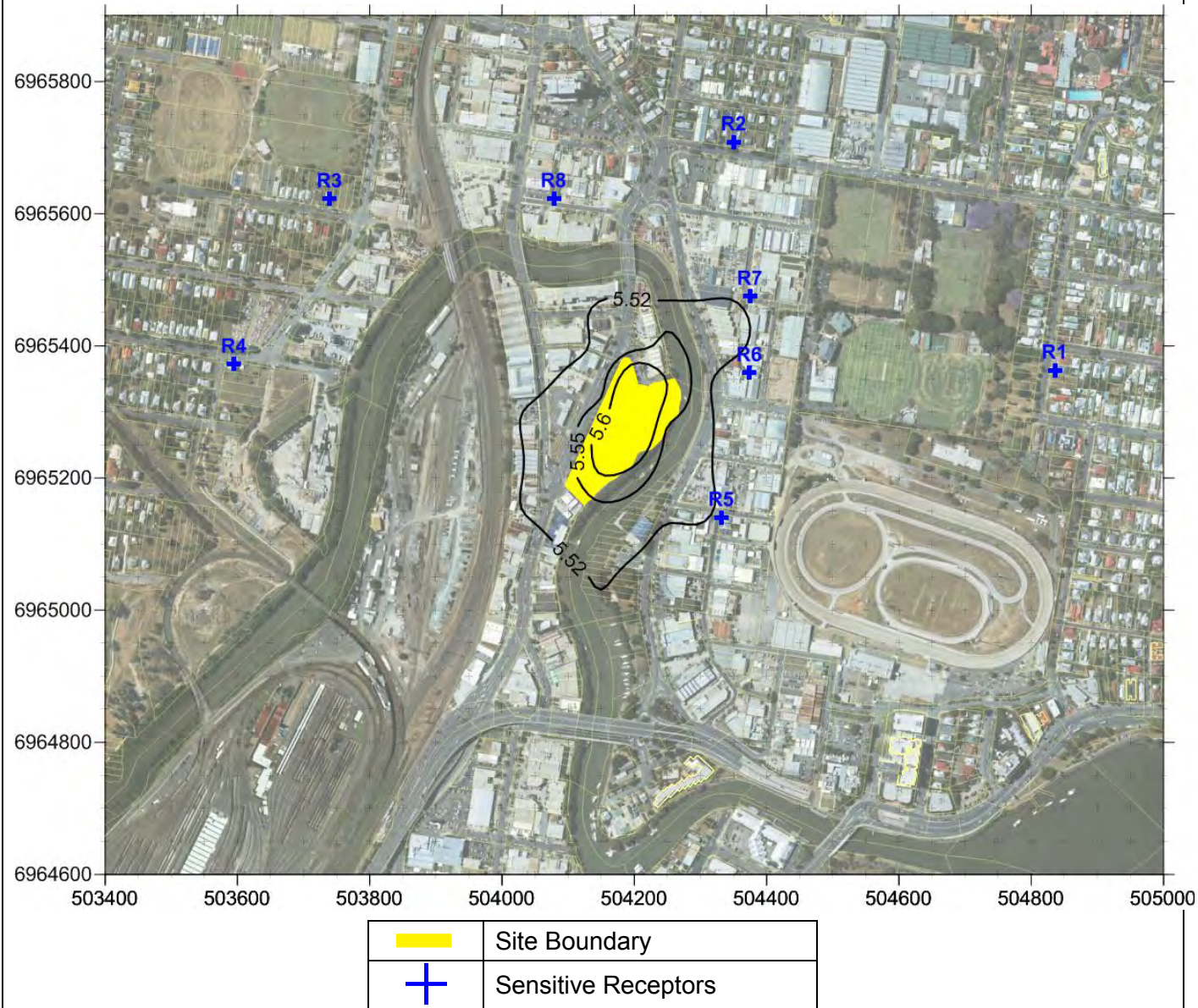
ATTACHMENT 7

Predicted Dust Concentrations / Deposition Rates



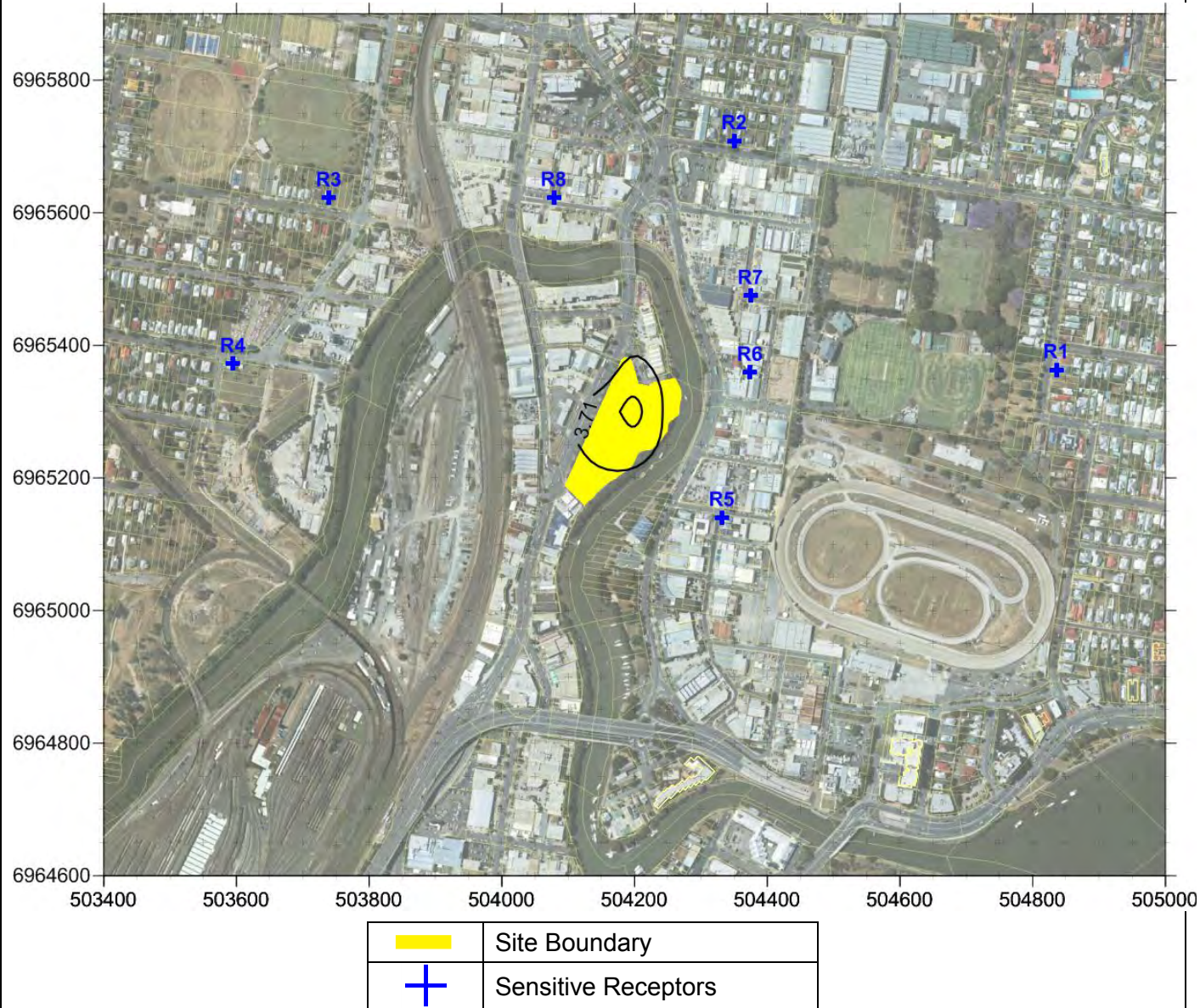
Predicted 24-hour PM₁₀ concentrations from the Proposed Concrete Batching Plant including ambient

Figure A7.1	Pollutant	Averaging Period	Units
	PM ₁₀	24-hour	µg/m ³
	Air Quality Guideline	Source	Date
	50 µg/m ³ 6 th Highest	EPP (Air)	27/03/2014



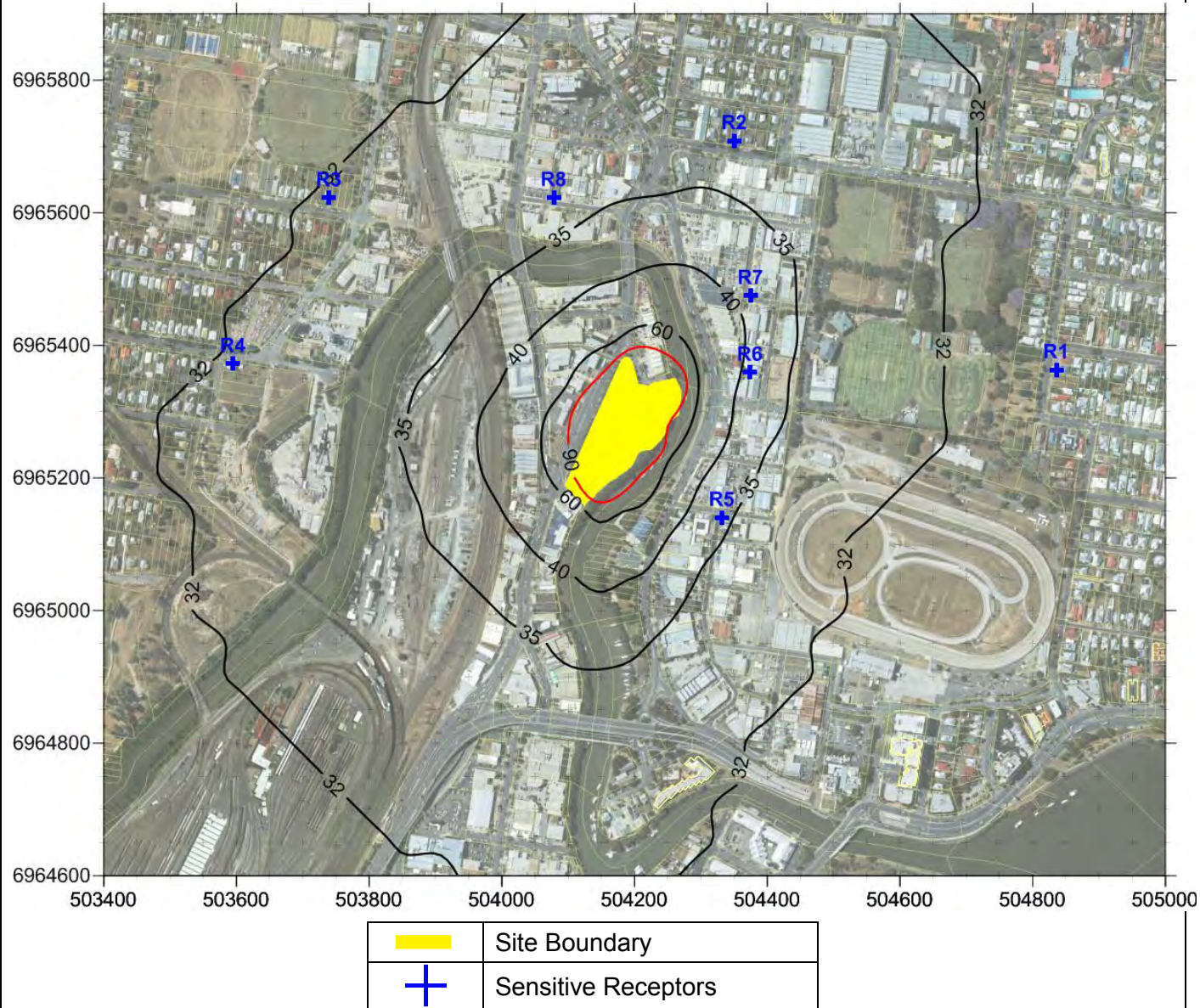
Predicted 24-hour PM_{2.5} concentrations from the Proposed Concrete Batching Plant including ambient

Figure A7.2	Pollutant	Averaging Period	Units
	PM _{2.5}	24-hour	µg/m ³
	Air Quality Guideline	Source	Date
	25 µg/m ³	EPP (Air)	27/03/2014



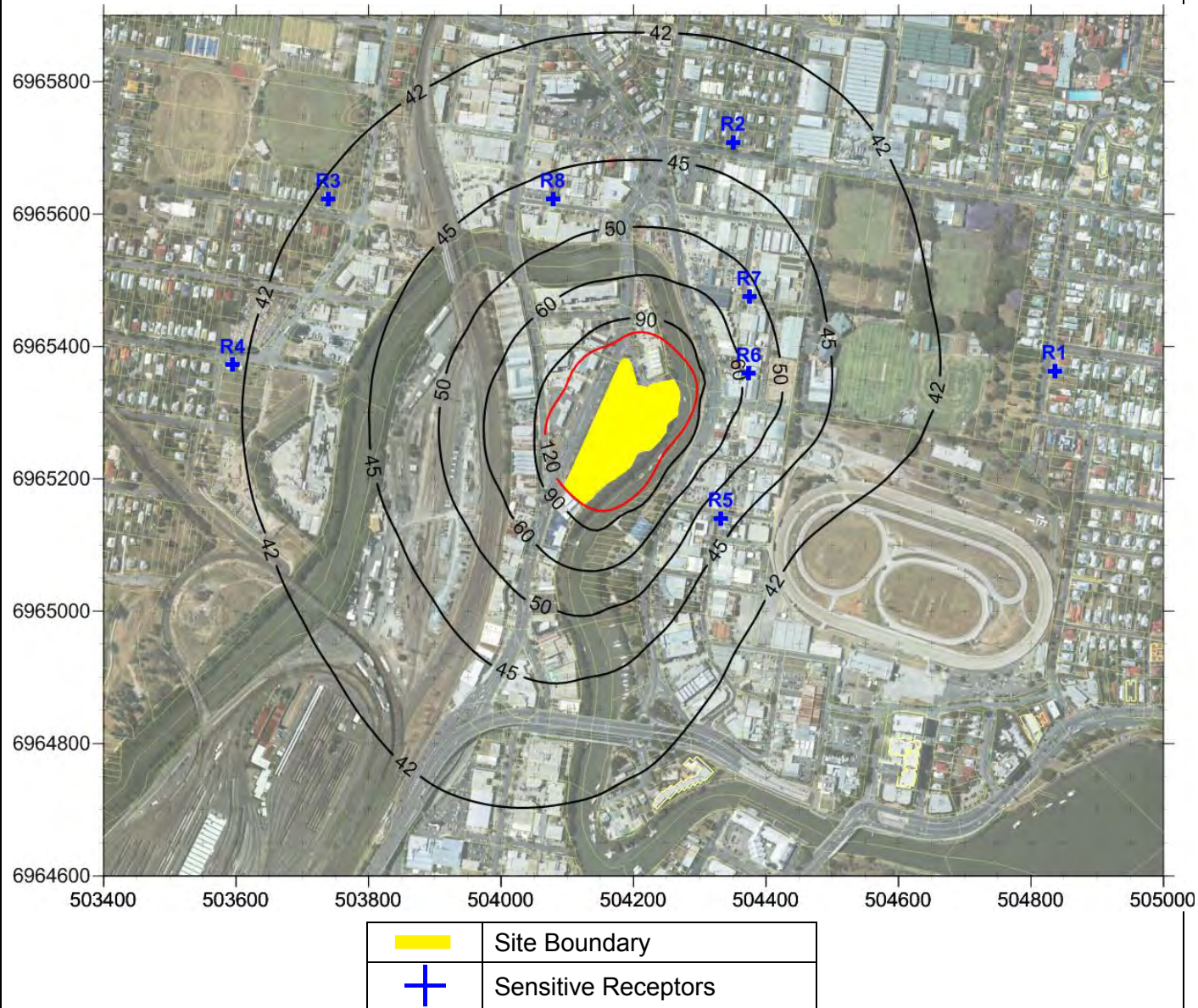
Predicted annual average PM_{2.5} concentrations from the Proposed Concrete Batching Plant including ambient

Figure A7.3	Pollutant	Averaging Period	Units
	PM _{2.5}	Annual	µg/m ³
	Air Quality Guideline	Source	Date
	8 µg/m ³	EPP (Air)	27/03/2014



Predicted annual average TSP concentrations from the Proposed Concrete Batching Plant including ambient

Figure A7.4	Pollutant	Averaging Period	Units
	TSP	Annual	$\mu\text{g}/\text{m}^3$
	Air Quality Guideline	Source	Date
	$90 \mu\text{g}/\text{m}^3$	EPP (Air)	27/03/2014



Predicted annual average Dust Deposition rates from the Proposed Concrete Batching Plant including ambient

Figure A7.5	Pollutant	Averaging Period	Units
	Dust Deposition	Annual	mg/m ² /day
	Air Quality Guideline	Source	Date
	120 mg/m ² /day	EHP Recommended Guideline	27/03/2014