# APPENDIX B6

## Construction Air Quality Management Plan

## *Halfway Creek to Glenugie*

## Pacific Highway Upgrade

**MAY 2015**

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# Glossary / Abbreviations

| | |
|---|---|
| CAQMP | Construction Air Quality Management Plan |
| CEMP | Construction Environmental Management Plan |
| CMC | Civil Mining and Construction Pty Ltd |
| CoA | Condition of Approval |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DECC | Former Department of Environment and Climate Change (NSW) now NSW Office of Environment and Heritage. |
| DoE | Commonwealth Department of Environment |
| DP&E | NSW Department of Planning and Environment |
| DLWC | NSW Department of Land and Water Conservation |
| EEC | Endangered Ecological Community |
| EIS | Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (December, 2012) |
| EPA | NSW Environment Protection Authority |
| EP&A Act | NSW Environmental Planning and Assessment Act 1979 |
| EPL | NSW Environment Protection Licence under the Protection of the Environment Operations Act 1997. |
| ERSED | Erosion and sedimentation |
| EWMS | Environmental Work Method Statements |
| FM Act | NSW Fisheries Management Act 1994 |
| Minister, the | NSW Minister for Planning |
| NEPC | National Environment Protection Council |
| NEPM | National Environment Protection Measures |
| NOW | NSW Office of Water |
| OEH | NSW Office of Environment and Heritage |
| PoEO Act | NSW Protection of the Environment Operations Act 1997 |
| SPIR | Woolgoolga to Ballina Pacific Highway Upgrade Submissions Preferred Infrastructure Report (November, 2013) |

# 1 Introduction

## *1.1 Context*

This Construction Air Quality Management Plan (CAQMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the upgrade of the Pacific Highway from Halfway Creek to Glenugie (the Project). The Project is Section 2 of the Woolgoolga to Ballina (W2B) Pacific Highway upgrade project, approved by the Minister for Planning in 2014.

This CAQMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) and the updated mitigation measures listed in the Pacific Highway Upgrade Woolgoolga to Ballina Submissions / Preferred Infrastructure Report (SPIR) and all applicable legislation. *The existing Glenugie Upgrade Project is to tie into the northern extent of the Project*. The Glenugie Project was approved separately by the Minister for Planning in December 2009 and relevant conditions of this approval have been referenced in the CEMP and this plan as appropriate.

## *1.2 Background*

The Pacific Highway Upgrade Woolgoolga to Ballina Environmental Impact Statement (EIS) (December 2012) assessed the impacts of construction and operation of the Project on air quality, within Chapter 18.

The EIS identified the potential for minor impacts on air quality during construction typically associated with dust. However, it concluded any potential impacts could be managed by standard mitigation and management measures.

The EIS management measures were subsequently updated within the Woolgoolga to Ballina SPIR), with applicable management measures from that report included as part of this Plan.

## *1.3 Environmental management systems overview*

The overall Environmental Management System for the Project is described in the Construction Environmental Management Plan (CEMP).

This CAQMP is part of *CMC's* environmental management framework for the Project, as described in Section 4.1 of the CEMP. Management measures identified in this Plan will be incorporated into site or activity specific Environmental Work Method Statements (EWMS).

EWMS will be developed and signed off by environment and management representatives prior to associated works and construction personnel will be required to undertake works in accordance with the identified mitigation and management measures.

Used together, the CEMP, strategies, procedures and EWMS form management guides that clearly identify required environmental management actions for reference by CMC's personnel and contractors.

The review and document control processes for this Plan are described in Chapter 10 of the CEMP.

# 2 Purpose and objectives

## *2.1 Purpose*

The purpose of this Plan is to describe how CMC proposes to manage and protect air quality during construction of the Project.

## *2.2 Objectives*

The key objective of the CAQMP is to ensure that impacts on air quality are minimised and within the scope permitted by the infrastructure approval. To achieve this objective, CMC will undertake the following:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise air quality impacts and potential adverse impacts to sensitive receivers along the Project corridor.
- Ensure appropriate measures are implemented to address the relevant CoA outlined in Table 3.1 and the mitigation measures detailed in the EIS.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3.1 of this Plan.

Refer to Appendix B7 Construction Waste and Energy Management Plan for measures to reduce greenhouse gas emissions during construction.

# 3 Environmental requirements

## *3.1 Relevant legislation and guidelines*

### 3.1.1 Legislation

Legislation relevant to air quality management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Protection of the Environment Operations Act 1997* (POEO Act).
- *National Greenhouse and Energy Reporting Act 2007*.
- Protection of the Environment Operations (Clean Air) Regulation 2010

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in Appendix A1 of the CEMP. Matters relating to the *National Greenhouse and Energy Reporting Act 2007* are addressed in the Construction Waste and Energy Management Plan (Appendix B7).

### 3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this Plan include:

- National Environment Protection Council's (NEPC) – NEPM for Ambient Air Quality Guidelines.
- Protection of the Environment Operations (Clean Air) Regulation, 2002.
- AS 3580.1.1:2007 Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment
- AS 3580.10.1-2003 (R2014) Methods of Sampling Analysis of Ambient Air.
- Action for Air 2009 (NSW DEC).
- Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (DEC 2005).
- Air Quality Monitoring Criteria for Deposited Dust (DEC Guideline), Refer to Table 5-1.

## *3.2 Minister's Conditions of Approval*

The CoA relevant to this Plan are listed Table 3-1. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

**Table 3-1 Conditions of Approval relevant to the CAQMP**

| CoA No. | Condition Requirements | Document Reference |
|---|---|---|
| B35 | Where available, and of appropriate chemical and biological quality, stormwater, recycled water or other water sources shall be used, where feasible and reasonable, in preference to potable water for construction activities, including concrete mixing and dust control. | Table 7-1 |
| B66 | The SSI shall be constructed in a manner that minimises dust emissions from the site, including wind-blown and traffic-generated | Table 7-1 |

| CoA No. | Condition Requirements | Document Reference |
|---|---|---|
| | dust and tracking of material onto public roads. All activities on the site shall be undertaken with the objective of preventing visible emissions of dust from the site. Should such visible dust emissions occur at any time, the Applicant shall identify and implement all feasible and reasonable dust mitigation measures, including cessation of relevant works, as appropriate, such that emissions of visible dust cease. | |
| B80 | The Applicant shall ensure that all plant and equipment used at the site is:<br>(a) maintained in a proper and efficient condition; and<br>(b) operated in a proper and efficient manner. | Table 7-1 |
| C1 | Prior to the commencement of construction or as otherwise agreed by the Secretary, the Applicant shall prepare and implement a **Community Communication Strategy** to the satisfaction of the Secretary. The Strategy shall provide mechanisms to facilitate communication between the Applicant (and its contractor(s)), the Environmental Representative (see condition D22), the relevant council and community stakeholders (particularly adjoining landowners) on the construction environmental management of the SSI. The Strategy shall include, but not be limited to:<br>(i)<br>(vi) air quality and dust;<br>The Applicant shall maintain and implement the Strategy throughout construction of the SSI. | Community Communication Strategy |
| D25 | The Applicant shall prepare and implement (following approval) a **Construction Environmental Management Plan** for the SSI, prior to the commencement of construction, or as otherwise agreed by the Secretary. The Plan shall be prepared in consultation with the EPA, OEH, DPI (Fisheries), NOW and DoE and outline the environmental management practices and procedures that are to be followed during construction, and shall be prepared in consultation with the relevant government agencies and in accordance with the *Guideline for the Preparation of Environmental Management Plans* (Department of Infrastructure, Planning and Natural Resources, 2004). The Plan shall | CEMP, Appendix B6 |

| CoA No. | Condition Requirements | Document Reference |
|---|---|---|
| | include, but not necessarily be limited to:<br>(a)<br>(v) measures to monitor and manage **dust emissions** including dust from stockpiles, blasting, traffic on unsealed public roads and materials tracking from construction sites onto public roads; | Table 7-1 |
| 2.16 (Glenugie Approval 2009) | The Proponent shall construct the project in a manner that minimises or prevents the emission of dust including wind blown and traffic generated dust, including but not limited to:<br>a) implementing practical measures for construction vehicles carrying loads; and<br>b) minimising tracking of material from construction sites onto public roads. | This plan |

# 4 Existing environment

The following sections summarise what is known about factors influencing air quality within and adjacent to the Project corridor.

The key reference document is Chapter 18 of the EIS.

## *4.1 Air quality records*

There is limited information about air quality in the vicinity of the Project. Long-term monitoring is not usually undertaken outside metropolitan and/or industrial areas, because pollutants typically do not exist in concentrations that would cause adverse environmental or health impacts. However, there has been short-term air quality monitoring adjacent to a dual carriageway section of the Pacific Highway at Korora, which is located in an urban area approximately 20 kilometres south of Woolgoolga. A monitoring station was established at Korora to monitor the ambient air quality from October 2005 to January 2007.

**Table 4-1 Korora air quality monitoring results**

| Pollutant | Averaging period | NEPM goals | | Korora monitoring results | |
|---|---|---|---|---|---|
| | | Maximum concentration | 10-year goal (max allowable exceedence) | Maximum recorded concentration | Average recorded concentration |
| National standards and goals for ambient air quality | | | | | |
| Carbon monoxide | 8hr | 9.0 ppm (10 mg/$m^3$) | 1 day a year | 0.2 ppm (0.3 mg/$m^3$) | 0.03 ppm (0.04 mg/$m^3$) |
| Nitrogen dioxide | 1 hr | 0.12 ppm (246 µg/$m^3$) | 1 day a year | 0.036 ppm (73.8 µg/$m^3$) | 0.004 ppm (9.2 µg/$m^3$) |
| Particles as $PM_{10}$ | 1 day | 50 µg/$m^3$ | 5 days a year | 37.8 µg/$m^3$ | 20.3 µg/$m^3$ |
| Advisory reporting goals | | | | | |
| $PM_{2.5}$ | 1 day | 25 µg/$m^3$ | Gather data to facilitate review of goal | 15.4 µg/$m^3$ | 7.7 µg/$m^3$ |

## *4.2 Rainfall, soil dryness and wind*

The rainfall records from Grafton have been selected to reflect the potential rainfall conditions across the Project site due to its location within the overall site, and extent of available data. A summary of the rainfall records from the Bureau of Meteorology is provided in Table 4-2

**Table 4-2 Summary of rainfall records**

| Summary of rainfall record from 1888 to present | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Summer / Autumn | | | | | | Winter / Spring | | | | | | |
| | Dec | Jan | Feb | Mar | Apr | Ma | Jun | July | Aug | Sep | Oct | Nov | Year |
| *Mean rainfall (mm)* | 119.3 | 143.7 | 150.8 | 129.4 | 88.4 | 79.5 | 69.2 | 38.1 | 40.9 | 37.7 | 77.9 | 106.1 | 1080.0 |
| *Mean rain days* | 10.0 | 10.6 | 10.9 | 11.2 | 8.0 | 7.5 | 5.8 | 4.6 | 4.3 | 5.2 | 7.3 | 9.4 | 94.8 |
| *Mean dry days* | 6.3 | 6.3 | 4.2 | 7.0 | 9.0 | 10.2 | 11.5 | 13.9 | 15.5 | 14.0 | 9.4 | 7.9 | 115.2 |
| *Mean wind speed (km/h)* | 6.2 | 5.8 | 5.7 | 6.1 | 6.8 | 5.9 | 6.0 | 5.7 | 7.2 | 7.3 | 7.8 | 6.6 | 6.4 |
| *Mean max emp ($^0C$)* | 29.6 | 30.1 | 29.3 | 28.2 | 26.2 | 23.1 | 20.8 | 20.5 | 22.2 | 24.9 | 26.7 | 28.1 | 25.8 |
| *Mean min temp* | 18.4 | 19.7 | 19.7 | 18.0 | 14.9 | 11.2 | 8.1 | 6.4 | 7.2 | 10.4 | 13.7 | 16.3 | 13.7 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ($^0$C) | | | | | | | | | | | | | |

The above table provides a consideration of typical climatic factors that contribute to the proliferation of dust particulates. In addition to the exposure of unconsolidated material during construction eg earthworks, climatic factors such as prolonged dry weather, combined with high winds, can increase the likelihood of dust particulate emissions.

It can be seen from the table that rainfall is typically higher during summer and autumn. Winter and spring are typically drier periods during the year.

Annually, winds within the study area most commonly occur from the south-south-east to south. The annual pattern of winds creates a greater potential for adverse dust impacts at sensitive receivers to the north and north-north-west of the site. This section of the project traverses or lies adjacent to vegetated or low-density rural residential and pastoral land, with the largest number of sensitive receivers located at the northern end of the project.

Figure 4.1 Wind roses for the Wells Crossing region (CSIRO 2008)


**Soil characteristics**

**The soil types along the Project are described in**

Table 4-3, with an indication of the potential for wind erosion ie dust emissions The soil information is from the DLWC Soil Landscapes of the Coffs Harbour (1999), Woodburn (2011) and Lismore and Ballina (1994) 1:100,000 sheets and the CSIRO Atlas of Australian Soils (1960-1968) 1:2,000,000 sheets.

**Table 4-3 Soil type and characteristics**

| Section | Soil type | Characteristics | Dust emission risk |
|---|---|---|---|
| 2 | No published soil landscape map is available for this section. | It is likely that the soil types are erosional or transferal and are generally highly erodible and have low bearing strength. Soft soils are reported to occur between the Dirty Creek Range and Halfway Creek. | *High* |

## *4.3 Sensitive receivers*

The construction of the Project will interact with a number of sensitive receivers and natural environments. The lands surrounding the Project have been considered for potential sensitivity to dust and air quality impacts. The potential sensitive receivers include:

- Residences.
- Native vegetation.
- Sensitive agricultural and commercial industries.
- Road users.
- Watercourses.

The nearest potentially affected non-residential sensitive receivers have been identified as, but not limited to, the following:

- *Coles Express Service Station (corner of Lemon Tree Road and Pacific Hwy)*
- *Benefield Rose Farm*
- *Tow truck yard north of Parker Rd*
- *Rural produce outlet Parker Rd*
- *Matilda Service Station Halfway Creek*
- *Native vegetation in the Glenugie State Forest*
- *Watercourses: Halfway Creek, Wells Crossing drainage line and Glenugie Creek*
- *Wells Crossing Flora Reserve*
- *Newfoundland State forest*

Residential sensitive receivers have been identified from their close proximity to the Project. These receivers have been grouped into dust catchment areas. The location of these catchments and the non-residential sensitive receivers listed above are shown in Appendix A

.

# 5 Air quality criteria

The Environment Protection Authority (EPA) sets goals for ambient dust concentrations and dust deposition, which is a measure of the impacts of nuisance (EPA 2001).

The acceptable increment in annual average dust deposition depends on the existing deposition level. These are based on research by Dean (1990) and other investigations, which detail community response to dust fallout. It should be remembered that the air quality goals relate to the total dust burden in the air and not just the dust from the Project. In other words, there needs to be some consideration of background levels when using these goals to assess impacts.

Table 5-1 details the air quality monitoring criteria for deposited dust.

**Table 5-1 Air quality monitoring criteria for deposited dust[a]**

| Pollutant | Annual concentration | | Source |
|---|---|---|---|
| Deposited dust[b] | 2 g/m2/month[c] | 4 g/m2/month[d] | NERDDC (1998) |

*Note:*

*a. Adapted from DECCW guideline; Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DECCW 2005).

*b. Dust is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).*

*c. Maximum increase in deposited dust level.*

*d. Maximum total deposited dust level.*

*e. Refer to G36 Section .4.4 Air Quality*

## 5.1 Air Quality Monitoring

Dust deposition gauges will be established in several locations throughout the project site to measure dust impacts on both residential and environmental receivers.

The dust gauge locations identified in Appendix A have been selected based on the sensitive receivers, typical wind direction and speeds and schedule of construction activities

A control site will also be established to assist in identifying background levels and validating data. The proposed gauge locations are identified in Appendix A.

# 6 Environmental aspects and impacts

## *6.1 Construction activities*

Emissions to the atmosphere during construction that could result in adverse impacts to air quality are typically divided into two categories:

- Dust and particulates.
- Gaseous.

Key aspects of the Project that could result in dust emissions include:

- General earthworks particularly during site establishment.
- Vegetation clearing.
- Bulk Earthworks.
- Drilling and Blasting;
- Operating, crushing and screening.
- Operation of concrete / asphalt batching plants.
- concrete cutting and sawing;
- jack hammering;
- liming; and
- chipping and grinding of vegetation
- Topsoil / material handling including stockpiling, material loading and material haulage.
- Vehicular movements over unpaved surface (including unsealed access roads).
- Wind erosion of exposed areas and temporary stockpiles.
- Tracking of dirt onto roads.

Air emissions, other than dust, which may be generated by construction activities include:

- Vehicle and plant exhaust emissions, which may be excessive if vehicles and plant are poorly maintained.
- Herbicide and pesticide spraying
- Odours/gases released during:
  - Excavations of organic or contaminated materials.
  - During sealing works.
  - Operation of concrete / asphalt batching plants.
  - Waste storage

## *6.2 Factors likely to affect dust generation and impacts*

In addition to the inherent risks of specific construction activities creating the potential to generate dust, a number of other environment factors also affect the likelihood of dust emissions. These include:

- Wind direction – determines whether dust and suspended particles are transported in the direction of the sensitive receivers.
- Wind speed – governs the potential suspension and drift resistance of particles.
- Soil type – more erodible soil types have an increased soil or dust erosion potential.
- Soil moisture – increased soil moisture reduces soil or dust erosion potential.
- Rainfall or dew – rainfall or heavy dew that wets the surface of the soil and reduces the risk of dust generation.

## *6.3 Impacts*

The potential for impacts on air quality will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to construction might include:

- Deposition of dust on surfaces where it may cause damage and/or lead to a need for increased cleaning or repair.
- Aesthetic effects that arise from visible airborne dust plumes and from deposits of dust on surfaces.
- Need for increased maintenance of air filtering systems (eg air conditioners etc).
- Potential adverse health effects including eye, nose and throat irritation from excessive inhalation of fine particles.
- Impacts on water quality and/or vegetation health from dust deposition.
- Impacts on residential sensitive receivers, including impacts on living areas, swimming pools and general amenities.
- Domestic tank water supply
- Complaints from the public relating to dust or odours.
- Dust deposition impacts on sensitive agricultural receivers, including blueberry farms Some impacts on air quality attributable to the Project are anticipated and have been described in the EIS.

CoA B66 requires that:

- The SSI shall be constructed in a manner that minimises dust emissions from the site, including wind-blown and traffic-generated dust and tracking of material onto public roads. All activities on the site shall be undertaken with the objective of preventing visible emissions of dust from the site. Should such visible dust emissions occur at any time, the Applicant shall identify and implement all feasible and reasonable dust mitigation measures, including cessation of relevant works, as appropriate, such that emissions of visible dust cease.

Chapter 7 provides a suite of mitigation measures that will be implemented to avoid or minimise dust impacts.

## *6.4 Air Quality Risks*

The potential for related air quality impacts have been considered in a risk assessment in Section 3.4 and Appendix A2 of the CEMP

# 7 Environmental control measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the EIS, Submissions Preferred Infrastructure Report (SPIR), supplementary assessments, Conditions of Approval and RMS documents, and from recent experience on similar road projects. Specific measures and requirements to address impacts on air quality are outlined in Table 7-1.

**Table 7-1 Air quality management and mitigation measures**

*To be updated by contractor*

| ID | Measure / Requirement | Resources needed | When to implement | Responsibility | Reference |
|---|---|---|---|---|---|
| **GENERAL** | | | | | |
| AQ1 | Training will be provided to all project personnel, including relevant sub-contractors on sound air quality control practices and the requirements from this plan through inductions, toolboxes and targeted training. | | Pre-construction<br>Construction | Construction Manager / Environment Manager | G38/G36<br>Good practice |
| AQ2 | Air quality control measures from this plan will be included in relevant Environmental Work Method Statements (EWMS) and/or Erosion and Sediment Control Plans (ESCP). | | Pre-construction / Construction | Site Engineer / Environmental Manager | Good practice |
| AQ3 | Vegetation clearing will be staged where possible to minimise the area and time that surfaces are exposed and adhere to vegetation clearing limits.. | | Construction | Site Engineer / Foreman | G40, SPIR |
| AQ4 | Exposed surfaces with no scheduled work for two weeks will be treated to minimise dust generation. Exposed surfaces will be stabilised progressively using the most practical site specific methods, including watering and geo-fabrics for short term exposure and emulation spray, spray grass, soil compaction and revegetation for longer term exposed areas or final finishes. | | Construction | Site Engineer / Foreman | SPIR |
| AQ5 | Construction activities will be modified, reduced or controlled during high or unfavourable wind conditions if they have a potential to increase dust generation. | | Construction | Site Engineer / Foreman | G36, SPIR |
| AQ6 | Control measures including water carts, sprinklers, sprays, dust screens or the application of geo-binding agents will be utilised where applicable to control dust emissions on all exposed areas including haul roads. The frequency of use will be modified accommodate prevailing conditions. | | Construction | Site Engineer / Foreman | G36, SPIR / EPL |
| AQ7 | Erosion control structures will be checked regularly for build up of silt and other materials to ensure deposits do not become a dust source. | | Construction | Site Engineer / Foreman | Good practice |
| AQ8 | Waste will be segregated and collected on a regular basis | | Construction | Site Engineer / Foreman | Good practice |

| ID | Measure / Requirement | Resources needed | When to implement | Responsibility | Reference |
|---|---|---|---|---|---|
| | to ensure odours associated with waste do not become an issue and the location of waste receptacles away from sensitive receivers to minimise odour impacts. | | | | |
| AQ9 | The application of pesticides and herbicides will be modified, reduced or controlled during high or unfavourable wind conditions where wind can carry pesticides outside of the defined treatment area. | | Construction | Site Engineer / Foreman | G36 |
| AQ10 | Stockpiles will be located in accordance with the criteria established in Appendix B8 of the CEMP. A suitable cover crop or provision of other covering over topsoil stockpiles will be established where stockpiles prone to wind erosion are in place for longer than 4 weeks. Where stockpiles are in place less than 4 weeks other measures such as compacting, covering, watering will be implemented. | | Construction | Site Engineer / Foreman | G36, SPIR |
| AQ11 | There will be no burning off of waste. | | Construction | Foreman | G36 |
| AQ12 | Stormwater, recycled water or other water sources shall be used, where feasible and reasonable, in preference to potable water for construction activities, including concrete mixing and dust control. | | Construction | Site Engineer / Foreman | COA B35 |
| **VEHICLE MOVEMENT AND MATERIAL STORAGE** | | | | | |
| AQ13 | Areas of disturbed material and access roads will be stabilised where possible by methods such as compaction. Compounds, ancillary facilities, administration access roads and standing areas will be hard surfaced. | | Construction | Superintendent | G36 |
| AQ14 | Measures implemented to minimise dust, soil or mud from being deposited by vehicles on public roads. This will be achieved by implementing mitigation measures such as rumble grids and large aggregate at entry/exit points. Manual cleaning will also be carried out where appropriate. In the event of any spillage or tracking, the spilt material will be removed immediately. | | Construction | Site Engineer / Foreman | G36, SPIR / EPL |
| AQ15 | Hardstand areas and surrounding public roads will be cleaned, as required, using methods including brooms, bobcat attachments or street sweepers. | | Construction | Site Engineer / Foreman | Good practice |

| ID | Measure / Requirement | Resources needed | When to implement | Responsibility | Reference |
|---|---|---|---|---|---|
| AQ16 | Vehicle movement will be confined to designated haul roads and areas. These roads will have speed limits of 40km/h in order to reduce dust generation. Reduced speed limit maybe implemented where dust generation persists | | Construction | Site Engineer / Foreman | G36, SPIR |
| AQ17 | All loaded haulage trucks will be covered where there is a risk of release of dust or other materials and at all times on public roads. | | Construction | Site Engineer / Foreman | G36, SPIR |
| **PLANT AND EQUIPMENT** | | | | | |
| AQ18 | Haul trucks and plant equipment will be switched off when not in operation for periods of more than 15 minutes. | | Construction | Foreman / Operators | G36 / EPL |
| AQ19 | Engines of plant parked next to residents will be switched off when not in operation. | | Construction | Foreman / Operators | Good practice |
| AQ20 | Exhaust systems of construction plant, vehicles and machinery will be maintained in accordance with manufacturer's specifications to ensure that emissions do not exceed EPA regulations. Periodic visual checks will be undertaken to ensure ongoing compliance, typically weekly. Plant and equipment found to be emitting excessive smoke will be stood down until adequately repaired. | | Construction | Site Engineer / Foreman | G36 / EPL |
| **BATCH PLANTS** | | | | | |
| AQ21 | Water carts will be used to suppress dust around batch plants. | | Construction | Site Engineer / Foreman | Good practice, SPIR |
| AQ22 | Batch plants will be swept and cleaned to keep them in a tidy state to prevent the build up of dust. | | Construction | Site Engineer / Foreman | Good practice |
| AQ23 | Deliveries and stockpiles of materials to be used within the batch plant will be managed via such measures as water sprays and covering. | | | | |
| AQ2 | High dust emitting structures or processors in batch plants (eg conveyer belts) will have water spraying systems installed to suppress dust. | | Construction | Site Engineer / Foreman | Good practice, SPIR |
| AQ25 | Concrete batch plants to be fitted with dust filters to minimise air quality impacts from batching operations. | | Construction | Site Engineer / Foreman | G36 |

| ID | Measure / Requirement | Resources needed | When to implement | Responsibility | Reference |
|---|---|---|---|---|---|
| **BLASTING AND CRUSHING** | | | | | |
| AQ26 | Where practical during blasting, a combination of the following mitigation measures will be used to suppress dust:<br>• Weather reports checked prior to blasting to ensure wind blown dust will not reach surrounding residents.<br>• Controlled blasts to minimise dust produced.<br>• Timely stripping of topsoil prior to blasting | | Construction | Site Engineer / Foreman | Good practice |
| AQ27 | Crushers will be positioned in protected areas, where practical, to reduce wind dispersion of dust particles (eg within cuts). Water spraying will be utilised if necessary. | | Construction | Site Engineer / Foreman | Good practice |
| **INSPECTION, MONITORING AND RECORDS** | | | | | |
| AQ28 | Public roads will be inspected each day at main entry and exit points to and from areas where construction activities are taking place and compound. Material tracked onto the road pavement will be removed in accordance with AQ14. | | Construction | Site Engineer / Foreman | G36 |
| AQ29 | Dust deposition gauges will be established three months prior to the commencement of construction to establish background dust levels. Monitoring equipment will remain in place until completion of the construction works and/or where ground conditions are stable. Results will be captured on a monthly basis and collected in accordance with DEC's "Approved Method for the Sampling and Analysis of Air Pollutants in NSW" guidelines. | | Pre-construction / Construction | Site Engineer / Foreman | G36, SPIR |
| AQ30 | Weather forecast will be reviewed on a daily basis and appropriate measures implemented where unfavourable weather conditions (dry weather, strong winds) are anticipated. Typical Measures include:<br>• Review work methodology<br>• Regular watering<br>• Compaction<br>• Cover | | Construction | Environmental Manager / Foreman | Good practice |

| ID | Measure / Requirement | Resources needed | When to implement | Responsibility | Reference |
|---|---|---|---|---|---|
| | • Geo-binders<br>• Dust Screens | | | | |
| AQ31 | An onsite weather station will be established to record weather data. Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office is established. | | Pre-construction / Construction | Environmental Manager | Good practice |
| AQ32 | Dust control and operational procedures will be reviewed and modified if results exceed the air quality criteria and are attributable to construction activities. | | Construction | Environmental Manager / Foreman | Good practice, SPIR |

# 8 Compliance management

## *8.1 Roles and responsibilities*

The CMC Project Team's organisational structure and overall roles and responsibilities are outlined in Section 4.2 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Chapter 7 of this Plan.

## *8.2 Training*

All employees, contractors and sub contractors working on site will undergo site induction training relating to air quality management issues. The induction training will address elements related to air quality management including:

- Existence and requirements of this sub-plan.
- Relevant legislation.
- EPL conditions (eg. specifically dust management competency and maintenance of plant and equipment conditions, and the Dust Assessment Handbook).
- Roles and responsibilities for air quality management.
- Air quality mitigation and management measures.
- Procedure to be implemented in the event of an incident (eg release of dust or gaseous emissions from site).

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in air quality management. Examples of training topics include:

- ERSED control installation methodology.
- Planning and preparedness for high wind events / dust risk periods.
- Lessons learnt from dusty periods, incidents and other event eg low rainfall/high wind.

Further details regarding staff induction and training are outlined in Chapter 5 of the CEMP.

## *8.3 Monitoring and inspection*

Regular monitoring and inspections will be undertaken during construction. Monitoring and inspections will include, but not be limited to:

- Refer to appendices A to C.
- Daily visual inspections of dust suppressant plant and equipment;
- Weekly inspections of dust suppressant measures e.g. of stabilisation measures and revegetation/groundcover
- Monthly dust monitoring in accordance with DEC's "Approved Method for the Sampling and Analysis of Air Pollutants in NSW" guidelines.
- Weather data at the premises, including rainfall measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office is established.

Additional requirements and responsibilities in relation to inspections are documented in Section 8.2 of the CEMP.

## 8.4 Licenses and permits

An EPL will be obtained by CMC for the scheduled activity “road construction”. The EPL typically prescribes air quality parameters to be measured. The air quality monitoring criteria for the Project is listed in Table 5-1 [CMC will update the table following issue of EPL, if necessary].

Any other relevant licenses or permits will be obtained in the lead up to and during construction as required.

## 8.5 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 8.3 of the CEMP.

## 8.6 Reporting

Reporting requirements and responsibilities are documented in the Sections 8.3 and 8.5 of the CEMP. In addition dust monitoring results will be reported on a monthly basis as per section 8.5 of the CEMP

# 9 Review and improvement

## *9.1 Continuous improvement*

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance.
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

## *9.2 CAQMP update and amendment*

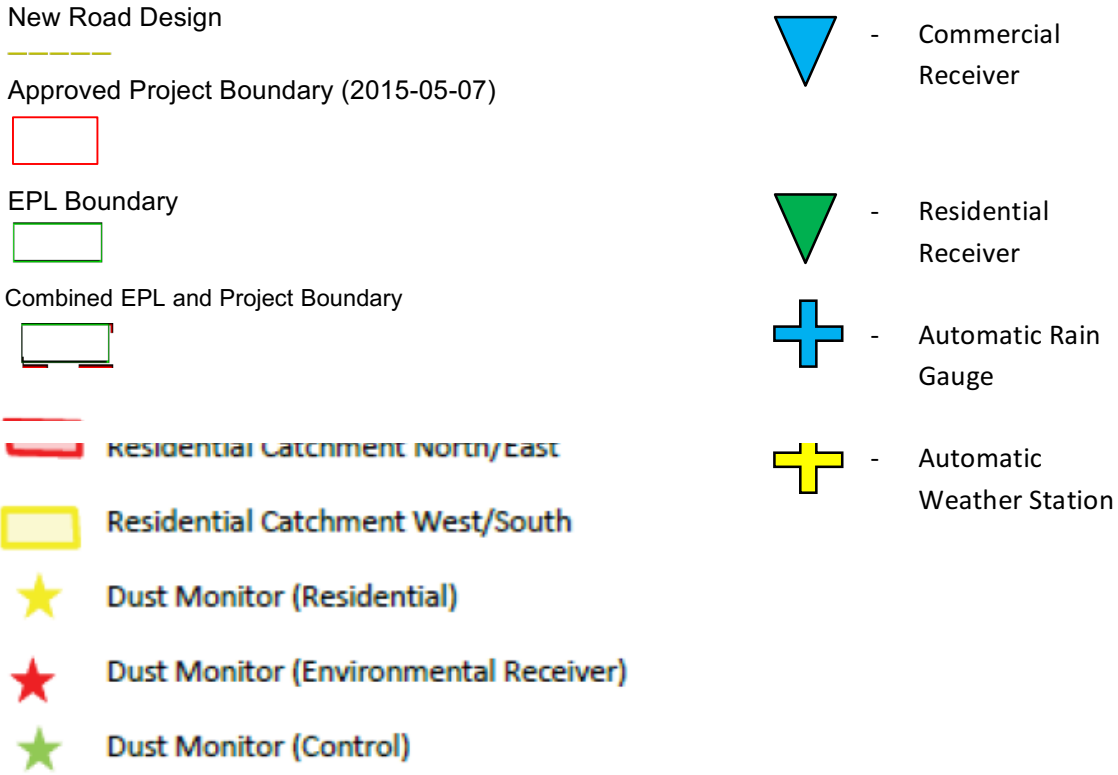
The processes described in Section 8 and Section 9 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Only the ER can approve minor amendments to the CEMP (including sub-plans). All other amendments must be approved by the Secretary.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 10.2 of the CEMP.

**Appendix A**
Dust catchment areas and sensitive receivers

# Sensitive Receiver Maps

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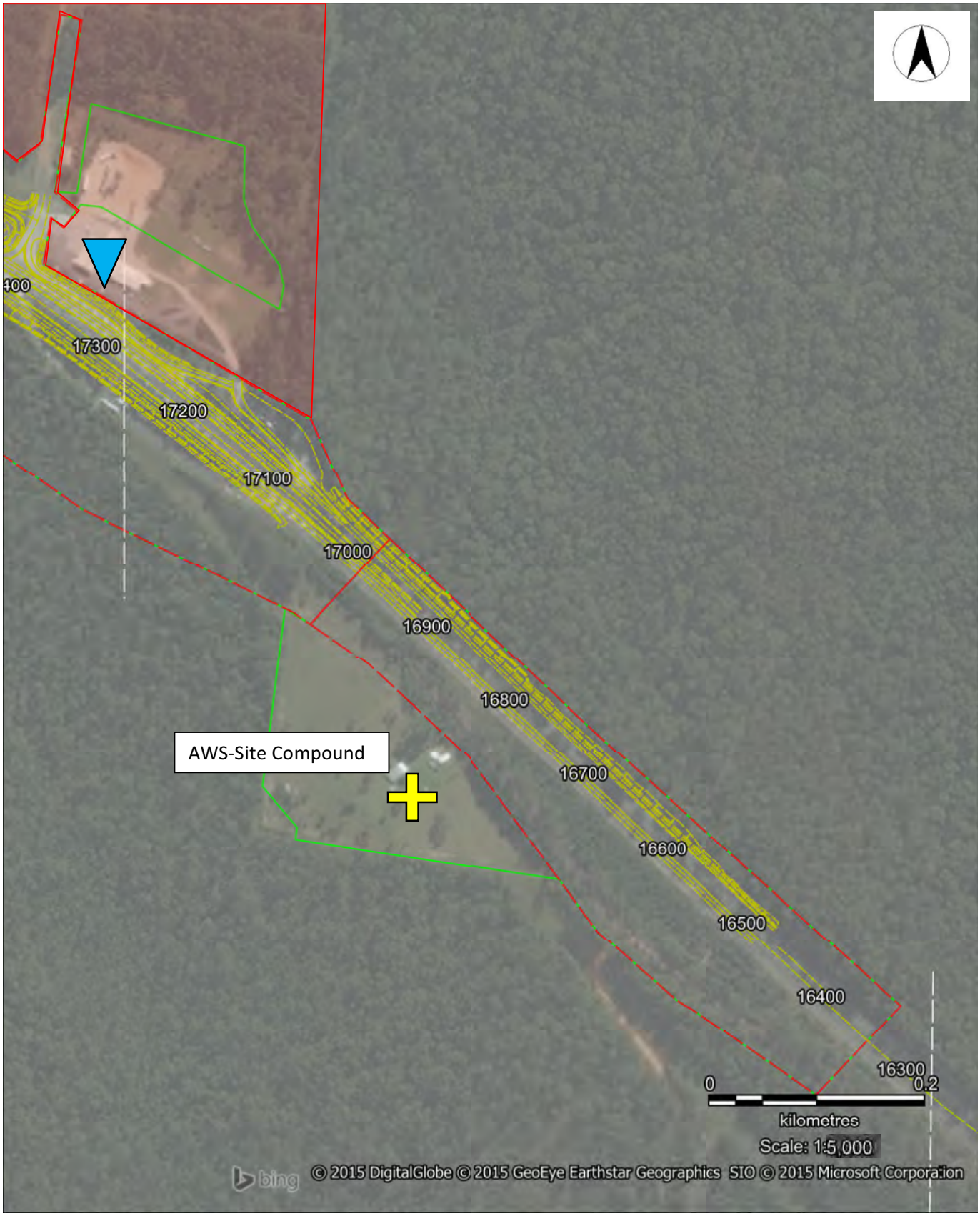


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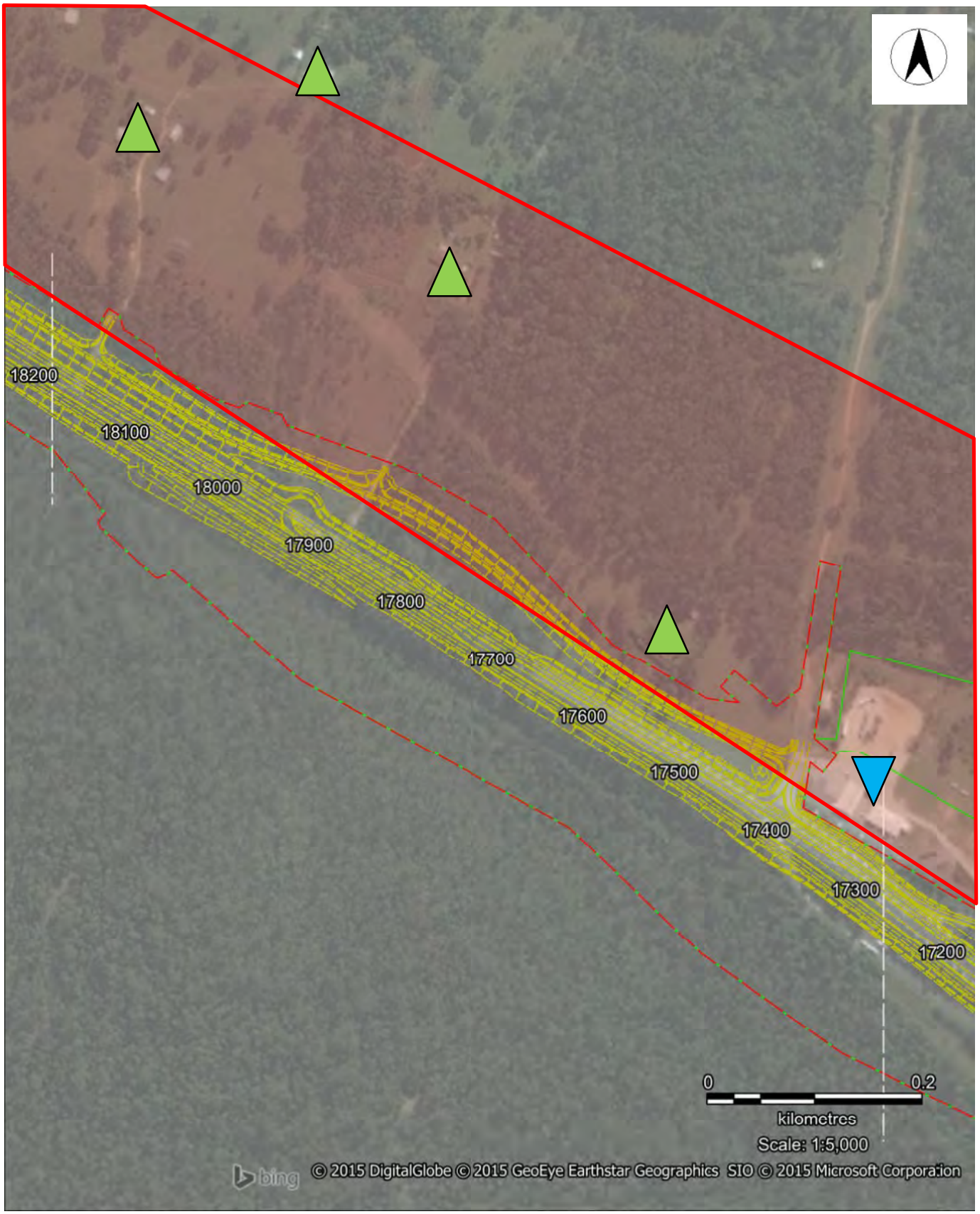


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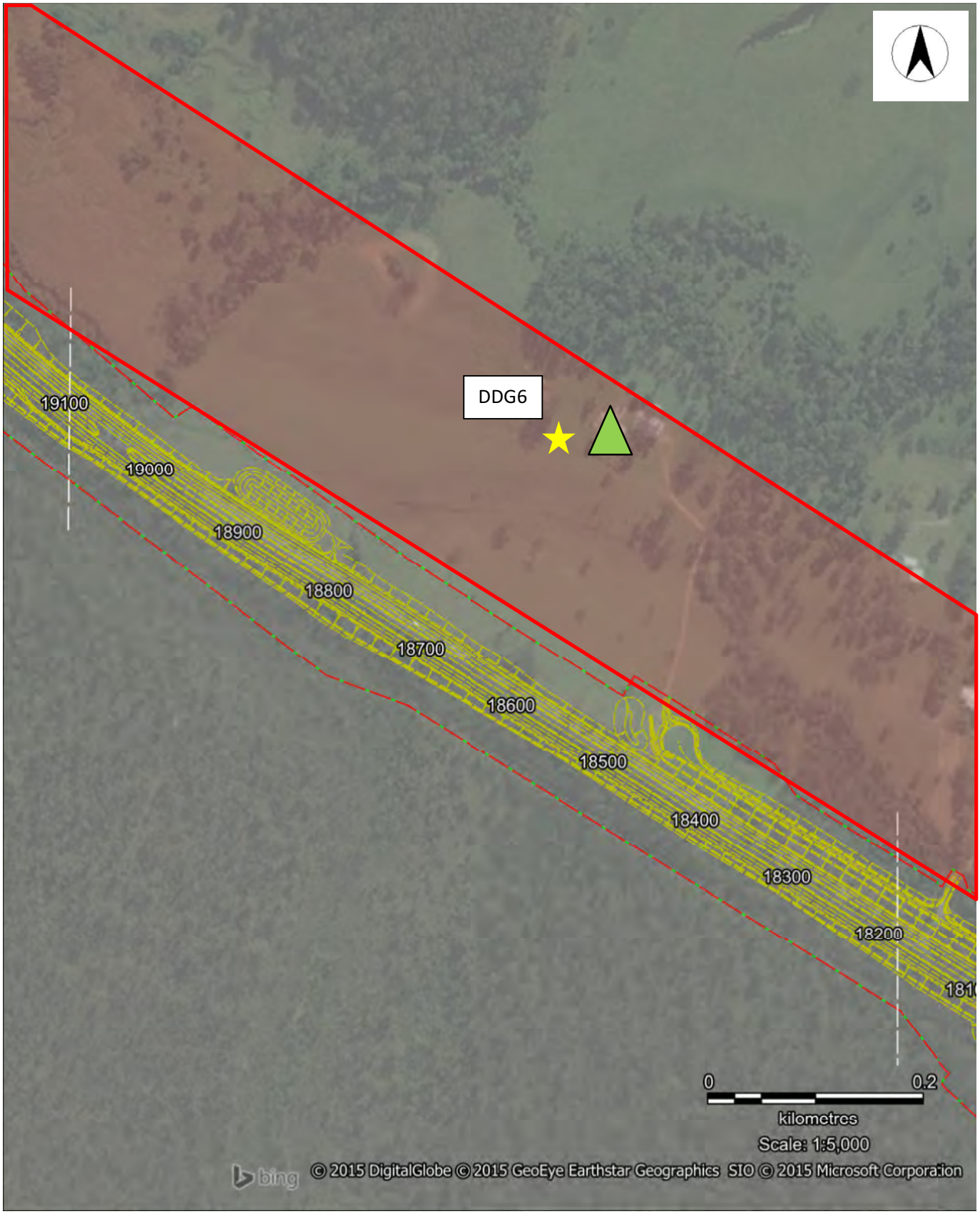


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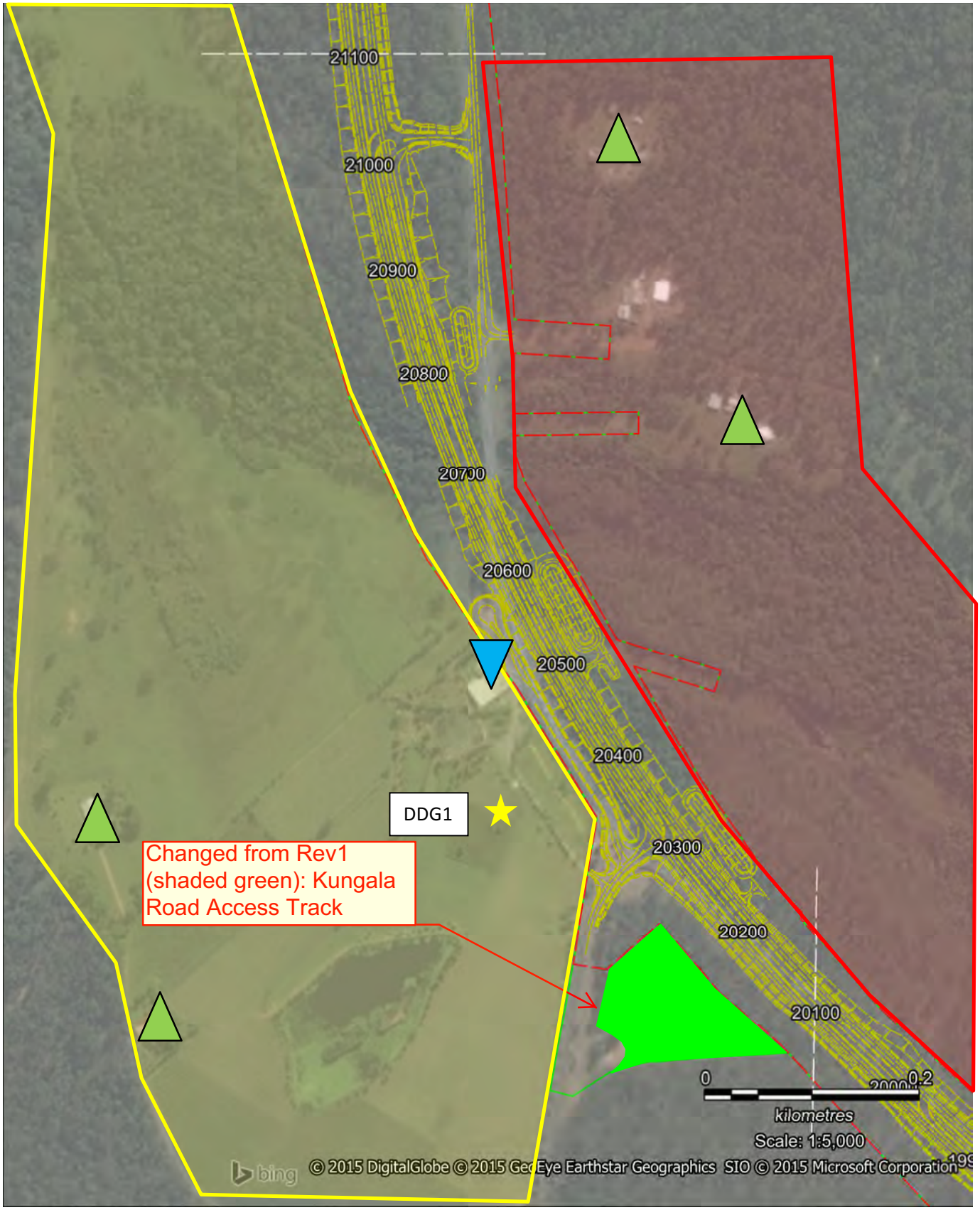


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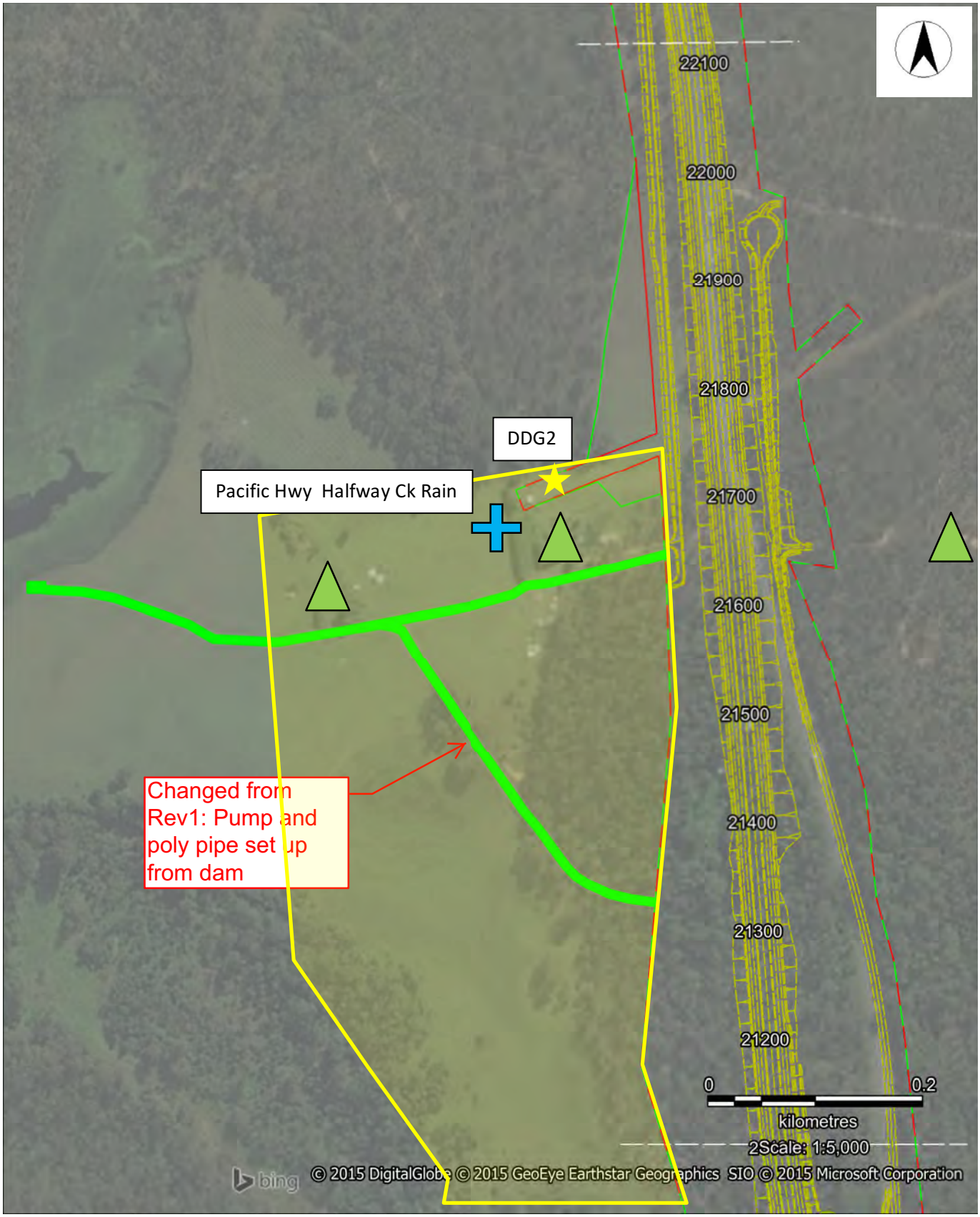


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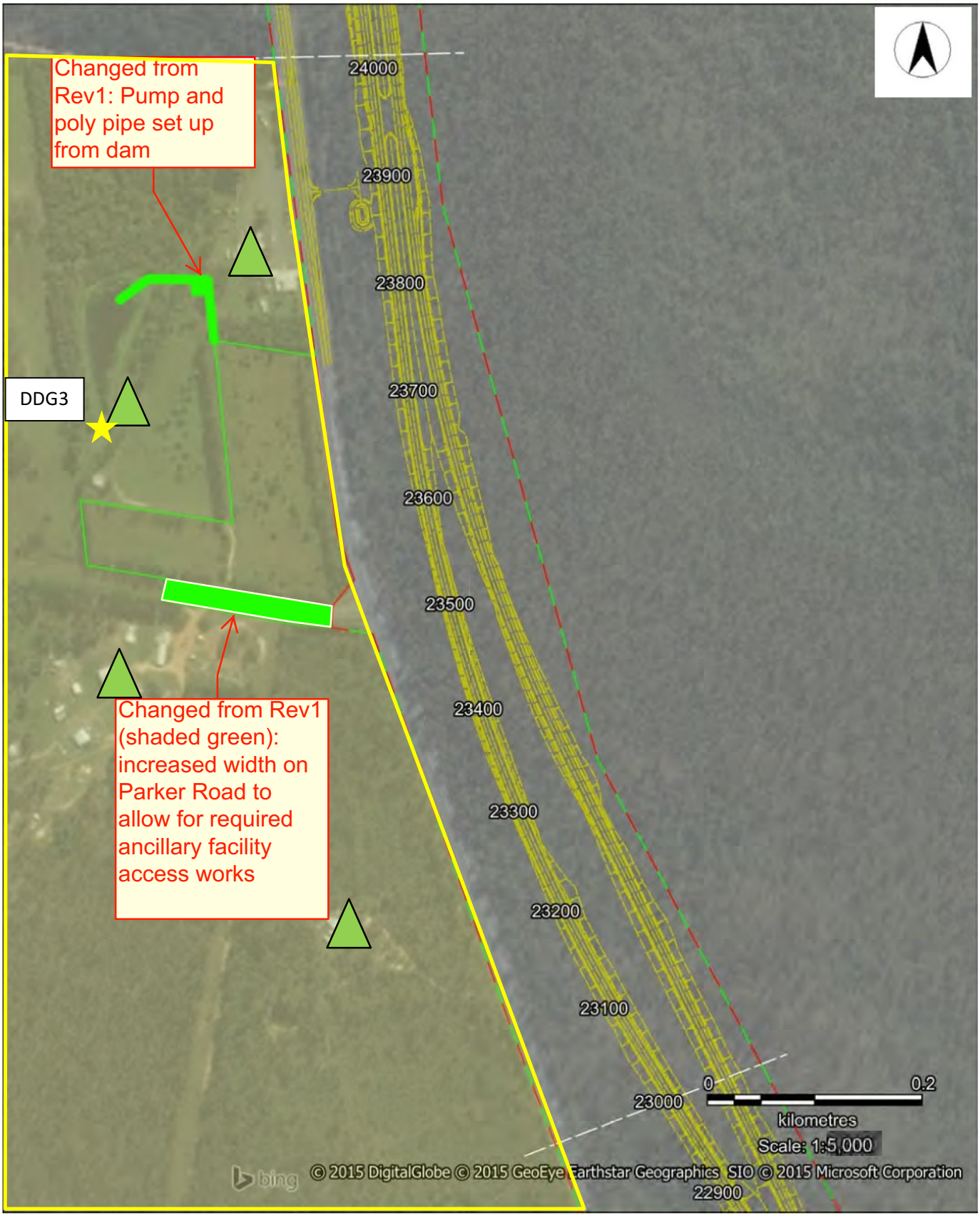
Revision: 2
Date: 2015/10/19
Sheet: 8

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Revision: 2
Date: 2015/10/19
Sheet: 9

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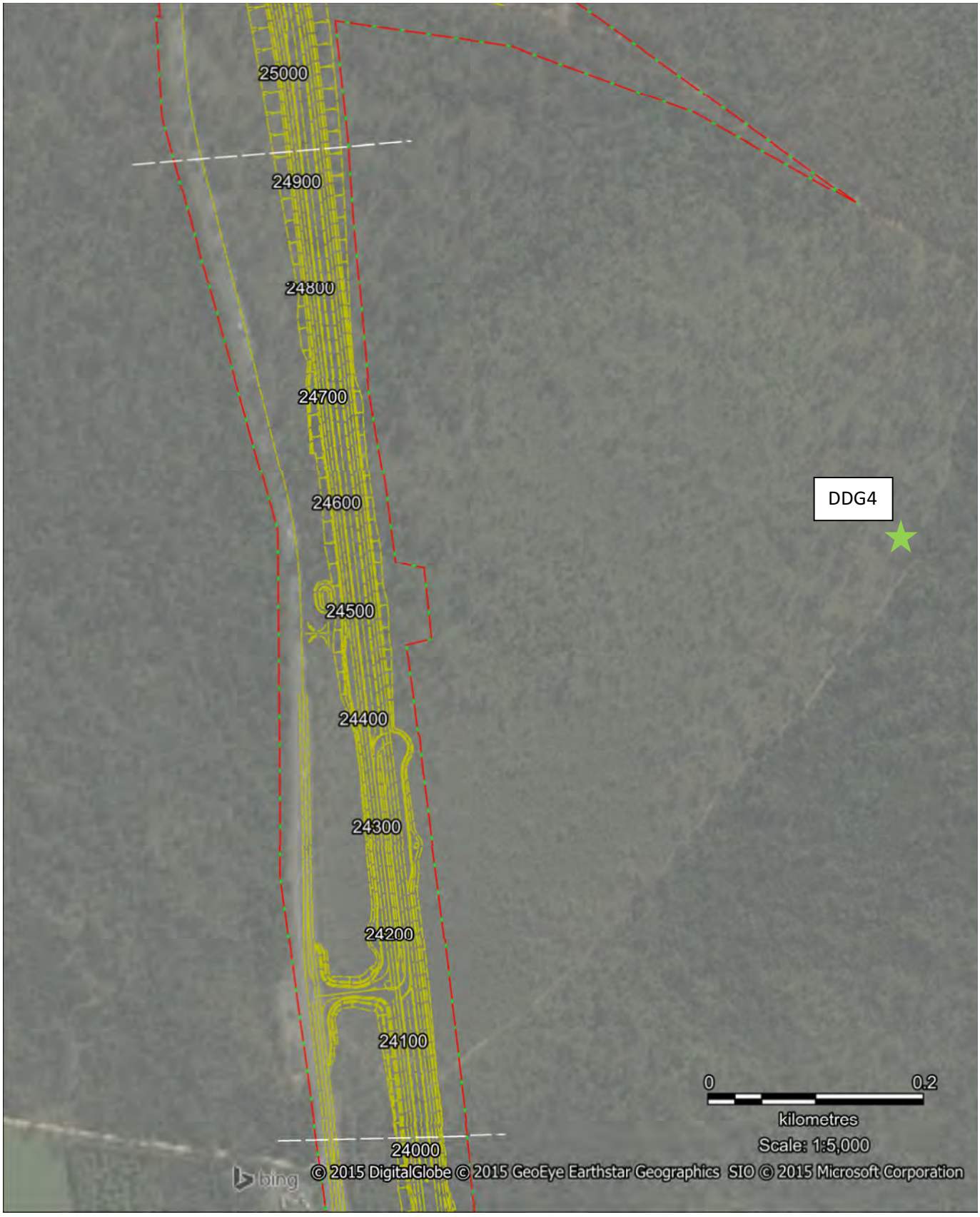


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Date: 2015/10/19

Sheet: 11

## Appendix B

Dust deposition gauge procedure

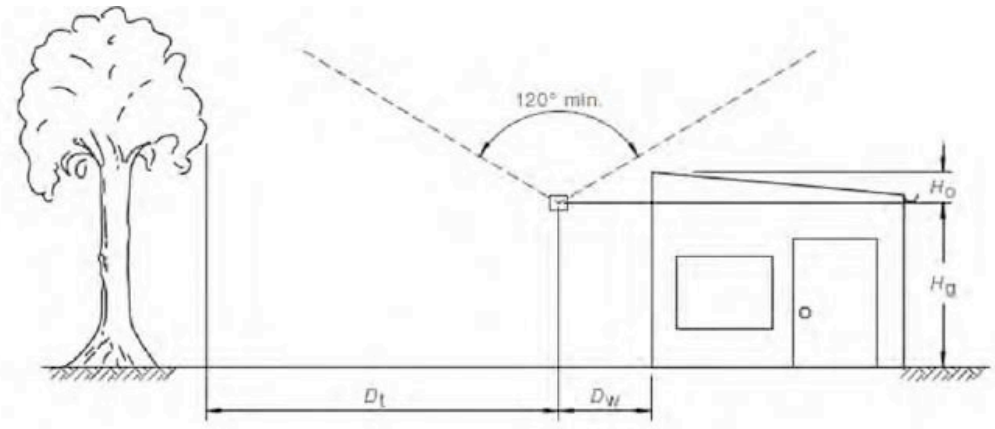
# Dust deposition gauge

## 1. Positioning of dust deposition gauges and site selection

The positioning of dust monitors will be undertaken in accordance with the guidelines in AS/NZS 3580.1.1:2007 Methods for sampling and analysis of ambient air - Part 1.1: Guide to siting air monitoring equipment. Key considerations in selecting dust monitoring sites will include:

- Positioning of dust Deposition Gauges (DDG's) will at representative locations along the construction corridor, at identified sensitive receivers in consultation with RMS (A list and maps of dust gauge locations are an attachment to the Air Quality Management Plan).
- The DDG should be sited away from any nearby structure so that it has a minimum clear sky angle of 120º, where there is unrestricted airflow of 360º around sample inlet and 10m from the drip line of trees. (See Figure 1 below).
- Sampling sites should not be near any external, unrelated emission sources.
- Local activities around a sampling site may change the suitability as a site (eg, demolition, other construction activities).
- Sites should be either secure or remote with low potential for vandalism.
- Sites should be chosen where personnel are able to perform monitoring activities in a safe environment in accordance with WHS legislation, are in easily accessible locations and not prone to natural disasters (eg, flooding).
- If these preferred locations are on private property, the communications team is to contact the landowner and/or resident to request whether these gauges may be placed on their property and accessed once a month by project personnel.
- DDGs are only to be placed on properties where the resident / landowner agree to the gauge being placed on the property and where permission has been granted to access the gauge monthly for bottle change over.

*Figure 1*




LEGEND:

$H_g$ = Height of sampling inlet above ground — 2 to 5 m for ground based sampling sites and up to 15 m for roof top sampling sites.
$H_o$ = Height of nearby obstacle above sampling inlet — $2H_o \leq D_w$
$D_t$ = Distance to nearby tree — $\geq$ 10 m
$D_w$ = Distance to wall (supporting structure) — minimum 1 m
120° = Minimum clear sky angle above sampling inlet

## 2. Selection and installation of equipment

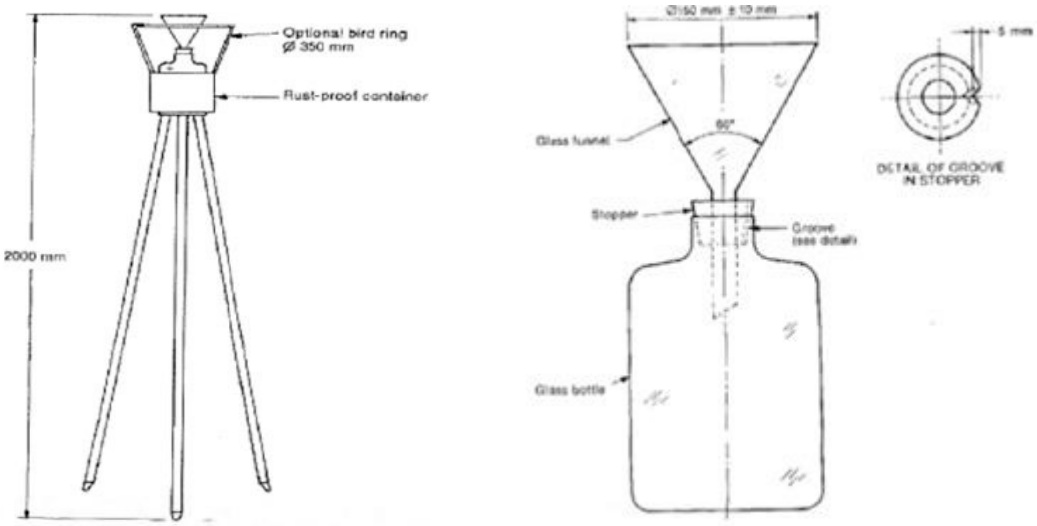
DDG's measure the dust deposition rate and involves the passive deposition of dust within a funnel and bottle arrangement. The key equipment includes:

- Grade A volumetric glassware that comply with AS 2164 must be used throughout
- A deposit gauge consisting of a 150mm diameter funnel (nominal angle of cone sides 60 degrees) of glass. The internal diameter of the funnel stem needs to be sufficient to permit passage of particulate matter during washing. It is supported firmly in the neck of a wide-mouth glass bottle of a suitable size, preferably of minimum volume of 4L, by means of a rubber or plastic stopper with a groove or outlet pipe to allow water overflow under excessive rainfall

conditions. The funnel diameter shall be known to the nearest millimetre when used in calculation of results. (See Figure 2 below).

- Laboratory provided glass bottles of either 2L or 5L volume (depending on expected rainfall over the sampling period) containing 10ml copper sulfate ($CuSO_4$) solution ready for use. The copper sulfate solution to prevent algal growth within the bottle stoppers which should be of a non-reactive, non-friable substance and should be replaced when aging is evident.
- A tight fitting lid to seal the glass bottle for transport to the laboratory.
- A stand approximately 2m tall and a canister which holds the glass bottle to protect it from the sunlight. (See Figure 3 below).
- Additional support methods may be used as long as it allows for the funnel to be horizontal and the height of the top of the funnel to be 2m (± 0.2m) above the surrounding ground level.
- The canister can be made from any material, as long as it protects the glass bottle from sunlight.
- Distilled water, tape, permanent marker, scissors and spare funnels, keys for project padlocks (eg, the fish farm and Daily Pre-start cards).

*Figure 2*




## 3. Methods for using the equipment

The following methods will be followed when using the dust depositional monitoring equipment:

- Prior to starting works, a daily pre-start card will be filled in for the day's activities.
- Any landowners or property managers who require notification prior to entry for bottle changeover will be contacted in accordance with the agreed time frame.
- Once the stand has been erected, it will remain in situ for the duration of the project.
- Remove the airtight lid from the bottle and place the adapter to the neck of the bottle. Insert the funnel into the adapter. Place the bottle into the stand, the top of the funnel is to sit 2m (± 0.2m) above the ground level of the immediate surrounding area.
- Ensure that the number on the bottle is the same as the number on the stand, so as not to confuse the sample, use the tape and marker to record the number if required. Do not remove any collected rainwater, bugs, leaf litter, bird faeces or any other material that gets collected in the glass bottle. (Such material does not contaminate the sample and should not be removed in the field).
- Any contamination that is collected will be noted and recorded on the Dust Management Register (CIV-HSE-FRM-0227). (This record is used to assist in accounting for any anomalies determined in the analytical results).
- Bottles are to be changed after 30 (± 2) days.
- Wash any deposited matter in the funnel into the glass bottle using distilled water.
- Remove the funnel and seal the glass bottle with a tight fitting lid.

- Record the following on the bottle:
  - Site location ID
  - The date that sampling commenced and ended
  - The diameter of the funnel to the nearest 10mm
  - Any current or recent activities occurring in the area that may contribute to recorded dust fallout
- Insert a clean funnel into a fresh laboratory supplied collection bottle containing 10mL of copper sulfate solution.
- Monitoring frequency, sample collection and analysis of dust samples.
- Samples must be collected every 30 (± 2) days. AS/NZS 3580 recommends that gauges be changed on or as near to the first day of each month. All efforts will be made to ensure that all samples are collected and changed over within 12 hours.
- Samples should be taken to a laboratory and analysed as soon as possible within 30 days of collection. Prior to taking to a laboratory, the sample should be kept in a cool dark environment to prevent the growth of algae.

The following information should be provided to the laboratory:

- Location of samples, including coordinate reference on a topographic map to within 100m
- Height of the sampling above the surrounding ground level
- The date sampling started and finished
- Any other relevant data (eg, climate conditions, proximity of bushfires, farm ploughing activities, demolition activities)

Laboratory personnel collect the sample bottles and they are taken to:

*For example* *Environmental Analysis Laboratory*
*Southern Cross University*
*Military Road*
*LISMORE, NSW, 2480*

The following is to be analysed at the laboratory:

- Insoluble solids This is the matter that does not dissolve in water
- Ash content This is the matter that remains after the sample has been combusted in the laboratory

When the samples are collected, a replacement set of bottles are brought to the site, ready for replacement during the next round of sampling. A complete set of replacement bottles will be kept on site to ensure that sample collection bottles can be exchanged within the required 30 (± 2) day period.

## 5. Recording, analysis and reporting

- Write gauge identification number, sample type (dust), date and time of setting up on the new bottle.
- Complete all fields in the Dust Deposition Gauge Monitoring Sheet (CIV-HSE-FRM-0228).
- Transfer relevant information onto the Dust Management Register (CIV-HSE-FRM-0227).
- Complete a Chain of Custody sheet (provided by lab), scan and place in project file. Put original sheet in a small zip-lock bag and place in boxes of samples. Seal boxes with tape and send samples to Environmental Analysis Laboratory.
- The results are to be analysed against the dust deposition goals of 4g/m$^2$/month or 2g/m$^2$/month above background and entered into the Dust Management Register (CIV-HSE-FRM-0227).
- Results including any exceedances of the dust goals are to be reported in the monthly report. Exceedances are to be investigated by the Environmental Rep (Environmental Manager, Environmental Officer, etc) to determine the validity of the results and adjust management practices, where required to reduce to dust generated.

## Appendix C

Dust deposition monitoring sheet

# Dust deposition gauge monitoring sheet

CIV-HSE-FRM-0228

| Approver: Systems and IT Manager | Reviewer: HSE Manager | Reviewed: 24/10/2014 |
|---|---|---|

**Project:**

| Gauge number | Date and time of new bottle | Date and time of collection | Days deployed (30 ±2) | Collected by | Comments (adjacent activities, weather, issues w equipment, etc) | Chain of Custody form completed | Date sent to lab |
|---|---|---|---|---|---|---|---|
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*Note 1: Lab results should be entered into the Dust Monitoring Register in the project File*

# Appendix D

Dust management register

# Dust management register

CIV-HSE-FRM-0227

| Approver: Systems and IT Manager | Reviewer: HSE Manager | Reviewed: 24/10/2014 |
|---|---|---|

**Project:**

| Location | Date of installation | Date of collection | Result ($g/m^2$/month) | Criteria ($g/m^2$/month) |
|---|---|---|---|---|
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