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Dear Shane

Letter of opinion regarding the proposed inclusion of a batching plant for Barangaroo blocks 1-3

AECOM have been commissioned by Lend Lease Project Management and Construction (Lend Lease) to prepare a letter of opinion in regards to potential air quality impacts as a result of the proposed operation of the temporary concrete batching plant at the Barangaroo site. This is in response to the issuing of Director Generals Requirements (DGRs for the plant (issued on 4 June 2013. This letter presents the findings of a high level desktop analysis into the proposed batching plant from an air quality perspective and outlined whether previous assessment undertaken for the Batching Plant address the requirements of the DGRs. The letter reviews the batching plant in general isolation from other activities on the site and also considers the cumulative effects of the proposal, noting that other activities will be undertaken simultaneously on the site as construction progresses.

1.0 Background

The Barangaroo Blocks 1-3 excavation and redevelopment is a sub-set of the larger Barangaroo development on the western side of the Sydney CBD. This stage of work is expected to involve the excavation of approximately 350,000m³ of soil and waste material to allow the construction of a basement car park and footings for the larger buildings planned for the site (temporarily named buildings C3, C4 and C5).

The project requires access to a reliable supply of concrete and it is now proposed to deliver that supply by operating an onsite concrete batch plant (the plant). Mixed concrete can only be stored for a limited amount of time and reliance on off-site deliveries can have implications for the construction schedule. On-site batching facilities also significantly reduce the volume of heavy construction traffic on local roads thereby minimizing the risk to road safety on public roads, minimizing the dilapidation of local roads and minimizing any increase in general nuisance to the local community. It is within this context that supply of concrete from an on-site batching facility was considered to be desirable.

The proposal involves the erection and operation of an onsite concrete batch plant for the purpose of supplying concrete for the site works. The basic function of the plant is to mix water, cement, fine and course aggregates, and admixtures to form wet mix concrete. The plant would comprise a number of specific elements including:

- Cement silos with a filter bag system– to store cement powder for inclusion within the batched concrete;
- Twin shaft mixer – to mix raw materials to create concrete, replaces need for agitator trucks;
- Aggregate weigh bins – to accurately measure quantities of sand and aggregates reducing wastage;
- Dust extraction system – to extract airborne cement powder around the inlet to the split drum mixer;
- Settlement and storage pits – to manage the cementitious water runoff around the cement loading point and mixer areas;
- Water holding tanks – to provide a buffer of required water and to manage recycled water for use within the batching of concrete;
- Silo ladders and platform – for access to service cement filters and operate the plant;
- Batch conveyor with cover – to reduce windblown dust from conveyor;
- Batch office – to operate the plant and ensure appropriate supervision of plant and stockpile areas;
- Electrical switchboard container – to house electrical components as per legislative requirements; and
- Admixture tanks and bunds (steel) – to ensure any leaks are contained.

Raw materials would be delivered to the worksite by the plant operator. Materials would be stored in silos, holding bins, open stockpiles or tanks and released into the batching process via a largely automated process. Cementitious materials would be pneumatically fed from the delivery trucks to the storage silos, with automated reverse pulse filter systems to prevent potential dust emissions.

A frontend loader would be used to move aggregates from the storage locations to the weigh bins. Subsequent to weighing, aggregates would then be transported along the covered conveyor to the split drum mixer. Other raw materials would then be released into the mixer to produce the wet mix concrete. This would generally be via enclosed air slides and pipes to ensure adequate containment.

Following quality control checks, the concrete batch would be released to a truck trailer. The use of a split-drum mixer coupled with short haul times means that generally agitator trucks would not be required.

2.0 Director Generals Requirements

The DGR's that need to be addressed as part of this assessment are as follows:

- *The application must include an Air Quality impact Assessment, including:*
 - *The identification of the pollutants of concern, including individual toxic air pollutants, dust and odours;*
 - *The identification and assessment of all relevant fugitive and point source emissions, including cumulative impacts of the operation of the plant in relation to other construction activities;*
 - *Potential health impacts, including details of human exposure scenarios and demonstration that the project will not have unacceptable acute or chronic effects;*
 - *Proposed air quality management and monitoring procedures during construction;*
 - *Dust management with an emphasis on PM10 which can result from general construction activities as well as plant operations and maintenance; and*
 - *Proposed mitigation measures.*

3.0 Pollutants of Concern and Emission Sources

From an air quality perspective, the pollutants of concern for the concrete batching plant relate to particulate emission and vehicle emissions. The pollutants of concern considered by the air quality impact assessment were as follows:

- Particulate matter (PM₁₀);
- Total suspended particulates (TSP); and
- Oxides of nitrogen [as nitrogen dioxide (NO₂)].

There are no significant sources of toxic air pollutants as defined by Table 7.2a of the NSW Approved Method for the Modelling and Assessment of Air Pollutants in NSW.

Sources of potential air pollution associated with the operation of the plant are emissions from machinery and the generation of dust. The concrete batching process does not produce perceivable odours. The following elements of the plant operation are potential sources of dust:

- Cement delivery system;
- Cement discharge to split drum mixer;
- Loader operations between aggregate storage and aggregate weigh bins;
- Aggregate discharge to split drum mixer;
- Delivery and storage of aggregates on site; and
- Movement of concrete tippers on site.

It should also be noted that the operation of the batching plant will result in an overall reduction of potential sources at the Barangaroo site. One of the largest potential sources of dust on a site such as Barangaroo is wheel generated dust and as such any modification to the number of truck movement would have a significant impact on potential dust emissions.

Typically, truck movements associated with the expected volume of concrete to be used on site results in delivery quantities of up to 37 concrete agitator trucks per hour (one truck every 90 seconds), totalling 280 concrete trucks per day. With an onsite batch plant, concrete truck movements will be confined to bulk raw materials only - resulting in 30% reduction in overall truck movements to site. This results in a significant reduction in traffic generated air pollution (both wheel generated dust and combustion emissions) within and outside the site.

4.0 Health Impacts

The air quality impact assessment prepared by AECOM in November 2012 and February 2013 have predicted a number of occasions where the concentration of PM₁₀ particulates may exceed the assessment criteria set out by NSW EPA, potential resulting in adverse impacts on surrounding receptors.

To address the potential adverse impacts, Lend Lease has agreed to modify its existing air quality monitoring network and operational procedures for the CBP to ensure the site emissions are mitigated to an appropriate level for the operation of the CBP and that the CBP is managed to a degree to which adverse impacts are not occurring (cumulative site concentrations at monitoring stations less than 50µg/m³ for 24 hour average PM₁₀). This will occur through the use of a reactive dust mitigation system which is directly linked to real-time warnings and work procedures to ensure if dust levels are elevated that action is taken to reduce them to levels whereby adverse impacts do not occur.

5.0 Emission Management and Mitigation Measures

The following safeguard and mitigation measures will be employed within and around the concrete batch plant. Such control and mitigation measures will be in accordance with the best practice management principles outlined in the "Blue book" Vol. 2D (2008), the Vic EPA Guidelines for Batch Plants 1998 and the Best Management practice (Concrete) Guideline (DECCW 2004) from the NSW Office of Environment and Heritage.

- Trucks entering and leaving the site would be well maintained in accordance with the manufacturer's specifications to comply with all relevant regulations;
- Truck movements would be controlled on site and restricted to designated roadways;
- Truck wheel washes or other dust removal procedures would be utilised to minimise transport of dust offsite;
- Construction activities that generate high dust levels would be avoided during high wind periods;
- Stockpile areas will be watered – control of watering level will be by the loader operator;
- Cement powder would be transferred from tankers to plant silos via pneumatic method to minimise the potential for cement dust release;
- The cement silos would be fitted with a filter bag system, including automatic reverse pulsing to clean bags. Filter systems will be serviced on a regular basis in accordance with manufacturers recommendations;
- The cement silos would be fitted with high level sensor alarms and visible beacon to prevent overfilling. The alarm point would be set having regard to silo profile, maximum fill rate, response time of the shut down system and volume of delivery vehicles;
- The aggregate conveyor would be covered to prevent windblown dust;
- The plant would be fitted with a dust extraction system and stand alone filter bag system to minimise release of dust associated with the transfer of cement and aggregates to the split drum mixer. Filter system will be regularly serviced in accordance with manufacturers recommendations; and
- Water sprays would be used to minimise dust on stockpiles and non sealed hardstand areas. Where practical fixed sprays will be utilised, elsewhere a water tanker will be utilised.

As stockpiles are generally expected to be a source of concern regarding potential dust emissions, the following paragraphs further expand on the proposed mitigation measures for this source.

The stockpiles will be actively maintained on a regular basis by the batch plant loader operator, in conjunction with the raw material delivery drivers. Stockpiles will be maintained at no greater than 3m in height at all times to reduce the potential of windblown dust.

Each individual stockpile will have a dust suppression system to prevent windblown dust effecting the local environment and sensitive receivers. The system will incorporate individual water sprays to wet down the stockpiles as the situation warrants. Operation of the sprinklers will be via a switch in the batch control office, with the decision to wet stockpiles the responsibility of the loader operator, as the person intimately familiar with the stockpile condition on a minute by minute basis. Automated sprinkler system are not feasible in this situation as the water content of the concrete required is tightly controlled and an automated system will invariably lead to non-compliant concrete and significant concrete waste issues that itself has an adverse environmental impact.

6.0 Cumulative Impacts

As part of the assessment of the potential impacts of the construction of the commercial and residential towers at Barangaroo south, AECOM has undertaken a cumulative impact assessments to examine the potential impacts of the construction operating simultaneously. The reports examined a scenarios which considered the following sources:

- **Barangaroo Stage 1A Construction AQIA, Nov 2012**
 - Construction of the following buildings occurring simultaneously:
 - R8 and R9 (ground level);
 - C3 and C5 (60 m high);
 - C4 (120 m high); and
 - Operation of an on-site concrete batching plant at full operational capacity of 2,000m³/day.

The impact assessment undertaken for the above stages of construction indicate the potential for exceedence of the PM₁₀ short term air quality limit at sensitive receptors adjacent to the Barangaroo site. However with the implementation of appropriate mitigation measures along with the modification¹ of the existing reactive dust monitoring program, it is expected that the CBP on the Barangaroo site can be operated at the same time as the excavation and construction activities without adverse impacts on the surrounding sensitive receptors.

In addition to the dust sources listed above, there are other potential dust generating activities that need to be considered when examining the potential for cumulative impacts. These activities (and their expected impact on the cumulative impacts) are provide as follows:

- **Basement construction.** As much of the basement construction will occur below grade (resulting in dust retention in the pit) and will be similar to the activities associated with the C3- C5 buildings, the assessment of the Stage 1A impacts would be expected to best represent worst case impacts than any contribution of dust from the basement construction. On this basis this aspect of the construction is not expected to result in adverse dust impacts.
- **Wynyard Walk.** As Wynyard walk is expected to predominantly consist of subterranean earthworks, cumulative impacts are not expected.
- **Barangaroo Central Waterfront Promenade.** The works expected to occur as part of the waterfront promenade (concreting, surface preparation and very minor earthworks) is not expected to contribute significantly to the cumulative dust emissions from the site.
- **Headland Park activities.** Due to the distance between the Headland Park works and the location of the potentially impacted receptors, additional cumulative impacts from Headland Park contributing to the impacts from the construction activities are not expected. As the worst case impacts are expected to occur to the east of the site works (which would be due to westerly winds), and given that Headland Park is a distance to the north, it is considered unlikely that Headland Park emissions would cumulatively impact on the receptors close to the development at Barangaroo South.

¹ An audit of the existing system would be needed to ensure the existing system is positioned appropriately to capture potential adverse impacts and mitigate those elevated dust concentrations.

7.0 Summary

A high level examination suggest that previously predicted pollutant levels are likely to decrease for some activities e.g. decrease in internal concrete truck combustion emissions and wheel generated dust, but may slightly increase as a result of the proposed batching plant. Although the batching plant is expected to have the potential to cause an increase in dust impacts from the site, this letter reviews and presents the mitigation measures applicable to the batching plant operations.

It is AECOMs opinion that the proposed operation of the batching plant with the mitigation measures reviewed in this letter are considered fit for purpose and if implemented are appropriate to minimise any potential impact to local air quality from the batching plant operations (both in isolation from surrounding activities and cumulatively with those activities).

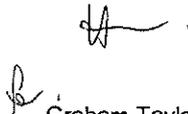
Given the reduction in truck numbers that the proposed batching plant would allow and the expected mitigation controls that would be adopted for the batching plant it is considered unlikely that the operation of the batching plant would cause a significant cumulative adverse impact on the air quality surrounding the Barangaroo site.

Yours faithfully



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