Appendix 5: Addendum Air Quality Impact Assessment

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14 March 2013

630.10359 Response to EPA 14Mar2013.docx

WorleyParsons
PO Box 1812
North Sydney
NSW 2059

Attention: Nicole Cowlishaw

Dear Nicole

Chaffey Dam Air Quality Impact Assessment
Response to Comments from NSW EPA

Thank you for providing SLR Consulting Australia Pty Ltd (SLR Consulting) with an opportunity to provide a response to the comments made by NSW Environment Protection Authority (EPA) on the Air Quality Impact Assessment (AQIA) prepared by SLR in 2012 for the Chaffey Dam Augmentation and Safety Upgrade Project (EPA submission, dated 30th January 2013, DOC13/2560). As discussed, additional modelling has been performed to address the recommendations made by EPA and further information is provided regarding recommended mitigation measures. As requested, we have discussed the EPA's comments on the AQIA with relevant EPA staff to ensure (as far as possible) that the information provided below adequately addresses their concerns.

1 Background

In 2012, SLR Consulting Australia Pty Ltd (SLR Consulting) was commissioned by WorleyParsons on behalf of State Water Corporation (State Water) to prepare an Air Quality Impact Assessment (AQIA) for activities associated with the Chaffey Dam Augmentation and Safety Upgrade. The AQIA was a required component of the Environmental Impact Assessment (EIA) for the Project.

As part of the AQIA, atmospheric dispersion modelling of fugitive emissions of particulate matter (as Total Suspended Particulate (TSP), particulate matter less than 10 microns (PM_{10}) and particulate matter less than 2.5 microns ($PM_{2.5}$)) from the site was undertaken using the CALPUFF dispersion model. Emissions from excavation, vehicle movements, wind erosion, and the handling of soils were addressed in the study. Local meteorological conditions were predicted using The Air Pollution Model (TAPM) for the year 2011. The activities assessed included the works associated with raising the dam wall, as well as road works that will be required along Western Foreshore Road and at Bowling Alley Point (Tamworth-Nundle Road and Rivers Road).

The results of the dispersion modelling indicated that TSP, PM_{10} and $PM_{2.5}$ concentrations and dust deposition rates at sensitive receptors in the vicinity of the dam wall works area (including the morning glory and auxiliary spillways), will comply with relevant NSW Office of Environment and Heritage (OEH) air quality guidelines (as per the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, August 2005, hereafter referred to as the "Approved Methods").

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The modelling did however, indicate a potential for elevated PM_{10} and $PM_{2.5}$ concentrations at residential receptors located close to the road construction activities along Western Foreshore Road and Bowling Alley Point. The greatest impacts were predicted at a residence located immediately east of the southern end of Rivers Road. This receptor was predicted to have the potential to be exposed to a worst case 24-hour average PM_{10} concentration of 150 µg/m^3 (compared to a guideline of 50 µg/m^3) and a worst case 24-hour average $PM_{2.5}$ concentration of 30.5 µg/m^3 (compared to a guideline of 25 µg/m^3). It was noted in the AQIA that the modelling is based on the peak, worst case construction scenarios occurring at the worst case locations for the full year of meteorological data used in the modelling, hence actual concentrations are likely to be lower than the predicted due to the transient and short-term nature of the Project.

Based on the results of the modelling, the AQIA identified that care will need to be taken when the road construction activities are being undertaken in the vicinity of residences along these roads and that a Construction Environmental Management Plan (CEMP) should be prepared detailing the control measures to be implemented to minimise off-site impacts of fugitive dust emissions. A range of best practice dust control measures were recommended.

2 Issues Raised by EPA

The recommendations made by the EPA (EPA submission, dated 30th January 2013, DOC13/2560) with regards to air quality were as follows:

1. *Revise the AQIA to include additional particle mitigation strategies so that predicted air impacts at all sensitive receptors meet EPA assessment criteria. Any additional particle emission controls must be consistent with best practice.*
2. *Develop and implement an air quality management plan (AQMP) for the Project. The AQMP will require the following information for each pollutant and emission source:*
   - *key performance indicator;*
   - *monitoring method;*
   - *location, frequency and duration of monitoring;*
   - *record keeping;*
   - *response mechanisms; and*
   - *compliance reporting.*
3. *Provide further details of each proposed mitigation strategy to ensure the effective implementation of each strategy can be demonstrated, consistent with the above requirements.*

This letter provides responses to recommendations 1 and 3 above. Recommendation 2, the development of an AQMP for the project, will be responded to separately.

Discussions with Newcastle EPA staff occurred on Tuesday 5th March (Mr Lindsay Fulloon) to clarify the requests for additional information above. Additional discussions with Antony Savage (OEH, Sydney) regarding the mitigation requirements occurred on Thursday 14th March.

3 Response to EPA Recommendations

3.1 Revision of Fugitive Dust Emission Estimates and Modelling

The following information focusses on predicted PM_{10} and $PM_{2.5}$ impacts at the sensitive receptors identified in the vicinity of the proposed Western Foreshore Road and Bowling Alley Point road works. The AQIA demonstrated compliance with annual average TSP criteria and dust deposition rates at all receptors hence these indicators for ambient dust levels are not discussed further below. Similarly, no exceedances were predicted in the AQIA for TSP, PM_{10}, $PM_{2.5}$ or deposited dust due to the proposed construction activities at the dam wall works area, hence no additional modelling has been performed for these activities.

3.1.1 Revisions to Emission Estimates

The emission estimates for the construction works along Western Foreshore Road and Bowling Alley Point have been reviewed and revised as follows:

- Based on additional information provided by State Water, the maximum excavation rate has been revised downwards from 100 tonnes per hour (tph) to 50 tph. This has halved the estimated emissions from the excavator, truck unloading, and vehicle movements.
- Using the latest Work Area Plans, the areas of disturbance have been reduced where possible to reflect a more typical area of disturbance that may be expected during the construction works.
- Additional control factors[1] have been used to reduce emissions from the two work areas as follows:
  - A control factor of 75% was used for the haul road emissions based on level 2 watering (>2 L/m^2/hour). The previous modelling was based on Level 1 watering (2 L/m^2/hour) at 50% control.
  - An additional control factor of 40% was also applied to the haul road emissions based on restricting vehicle speeds to less than 50 km/hr.
  - A control factor of 50% was applied to the emissions from the dozer for keeping travel routes and materials moist.
  - A control factor of 30% was applied to emissions from wind erosion of exposed areas based on the use of wind breaks to reduce wind speeds across the work sites.

These revisions have resulted in a 58% decrease in the PM_{10} emissions estimated for the Western Foreshore Road construction area and a 50% decrease in the PM_{10} emissions estimated for the Bowling Alley Point construction area (see **Table 1**).

Table 1 Revisions to Dust Emission Estimates

Area	Source	Estimated Emissions – AQIA (kg/hr)			Revised Emission Estimates (kg/hr)		
		TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Western Foreshore Road	Excavators	1.3	0.6	0.06	0.6	0.3	0.03
	Truck Unloading	0.4	0.1	0.01	0.4	0.1	0.01
	Dozers	0.7	0.1	0.01	0.3	0.1	0.01
	Graders	0.4	0.2	0.02	0.2	0.1	0.01
	Haul roads	0.6	0.2	0.02	0.2	<0.1	<0.01
	Wind erosion	2.4	1.2	0.18	0.8	0.4	0.06
	TOTAL	**5.7**	**2.4**	**0.3**	**2.4**	**1.0**	**0.1**
Bowling Alley Point	Excavators	1.3	0.6	0.06	0.6	0.3	0.03
	Truck Unloading	0.4	0.1	0.01	0.4	0.1	0.01
	Dozers	0.7	0.1	0.01	0.3	0.1	0.01
	Graders	0.4	0.2	0.02	0.2	0.1	0.01
	Haul roads	0.6	0.2	0.02	0.2	<0.1	<0.01
	Wind erosion	0.8	0.4	0.06	0.4	0.2	0.03
	TOTAL	**4.1**	**1.6**	**0.2**	**2.1**	**0.8**	**0.1**

[1] *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*, Katestone Environmental Pty Ltd, Prepared for Office of Environment and Heritage, June 2011.

3.1.2 Updated Modelling Results

Contour plots showing the revised model predictions (incremental impacts) are attached, while tables summarising the maximum predicted incremental and cumulative 24-hour and annual average PM_{10} and $PM_{2.5}$ concentrations are shown below in **Table 2** and **Table 3**. The results show that with the reduced activity rates and additional control factors, maximum predictions at the identified sensitive receptors comply with NSW OEH assessment criteria (as per the Approved Methods).

While the cumulative 24-hour PM_{10} and $PM_{2.5}$ concentrations do show one exceedance per annum being predicted for all receptors, this is due the background PM_{10} and $PM_{2.5}$ files containing one exceedance. The predicted incremental impacts from the road construction activities, once revised to account for the reduced activity rates and additional control measures, do not result in any additional exceedances being predicted at any receptors. This is illustrated in the time series plots of the 24-hour average PM_{10} concentrations predicted at sensitive receptors 7 and 8 shown in **Figure 1**.

Table 2 Predicted 24-Hour and Annual Average PM_{10} Concentrations

ID	Description	24-Hour Average PM_{10} Concentrations		Annual Average PM_{10} Concentrations	
		Incremental (µg/m³)	Cumulative * (µg/m³)	Incremental (µg/m³)	Cumulative * (µg/m³)
R4	Bowling Alley Point	0.6	51 (1)	<0.1	13
R5	Bowling Alley Point	1.4	51 (1)	0.4	13
R6	Bowling Alley Point	0.9	51 (1)	0.2	13
R7	Bowling Alley Point	29.3	55 (1)	3.1	16
R8	Western Foreshore	7.0	52 (1)	1.1	14
R9	Western Foreshore	4.3	51 (1)	0.7	14
R10	Western Foreshore	1.9	51 (1)	0.3	13
R11	Western Foreshore	1.3	51 (1)	0.2	13
Criteria		**-**	**50**	**-**	**30**

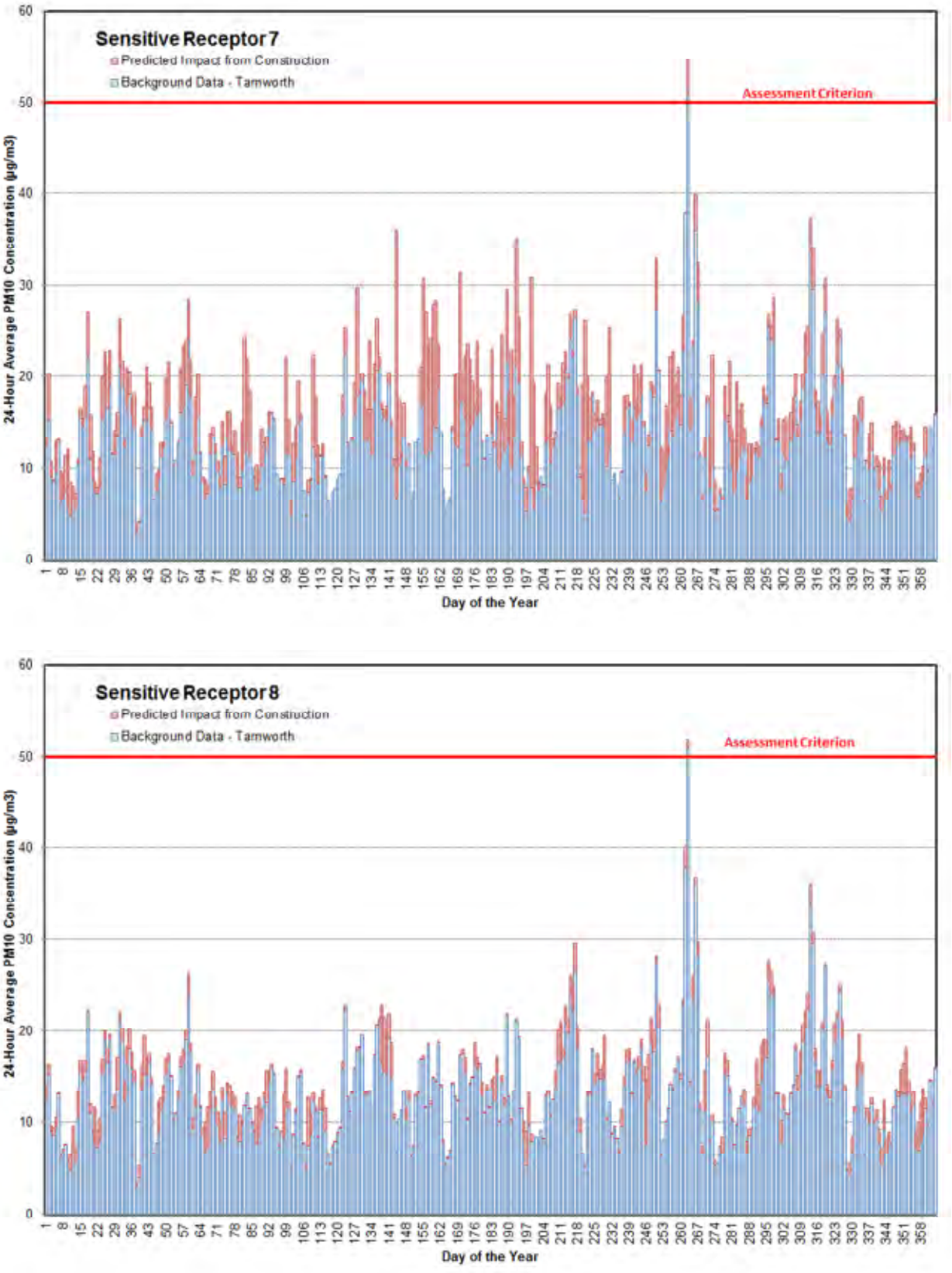
* Cumulative impacts derived using a daily-varying background file as discussed in the AQIA report.
Numbers in brackets are the number of days predicted to exceed the OEH Standard of 50 µg/m³.

Table 3 Predicted 24-Hour and Annual Average $PM_{2.5}$ Concentrations

ID	Description	24-Hour Average $PM_{2.5}$ Concentrations		Annual Average $PM_{2.5}$ Concentrations	
		Incremental (µg/m³)	Cumulative * (µg/m³)	Incremental (µg/m³)	Cumulative * (µg/m³)
R4	Bowling Alley Point	0.1	25.5 (1)	<0.0	6.6
R5	Bowling Alley Point	0.2	25.5 (1)	0.1	6.6
R6	Bowling Alley Point	0.1	25.5 (1)	<0.0	6.6
R7	Bowling Alley Point	3.0	26.0 (1)	0.3	6.9
R8	Western Foreshore	1.1	25.6 (1)	0.2	6.7
R9	Western Foreshore	0.6	25.5 (1)	0.1	6.7
R10	Western Foreshore	0.3	25.5 (1)	0.1	6.6
R11	Western Foreshore	0.2	25.5 (1)	<0.0	6.6
Criteria		**-**	**25**	**-**	**8**

* Cumulative impacts derived using a daily-varying background file as discussed in the AQIA Report. Numbers in brackets are the number of days predicted to exceed the Advisory Reporting Standard of 25 µg/m³.

Figure 1 Time Series Plots of 24-Hour Average PM_{10} Concentrations Predicted at Sensitive Receptors 7 and 8 – Revised Results



It is noted that the methodology used to model the wind speed-dependent emissions from wind erosion was revised in the model to use an hourly-variable emission file; varying the wind erosion emission rate based on a cubic relationship with wind speed. This is a more accurate approach than assuming a constant emission rate for all hours when the wind speed is above the threshold for dust pickup of 5.4 m/s as was done in the AQIA and it means that the highest dust emissions occur when the winds are strongest when there is more efficient dispersion of the dust emissions. The use of a cubic wind speed relationship for wind erosion sources is accepted by NSW EPA as an acceptable approach when modelling of fugitive dust sources (*personal communication, Kelsey Bawden, Senior Technical Policy Advisor, 10th Febraury, 2011*).

3.2 Mitigation Measures

The requirements listed in points (2) and (3) of the EPA's response are driven by a desire to ensure that there is a strong relationship between the assessment and the AQMP, with all mitigation measures assumed in the assessment being incorporated into the AQMP, and to provide mechanisms to ensure that during the project the effective implementation of the mitigation measures can be demonstrated. This is part of a wider program to ensure effective management of fugitive dust sources, including mines and quarries.

The control measures incorporated into the revised modelling are:

- Level 2 watering (>2 L/m^2/hour) of haul roads.
- Restricting vehicle speeds to less than 50 km/hr.
- Keeping travel routes and materials handled by the dozers moist.
- Use of water sprays to minimise emission from the graders.
- Use of wind breaks to reduce wind speeds across the work sites.
- Minimise disturbed areas.

These mitigation measures will be most critical when the activities are being carried out close to houses and during dry windy periods. For example, it is expected that wind breaks would only to be required when the active work areas are very close to the houses (e.g. approximately 250 m).

Recommended methods to record/demonstrate the effective implementation of these control measures which can be incorporated into the AQMP are:

- Incorporation of a daily log sheet in the AQMP that the site supervisor (or delegate) is required to fill out once or twice a day, which requires them to log the following:
  - the date/time;
  - the distance from active work areas to the nearest residences;
  - meteorological conditions (i.e. wind strength based on the Beaufort scale, wind direction (N,NE SW etc), and whether it has rained in last 24 hours);
  - the fugitive dust controls being used (water carts operating etc);
  - whether there are any visible dust emissions travelling off-site towards sensitive receptors; and
  - if yes, what additional controls are to be applied and then confirmation that this has resolved the problem.
- Logging of operating hours and water use (kL or number of loads/day) of the water carts as part of the daily observation sheets discussed above.
- Completion of daily observation sheets as discussed above to record that travel routes and dozer work areas are well watered in dry periods.
- Provide evidence (e.g. photos attached to log sheets) of signage for vehicle speeds and documentation of training of site staff in the need to keep speeds down close to houses and to minimise drop heights.

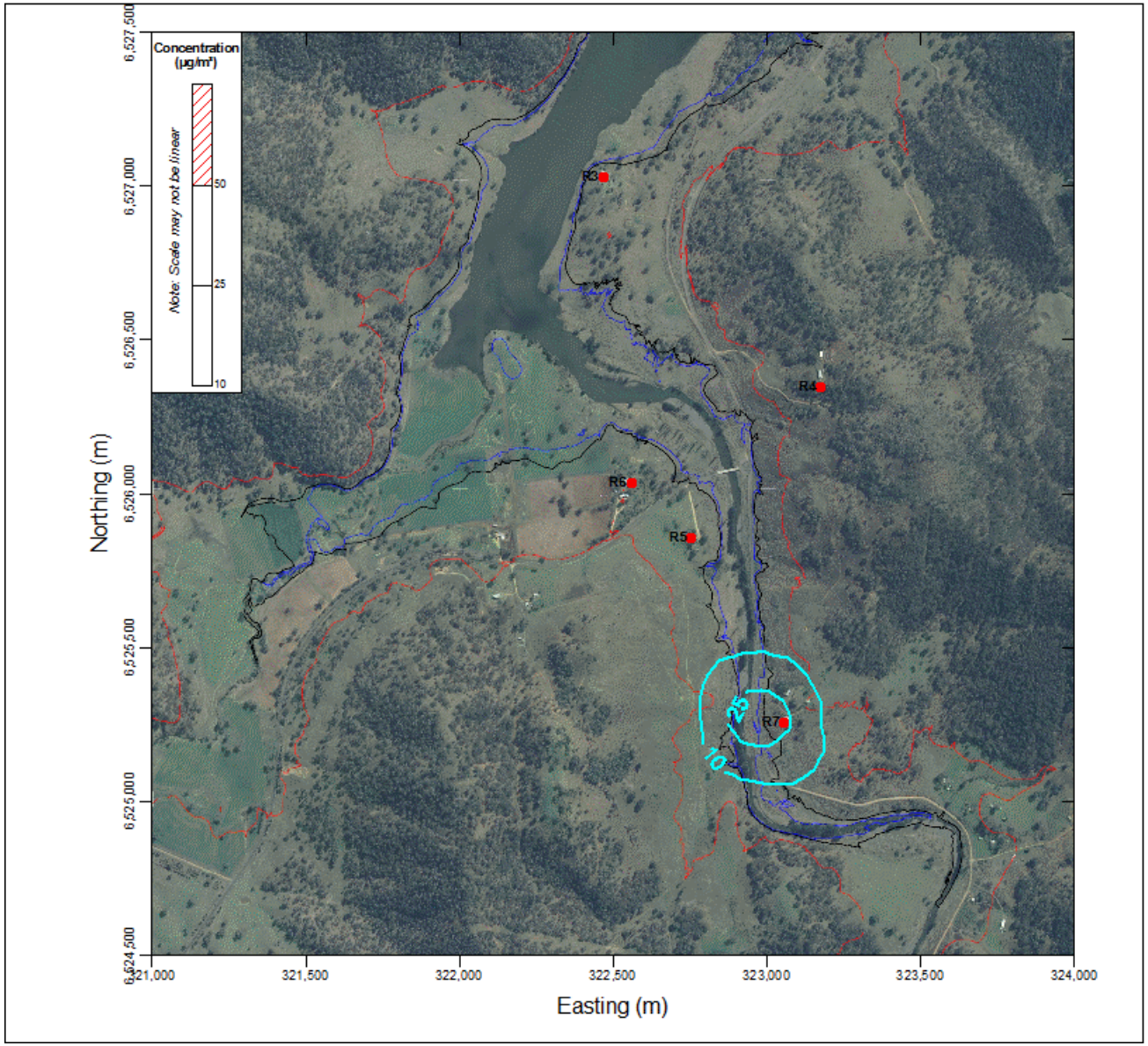
- Provide evidence (e.g. photos attached to log sheets) of wind breaks erected around work areas close to houses.
- Documented consultation with potentially affected residents regarding any impacts they are experiencing as the works progress.

It is important to note that the emission estimates are based on fugitive dust emission factors which are based on measurements performed at large mining operations. They can therefore only be regarded as indicative of the level of emissions that may be expected from the short-term, transient and variable activity levels associated with road construction projects.

As the construction activities will be short-term and variable in nature, the impacts on local air quality will also be short-term and will depend significantly upon the meteorological conditions during the construction period. Regular consultation with potentially affected receptors should be carried out to assess the effectiveness of the implemented dust mitigation measures and to identify whether any additional controls (e.g. modifying or ceasing activities when the wind is blowing towards the nearest residences) are required.

Yours sincerely

KIRSTEN LAWRENCE
Principal



Maximum Predicted 24-Hour Average PM10 Concentrations

(Excluding Background)

NSW OEH Assessment Criterion = 50 µg/m3

LEGEND

Sensitive Receptor

NOTES

Dispersion Model: Calpuff V6.267
Meteorological Year: 2011
Modeller: KL

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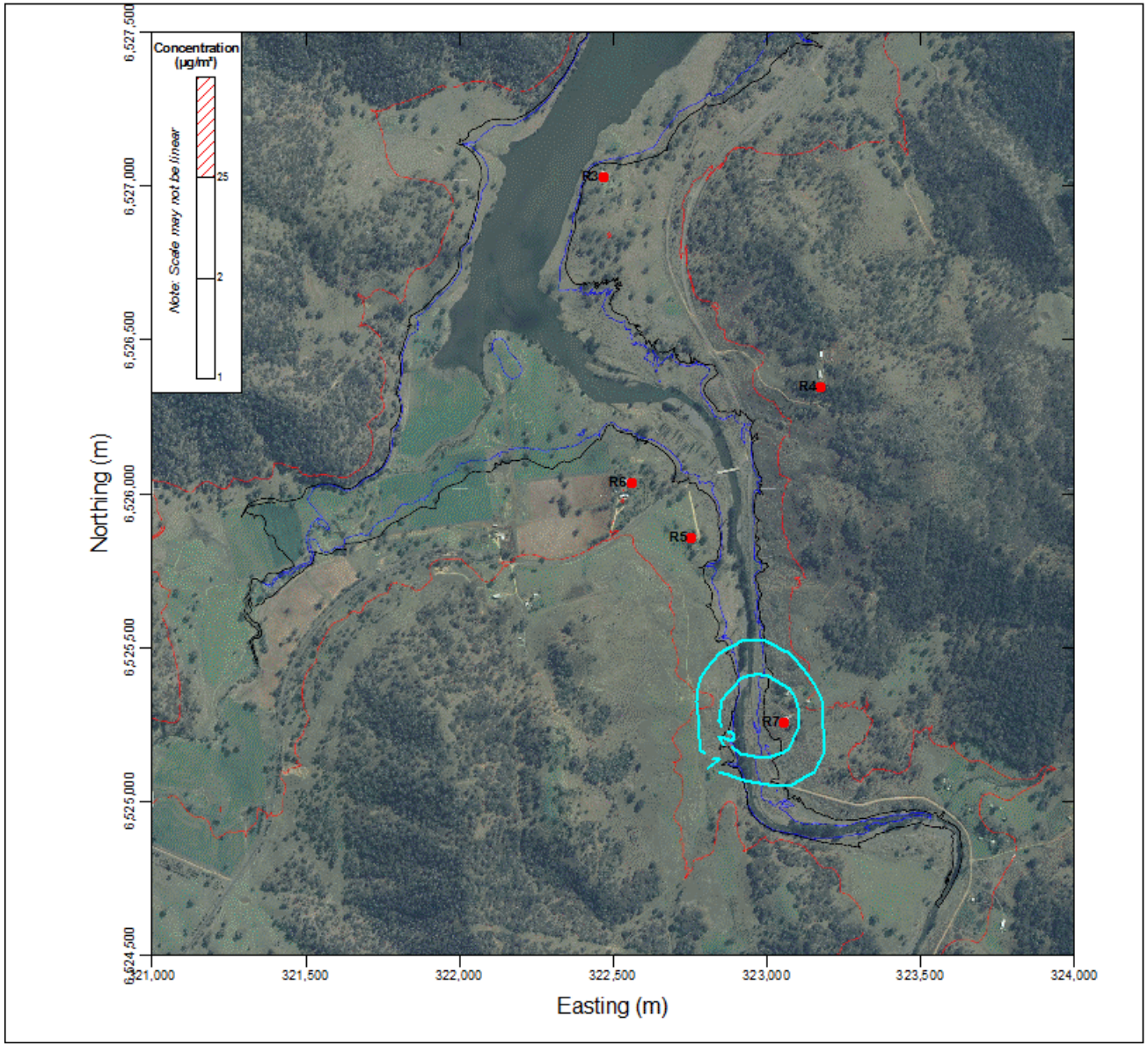
Chaffey Dam Augmentation and Safety Upgrade

AIR QUALITY IMPACT ASSESSMENT

BOWLING ALLEY POINT

Project No.	Date
630.10359	6/03/2013



Maximum Predicted 24-Hour Average PM2.5 Concentrations

(Excluding Background)

NSW OEH Assessment Criterion = 25 µg/m3

LEGEND

Sensitive Receptor

NOTES

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Meteorological Year: 2011
Modeller: KL

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Chaffey Dam Augmentation and Safety Upgrade

AIR QUALITY IMPACT ASSESSMENT

BOWLING ALLEY POINT

Project No.	Date
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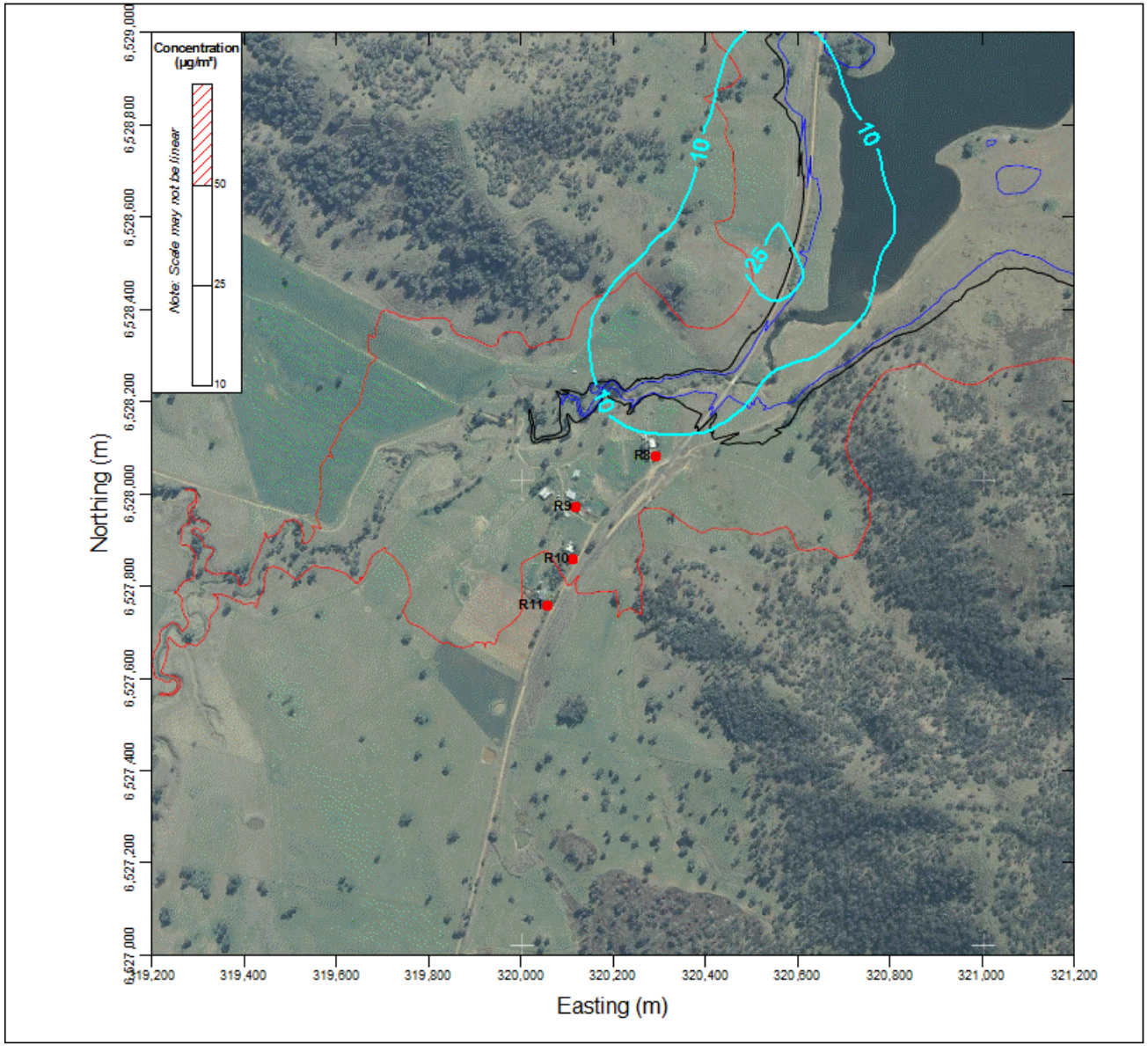

Maximum Predicted 24-Hour Average PM10 Concentrations

(Excluding Background)

NSW OEH Assessment Criterion = 50 µg/m3

LEGEND

Sensitive Receptor

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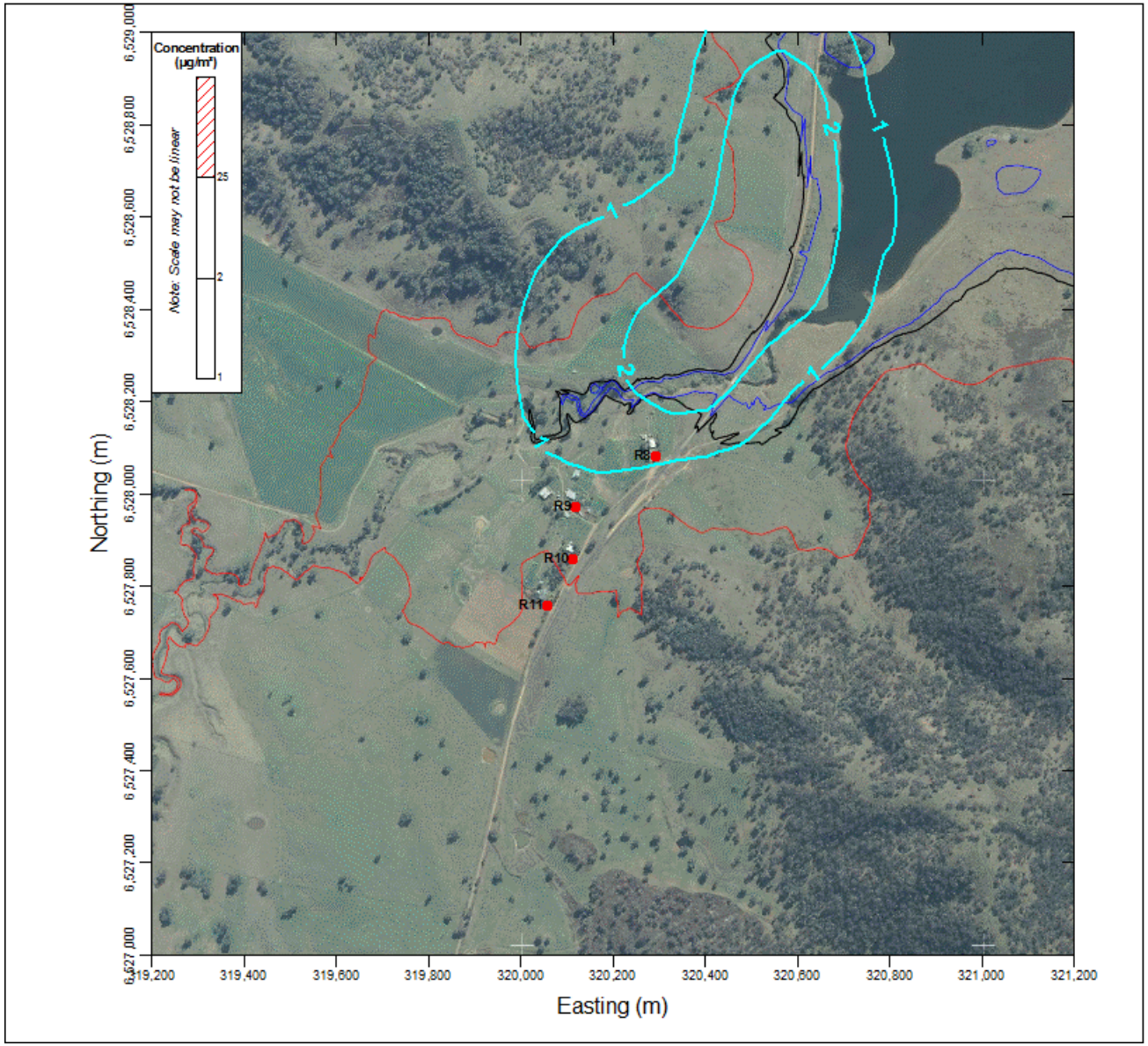
AIR QUALITY IMPACT ASSESSMENT

WESTERN FORESHORE RD

Project No.	Date
630.10359	6/03/2013



Maximum Predicted 24-Hour Average PM2.5 Concentrations

(Excluding Background)

NSW OEH Assessment Criterion = 25 µg/m3

LEGEND

Sensitive Receptor

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WESTERN FORESHORE RD

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