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High Street Upgrade Project

Response to Submissions Document

EPA ASSESSMENT NO: 2181

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Contents

1 INTRODUCTION

1.1 Background

The Commissioner of Main Roads Western Australia (Main Roads) is proposing to upgrade High Street (the Proposal) within the City of Fremantle. The Proposal is the construction of the High Street upgrade between Stirling Highway and Carrington Street in Fremantle. The Proposal consists of the construction of a roundabout at the Stirling Highway and High Street Intersection, a new westbound carriageway of High Street between Stirling Highway and Carrington Street, realignment of approaches to Stirling Highway and High Street, pedestrian crossing points, a new service road for residents north of High Street and local road realignments. The Proposal also includes the installation of noise walls, drainage, lighting, electricals, utilities and associated road infrastructure.

This document forms a summary of public submissions and advice received regarding the Environmental Review Document (ERD) for the High Street Upgrade Project proposed by Main Roads Western Australia.

The Proposal was referred to the Environmental Proteciton Authority (EPA) under section 38 of the *Environmental Protection Act 1986* (EP Act) on 8 October 2018. The EPA determined the Proposal required assessment under Part IV of the EP Act and set the level of assessment at Public Environmental Review on 6 November 2018.

The public review period for the Proposal commenced on 17 December 2018 for a period of 4.5 weeks, ending on 18 January 2019. A total of nine public submissions were received and 33 separate issues have been raised.

Submissions received raised issues in the following categories:

- General comments regarding the project - 8 issues.
- Terrestrial Fauna – 1 issue.
- Air quality – 5 issues.
- Social Surroundings (Noise) – 12 issues.
- Flora and Vegetation – 5 issues.
- Other issues (amenity) – 2 issues.

Although not all of the issues raised in the submissions are environmental, Main Roads has addressed all issues as they are relevant to the Proposal.

1.2 Purpose of this Document

This document has been developed to address agency and public submissions received during the public review period for the ERD.

EPA Services requested Main Roads respond to issues raised in the submissions lodged. This document addresses submissions in a structure consistent with EPA Services' request.

2 RESPONSE TO EPA SERVICES ISSUES

EPA Services raised a number of issues regarding technical aspects of the air quality assessment. EPA Services submission is attached as Attachment 1 and Main Roads response is attached as Attachment 2.

3 RESPONSE TO OTHER GOVERNMENT AGENCIES ISSUES

One submission was received from the Department of Planning, Lands and Heritage (DPLH). DPLH noted that the Proposal had undergone extensive stakeholder and public consultation and has the endorsement of the City of Fremantle. DPLH had no comment to provide.

4 RESPONSE TO ISSUES RAISED BY THE PUBLIC

4.1 The Proposal – General Comments

Submitter	Submission and/or issue	Response
ANON-T6Y8-SV83-F ANON-T6Y8-SV85-H	Submitters did not support the Proposal and recommended that the previous 2014 design for the upgrade of High Street should be implemented. The submitters consider the previous design would have provided a better and more permanent solution by including provision for six lanes and a sweeping curve that would have allowed for higher speeds and greater traffic throughput meaning efficiency of movement.	The existing layout of High Street from Carrington Street to the Stirling Highway intersection provides direct access to several local roads and driveways that creates stop-start conditions and heightened safety risks. This results in congestion and unpredictable journey times to and from Fremantle and the Fremantle Port. As discussed in Section 2.2 of the ERD, Main Roads has invested significant time and effort engaging with relevant stakeholders regarding this Proposal. The Proposal being assessed was developed in response to comments from adjacent residents, local community, road users and key stakeholders and has a smaller footprint, improved accessibility for pedestrians and cyclists and improved parking than the 2014 concept. The 2014 design for the upgrade of High Street was never finalised as there was still disagreement between stakeholders on the design. The 2014 design had some significant issues that prevented any agreement with stakeholders, especially in regard to the design of the “sweeping curve” referred to by the submitter. The primary purpose of this project is to improve road safety along High Street between Carrington Street and Stirling Highway and improve the intersection of Stirling Highway and High Street in order to cater for expected future traffic growth. The Proposal being assessed achieves this. Long term planning of infrastructure to service the State’s ports is currently being investigated and is dependent on the outcomes of the

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		Westport taskforce and as part of the State Government's Westport Strategy, which it is currently in development (see www.transport.wa.gov.au). Any future design or upgrade of the intersection could constitute a different proposal. The Westport Strategy will outline a vision to guide the planning, development and growth of both the Inner Harbour at Fremantle and the Outer Harbour at Kwinana. This strategy will set out how the port and its associated landside transport linkages are expected to develop.
ANON-T6Y8-SV8B-X ANON-T6Y8-SV8C-Y ANON-T6Y8-SV8V-J	Explain why the High Street Upgrade is being proposed instead of the Roe Highway Extension.	As discussed in Section 5, the Proposal being assessed addresses safety and congestion issues along High Street and is unrelated to the Roe Highway Extension Project.
ANON-T6Y8-SV8C-Y	Address the concern raised by the submitter that the Proposal offers no benefits, is a waste of money and should be scrapped.	As discussed in Section 2.2, the primary purpose of this project is to improve road safety along High Street between Carrington Street and Stirling Highway and reduce congestion in the area. In addition to these primary benefits, the Proposal will also • Improve pedestrian access and safety • Reduce the overall traffic noise impact levels on adjacent sensitive receivers.
ANON-T6Y8-SV83-F ANON-T6Y8-SV8C-Y	Address the following issues in regard to the proposed roundabout at the intersection of Stirling Highway and High Street: • A grade separated intersection or co-ordinated traffic signals will provide better traffic flow than a roundabout.	A number of different intersection designs were modelled for this intersection and discussed with key stakeholders. The proposed roundabout design with free flow slip lanes was considered to be the best option given the estimated future traffic flows, the space available and the cost of construction. Constructing a grade separated intersection was not considered a viable option for this project given the cost involved, the limited availability of land and likely impact on mature trees.

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	• Roundabouts are dangerous when mixing heavy vehicles and general traffic.	A number of designs of signalised intersections were also modelled, however the installation of a roundabout provided a better and safer traffic flow solution. Main Roads has consulted with freight industry groups regarding a roundabout at this location. The freight industry groups were supportive of the proposed roundabout as it allows freight trucks to remain in the left hand from High Street through to the port Roundabouts have been shown to reduce the instances of severe crashes (especially right angle crashes) when compared to traffic signals. Roundabouts also reduce the severity of a crash when a crash does occur. Given the number of heavy vehicles turning right onto Stirling Highway from High Street, installing a roundabout provides the most suitable option to improve road user safety
ANON-T6Y8-SV83-F	Explain whether cycling infrastructure was considered as part of this Proposal.	As discussed in Section 3 of the ERD, Main Roads has undertaken extensive consultation with a range of stakeholders, including the City of Fremantle and the Department of Transport regarding accessibility. High Street (Leach Highway) is designated a primary freight route and does not form part of the Department of Transport's Perth Bicycle Network (PBN). Given the high traffic volumes and the number of large heavy vehicles that use High Street and the limited space available, cyclists will continue to be encouraged to use the existing primary east-west cycling routes which run parallel to High Street. These include Marmion Street and Forrest Street to the north and Stevens Street to the south. The project does however significantly improve accessibility and connectivity for pedestrian and cyclists accessing local schools, parks, shopping and recreation facilities through the construction of a continuous footpath along the northern verge of High Street and the provision of two new underpasses which separate pedestrian from vehicle movements.

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		The underpasses are located at the junctions of: • Forrest Street and Stirling Highway • Montreal Street and High Street
ANON-T6Y8-SV8B-X	The submitter raises concerns that High Street should not be upgraded as it will affect the adjacent golf courses and netball facility and that any upgrade will make parking for the netball facility more dangerous.	As discussed in Section 5 of the ERD, the majority of the project is being constructed within the existing Primary Regional Road reservation. However, the Proposal does extend into reserves 6638 and 8860 (the public and private golf courses), which are both owned by the crown and vested in the City of Fremantle. High Street is the currently designated road freight route to and from Fremantle Port and as such is a heavy haulage route. The intersection at High Street and Stirling Highway requires upgrading to manage current and future traffic flows along this freight route. The objective of the Proposal is to improve safety and the general flow of traffic for all road users travelling in and out of Fremantle. Main Roads has undertaken consultation with the management of both golf courses to ensure the potential impacts on these important recreational areas are minimised. Although some land is required from both golf courses to accommodate the upgrade of High Street, neither golf course will be significantly impacted in the long term, with both retaining the same number of fairways. Main Roads has been working with Fremantle Netball Association and will continue to do so as the project develops. Main Roads believes the Proposal will have a positive impact on the local netball community by increasing the number of formal parking bays along a dedicated service road north of High Street and on Wilkinson Street adjacent to the netball courts.

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		The Proposal will also provide safer crossing points for netball centre users and all pedestrians with the installation of pedestrian underpasses at Forrest Street and Montreal Street.
ANON-T6Y8-SV85-H	A submitter questioned the value and benefit of assessing the Proposal, given the disturbed nature of the project area and the values present within nearby adjacent areas.	The EPA decided to assess this Proposal due to potentially significant effects on: • Terrestrial fauna • Air Quality • Social Surroundings (Noise) The EPA also stated that additional information was required to determine the extent of the proposal's direct and indirect impacts that are of public interest.
ANON-T6Y8-SV81-D	Submitter is concerned that environmental studies have been focused to the east of Stirling Highway and have not adequately addressed issues to the west of Stirling Highway	Environmental studies have addressed issues to the west and east of Stirling Highway, as well as High Street between Stirling Highway and Carrington Street. See responses under Terrestrial Fauna, Air Quality, Social Surroundings and Other Issues for further details.

4.2 Terrestrial Fauna

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ANON-T6Y8-SV81-D	Concerns were raised by local residents immediately west of Stirling Highway in Holland Street. The submitters note that the emphasis for the fauna observations undertaken was largely to the east of Stirling Highway.	The area to the west of Stirling Highway was surveyed during the fauna assessment for the Proposal. The lack of fauna observations to the west of Stirling Highway is due to the lack of fauna habitat in the largely urban environment rather than a survey bias to the east of Stirling Highway. Figure 1 of Appendix 3 of the ERD (Black Cockatoo Assessment) shows the survey extent for the assessment. It includes all areas within the development envelope and 150m along Holland Street to the west of Stirling Highway. Figure 2 of Appendix 3 of the ERD (Black Cockatoo Assessment) shows a number of records of potential black cockatoo trees to the west of Stirling Highway. To the east of the highway, there is also relatively few records. Most potential black cockatoo trees were recorded south of High Street.

4.3 Air Quality

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ANON-T6Y8-SV83-F	Explain how this Proposal compares to previous concepts where the project provided for a sweeping curve that would have allowed for higher speeds and greater traffic throughput meaning efficiency of movement, and importantly less emissions due to less stop-start traffic.	The proposed roundabout at the intersection of High Street and Stirling Highway will improve the traffic flow when compared to the current situation and result in less stop-start traffic than is currently being experienced. The roundabout design addresses the congestion and road user safety concerns in a cost effective manner. As discussed earlier, the “sweeping curve” of the 2014 design had a number of issues that were not resolved. The Air Quality Assessment of the current Proposal indicated the project will not have a significant cumulative impact on local air quality above existing impacts. Predicted air quality concentrations for the pollutants modelled were all well below the relevant air quality criteria under all scenarios.
ANON-T6Y8-SV8M-9	Justify why the air quality model and the traffic noise model use a different year for their baseline comparisons. Both models should use the same year for baseline comparison.	The selection of a different baseline year does not diminish the findings of either assessment. The purpose of the air quality and noise assessments are to predict the resulting Proposal impacts to air quality or noise respectively, with or without the proposed project. These assessments typically consider a baseline and future design (nominally 15+ years after opening of the project) scenario. The air quality assessment used 2020 as the baseline year, in order to be able to directly compare the no-build scenario to the build scenario in the year of opening. The Noise Assessment used the existing 2018 baseline year rather than the year of opening, to allow validation of the noise model against noise measurements and traffic volumes obtained during 2018. The validated

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		noise model is then used for future scenario noise level predictions, at design year 2041 for no build, build and build with mitigation scenarios. The additional scenarios considered by the noise assessment were associated with the existing road network exceeding SPP 5.4 criteria. Furthermore, the future design scenario for both assessments provided a conservative worst case prediction based on the assumptions applied in the model, when compared to the baseline year. This future design scenario was the same year for both the air quality and noise assessments and allows comparison where required.
ANON-T6Y8-SV8M-9	The submitter states: "Given the prevalence of a S/SW wind the effect of a noise barrier on particulate distribution for receivers 37 to 58 may be negative, not positive as suggested. The barrier along High Street would be considered a downwind barrier and there would be a raised concentration of airborne particulates as a function of height due to the barrier's presence on the leeward side of the barrier for 20-25m. This increase in concentration is clearly within the vicinity of the receivers. Concentration of airborne particulates behind a barrier increases with barrier height, and given the proposal of a 5 m height this is considered a high barrier. However, implementation of vegetative barriers would have a positive effect on this dispersion. It would be best to mitigate this by introducing vegetative barriers along High Street, and easterly side of Stirling Highway to assist with dispersion. An extract of Fuka and	The submitter does not provide a full reference to Fuka and Brechler (2013), but Main Roads assumes that the submitter is referring to Brechler and Fuka (2014). *Impact of Noise Barriers on Air-Pollution Dispersion.* Natural Science Vol. 6 No. 6 pp 377-386 published online at http://file.scirp.org/Html/1-8301915_44602.htm. It should be noted that the dispersion study in Brechler and Fuka (2014) used a simplified layout for the modelling process. They noted that this was an important consideration as buildings and vegetation were not taken into account and the terrain was assumed to be flat. Other simplifications to the model included: the barrier was infinitely long and the wind was perpendicular to the barrier (Brechler and Fuka, 2014). Brechler and Fuka (2014) supports the statement made in the ERD that a noise barrier will reduce air emissions impacts at nearby houses. At a position 22.5 m downwind of the road they state: "*This demonstrates that the presence of any barrier, regardless of location, results in a decrease in concentration at ground level and an increase in height at which higher concentrations occur, due to blocking effects and recirculation behind the barrier*". Barriers on both sides of the highway is considered to be the most advantageous result and will improve environmental conditions in respect to air emissions from road traffic (Brechler and Fuka, 2014). Along Stirling Highway there will be barriers on both sides of the highway and therefore,

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	Brechler (2013) is given below showing that time average concentrations on the leeward side of a downwind barrier are increased in height over a distance of 20m to 25 m compared to time average concentrations without barriers. I note that the airborne pollution study has not considered the effect of barriers at all, yet references to its effect. Given the proximity of receivers and that this road carries the highest concentration of heavy vehicles for a residential area in WA this warrants proper consideration and/or mitigation."	based on Brechler and Fuka (2014) findings, there will be a reduction in air quality impacts when compared to the no barrier scenario. It is also important to note that the predicted air quality concentrations for all the pollutants modelled were all well below the relevant air quality criteria under all scenarios. The air assessment indicates the contribution of the vehicle particulate emissions from the Proposal area to ambient levels modelled at both discrete and auto receptors is approximately 10% of the total concentration. Furthermore, under all scenarios modelled the maximum predicted ambient particulate concentration for PM_{10} and $PM_{2.5}$ is 45% and 52% of the criterion at the most impacted receptor, respectively. Even if the incorporation of noise walls along High Street did result in an increase in ambient particulate concentrations immediately downwind to the noise walls, the relatively low contribution of vehicle emissions from the Proposal area is unlikely to cause either a significant increase in ambient concentrations or an exceedance of the criterion. Where space is available in front of noise barriers, these areas will be landscaped with native vegetation.
ANON-T6Y8-SVBY-N ANON-T6Y8-SV81-D	Concerns were raised by local residents immediately west of Stirling Highway in Holland Street and Forrest Street. The submitters raised concerns about the effect of pollution from this Proposal on their residences and the emphasis for the air quality observations undertaken was largely to the east of Stirling Highway.	The Proposal will not result in a material change to air quality for any sensitive receptor within the development envelope. This has been addressed in detail in the ERD (see Section 4.3 of the ERD). No air quality observations were undertaken for this assessment. Project specific air quality monitoring is not routinely conducted for road projects of this nature, with existing monitoring from the DWER network and air dispersion modelling used as the appropriate assessment tool. Air quality is monitored throughout the Perth metropolitan area at a number of locations by DWER. Air quality monitoring results from the closest monitoring stations located at Swanbourne and South Lake were considered to determine existing

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		background pollutant levels for the assessment. The 75th percentile pollutant concentration was adopted as the background pollutant level, which is consistent with DWER requirements for air dispersion modelling studies. The Air Quality Assessment (see Appendix 4 ERD) modelled air quality impacts along High Street from Carrington Street to Amherst Street and Stirling Highway from High Street to Forrest Street. Sensitive receptors were modelled on both sides of Stirling Highway. Several receptors were modelled on the western side of Stirling Highway (indicated at SR29, SR30, SR31 and SR32 in Appendix 3 of the ERD). A summary of the highest pollutant concentrations at each modelled sensitive receptor under each modelled scenario is provided in Tables B1 to B3 of Appendix B of the air quality assessment (see Appendix 4 of the ERD). It shows that there will be no material change to any receptor as a result of this project.
ANON-T6Y8-SV8M-9	The submitter states: “There has been no consideration of the expected TEU increase through Fremantle Port in order to justify the heavy vehicle percentage and 2.8% annual growth rate to 2041. It is a very simplistic assumption that is likely to be incorrect. It is not that difficult to estimate the expected heavy vehicle volumes to 2041 given that the Westport Taskforce are currently assessing this for determination of the viability of Fremantle Port to deliver the states freight task.”	Traffic modelling has been undertaken for this Proposal to the standard required by the State’s strategic road network manager – Main Roads Western Australia. Main Roads is responsible for managing and operating the State’s strategic road network. As part of this responsibility Main Roads uses a range of traffic modelling tools to assess road network performance, optimise the road assets, develop operational strategies and plan for the future development of the network (Main Roads, 2018). Main Roads maintains a strategic transport model known as ROM24 that covers the entire Perth metropolitan region from Yanchep to Mandurah. ROM24 is used to project travel demand patterns in Perth under different land use, transport and pricing scenarios. ROM24 has separate models for 2011, 2016, 2021 and 2031 which are regularly updated with the latest land use and development forecasts from DPLH.

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		Consultants modelling future traffic scenarios on the State's strategic road network are required to consult with Main Roads to determine an appropriate modelling methodology. Alternative methods for determining future traffic flows include extrapolating historical traffic growth data or using traffic volumes produced by ROM24. GHD has used both methods to model future traffic volumes – applying ROM24 to obtain 2031 traffic volumes and then applying historical traffic growth data from 2031 to 2041 (Main Roads, 2018). Main Roads advised its consultant that a 2.8% annual growth rate be used to adjust all traffic numbers from the ROM model 2031 forecast to predict 2041 volumes. The ROM24 model uses land use forecasts provided by the Department of Planning which in turn uses a range of government and industry data to predict traffic flows on the regional and arterial road network. The most current TEU (twenty-foot equivalent unit) forecasted increases through Fremantle Port have therefore been considered in the ROM24 model. The Westport Taskforce is currently undertaking their assessment and the results of this assessment are not yet available.

4.4 Social Surroundings (Noise)

Submitter	Submission and/or issue	Proposed Response
ANON-T6Y8-SV8Y-N ANON-T6Y8-SV8M-9	Concerns were raised by local residents immediately west of Stirling Highway in Forrest Street. The submitters noted that the noise wall in the ERD was proposed to stop short of Forrest Street. The submitter requested that the wall be extended further north given the Proposal extends north to the pedestrian underpass at Forrest Street.	The proposed extent of noise walls shown in Figure 9 and Appendix 5 of the ERD shows noise walls extending along Stirling Highway to approximately mid-way between Holland Street and Forrest Road. This aligns with the proposed extent of the road works, where the new alignment ties into the existing pavement. The incorporation of an underpass at Forrest Street will not result in additional noise impacts and therefore no noise mitigation measures were proposed. Since the ERD was released for public comment, Main Roads has agreed to extend the noise walls to Forrest Street. However, extending the noise wall to Marmion Street is well beyond the extent of the proposed works.
ANON-T6Y8-SV8M-9	The submitter states: Given that [draft] State Planning Policy 5.4 (DPLH & WAPC 2017) is likely to be introduced by the time this PER is assessed by the WAPC, this has an effect of invalidating the noise mitigation component of the PER as it has been assessed under [gazetted] State Planning Policy 5.4 (WAPC, 2009).	The draft State Planning Policy 5.4 (DPLH & WAPC, 2017) is still in draft and is therefore not applicable at this time. The noise assessment was carried out in accordance with the requirements of State Planning Policy 5.4 (SPP 5.4) (WAPC, 2009) and the SPP 5.4 Implementation Guidelines. This Public Environmental Review (PER) is not being assessed by Western Australian Planning Commission (WAPC). The PER is being assessed by the EPA.
ANON-T6Y8-SV8M-9	Submitter raised concern that traffic noise impacts on second floor residencies were not considered.	The noise assessment was carried out in accordance with the State Planning Policy 5.4 Implementation Guidelines (section 7.1.4, page 39), which state that for new or redevelopment road projects, the receiver height of noise-sensitive premises is at ground floor level only for noise assessments.

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ANON-T6Y8-SV8M-9	Justify why acoustic treatments have not been considered by Main Roads. The submitter considers that implementing acoustic treatments will likely make the current noise assessment compliant with the draft State Planning Policy 5.4 (DPLH & WAPC, 2017).	As noted previously, draft SPP 5.4 (DPLH & WAPC, 2017) is in draft format and is not applicable. The noise assessment for this Proposal has been done in accordance with the gazetted SPP 5.4. In accordance with SPP 5.4, where the noise limit can't practicably be achieved, the primary focus of noise mitigation is on achieving the lowest possible level of noise. Main Roads is proposing to achieve the lowest possible level of noise through the construction of noise barriers. This has been demonstrated in the ERD and noise assessment (Appendix 5 of the ERD). Only in exceptional circumstances does Main Roads apply acoustic treatments to noise sensitive premises. These circumstances are usually where it is impractical or ineffective to install noise barriers or apply other treatments (eg quieter road surfacing treatments). Considering the majority of the noise sensitive premises adjacent to the Proposal will either meet the SPP 5.4 noise limit, or have a significant reduction in traffic noise impacts from the "no-build" scenario, Main Roads considers that the proposed noise mitigation is sufficient and no acoustic treatment is required. As stated above, for most residents there is a significant reduction in noise as noted by DWER's Environmental Noise Branch *"However ENB does not disagree that MRWA uses SPP5.4 standards to assess and manage the traffic noise impact, as a conservative approach. This will result in the significant reduction of the traffic noise impact levels on the existing residences along the upgraded section of High Street"*
ANON-T6Y8-SV8M-9	The submitter states: "The assumption of 4.4.2.1 that SPP 5.4 (2009) may not apply is incorrect. Notwithstanding the consideration of the proponent's contractor,	SPP 5.4 (2009) states: *Typically, a major redevelopment of an existing major road involves physical construction works designed to facilitate an increase in traffic carrying capacity (such as carriageway duplication or the addition of a*

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	GHD, that Section 5.6 and 5.7of SPP 5.4, do apply (Appendix 5 p.9). The road(s) being developed is a major upgrade to part of a primary freight route and as noted in the policy and guidelines it is a noise sensitive development. Furthermore, the occurrence of land acquisition for the development, major reconfiguration to the intersection, and the implementation of a new dedicated truck lane (resembling a new road) resulting in the shifting of the noise source considerably closer to the receivers materially increasing the noise levels in absence of any mitigation, and the obvious scope to build a road to handle the expected increase in traffic volumes this is a major land use redevelopment. With reference to (1), there is no question that this would need to be assessed under SPP 5.4 given road upgrades would also be included"	*traffic lane), or a change in the alignment through design or engineering modifications.* *Major redevelopment does not cover minor works such as routine maintenance, minor changes in alignment or minor changes required for safety reasons, if these works will not result in a significant increase in road transport noise levels.* DWER's ENB reviewed the noise assessment for this Proposal and stated in a response to EPA Services *"It can be read from the proposal that the proposed upgrade is to improve road safety and the general flow of traffic for all road users travelling into and out of Fremantle. It does involve changes in alignment, particularly around the intersection of High Street and Stirling Highway, but does not involve the increase of traffic-carrying capacity. It does not involve the increase of the road traffic noise levels at most of the existing residences either. Therefore, the application of the SPP5.4 noise standards to this proposed upgrade may be arguable.*" (ERD section 4.4.2.1). The High Street Upgrade Project is not considered a major upgrade as the Proposal does not facilitate an increase in traffic carrying capacity (there are no additional lanes) and the alignment changes are only minor in nature, designed to improve traffic flow and to improve the safety of the road and do not result in a significant increase in road transport noise levels. The purpose of the proposed upgrade, including the construction of a roundabout at the Stirling Highway and High Street intersection, is to improve road user safety and the general flow of traffic for all road users travelling into and out of Fremantle. It is still considered that SPP 5.4 outlines the most relevant criteria for the assessment and management of transportation noise, as a conservative approach. As such, the noise assessment has been completed with consideration to SPP 5.4 and appropriate mitigation measures included in the design.

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		The noise assessment (Appendix 5 of the ERD) demonstrates noise levels will predominantly decrease for properties adjacent to the High Street Upgrade, as the main traffic lanes are moved further away from residences and due to the effect of noise barriers.
ANON-T6Y8-SV8M-9	The submitter states that the noise assessment has not considered a worst case scenario where there is no diversification of freight activities to Kwinana and there is an increase in night-time port freight movements to reduce traffic pressures during the day-time. The submitter considers that acoustic treatment of affected noise sensitive receivers will mitigate this in the most practicable way.	The traffic modelling used in the noise assessment is based on the ROM24 model which has considered land uses and land use changes both actual and proposed. See response below for more detail. Acoustic treatments for residential properties are not suitable for this Proposal. This has been addressed in a previous response.
ANON-T6Y8-SV8M-9	The submitter states: “There has been no consideration of the expected TEU increase through Fremantle Port in order to justify the heavy vehicle percentage and 2.8% annual growth rate to 2041. It is a very simplistic assumption that is likely to be incorrect. It is not that difficult to estimate the expected heavy vehicle volumes to 2041 given that the Westport Taskforce are currently assessing this for determination of the viability of Fremantle Port to deliver the states freight task.”	Traffic modelling has been undertaken for this Proposal to the standard required by the State’s strategic road network manager – Main Roads Western Australia. Main Roads is responsible for managing and operating the State’s strategic road network. As part of this responsibility Main Roads uses a range of traffic modelling tools to assess road network performance, optimise the road assets, develop operational strategies and plan for the future development of the network (Main Roads, 2018). Main Roads maintains a strategic transport model known as ROM24 that covers the entire Perth metropolitan region from Yanchep to Mandurah. ROM24 is used to project travel demand patterns in Perth under different land use, transport and pricing scenarios. ROM24 has separate models for 2011, 2016, 2021 and 2031 which are regularly updated with the latest land use and development forecasts from DPLH. Consultants modelling future traffic scenarios on the State’s strategic road network are required to consult with Main Roads to determine an appropriate modelling methodology. Alternative methods for determining

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		future traffic flows include extrapolating historical traffic growth data or using traffic volumes produced by ROM24. GHD has used both methods to model future traffic volumes – applying ROM24 to obtain 2031 traffic volumes and then applying historical traffic growth data from 2031 to 2041 (Main Roads, 2018). Main Roads advised its consultant that a 2.8% annual growth rate be used to adjust all traffic numbers from the ROM model 2031 forecast to predict 2041 volumes. The ROM24 model uses land use forecasts provided by the Department of Planning which in turn uses a range of government and industry data to predict traffic flows on the regional and arterial road network. The most current TEU (twenty-foot equivalent unit) forecasted increases through Fremantle Port have therefore been considered in the ROM24 model. The Westport Taskforce is currently undertaking their assessment and the results of this assessment are not yet available.
ANON-T6Y8-SV8M-9	The submitter states: “The large difference in measured and predicted noise levels (6.5 dbA) in Table 6.3 of Appendix 5 for Site A is a cause for concern. This indicates that something is likely to be wrong with the traffic model and /or the propagation model and/or the technique of measurement and requires closer inspection.”	Site A in the noise assessment completed for this Proposal is the monitoring site representative of noise levels along Stirling Street and sites B, C and D are the monitoring sites representative of noise levels along High Street. DWER’s ENB provided advice on the noise assessment submitted as part of the referral documentation (Revision 1). Regarding calibration of the noise model they stated: *“GHD has calibrated the noise model with the existing traffic noise levels measured at the four noise monitoring locations. While ENB accepts that noise models can be calibrated by the noise levels measured from the current traffic, there seems a mistake in GHD’s model calibration for this project, of which noise measured at ALL four monitoring locations were used for the calibration. It is a problem with such an approach, due to the following two reasons:* *1. The four monitoring locations include one on Stirling Highway and three on High Street. Only the noise levels measured at One*

Submitter	Submission and/or issue	Proposed Response
		street can be used for the calibration of noise model for That street. This means only the three High Street locations can be used for the calibration of the noise model for High Street; *2. The difference of the measured and predicted noise levels at the Stirling Highway location is 6.5 dB, which is much higher than a reasonable variation of a traffic noise model. It would be expected that such a large variation is to be investigated, not simply be calibrated.* *The inclusion of the Stirling Highway location for the model calibration may lead to the underestimation of the traffic noise levels by 1.5 dB. However, this possible underestimation may not necessarily result in the change of GHD's assessment conclusions, which are based on the comparisons of different modelled scenarios."* The noise consultant completed a thorough review of the noise monitoring data from Site A, which did not result in any clear reason for the variation in the difference between observed and modelled results at this location. The calibration of the model was reduced from -3 dBA to -2 dBA along Stirling Highway. This approach is likely to result in an over prediction of noise levels, resulting in a more conservative assessment of noise impacts along Stirling Highway. Comparison of measured and model predicted noise levels show that the $L_{A10,\ 18\text{-}hour}$ traffic noise levels are being over-predicted on average by 1 dB along High Street and 7 dB along Stirling Highway. Noise measurements and model predictions along Stirling Highway (at Site A) were examined to determine possible causes of observed measured vs modelled noise levels. No clear reasons for the variation were determined. The calibration factor was adjusted to provide a calibration factor for each street (Stirling Highway and High Street) as per ENB's. Due to model over prediction being higher than the accepted +/- 2 dB, model calibration has been limited along Stirling Highway to 2 dB. As such, the prediction model has been adjusted using a calibration factor of 1 dB

Submitter	Submission and/or issue	Proposed Response
		along High Street and 2 dB along Stirling Highway. This approach is in line with recognised acoustic modelling practices. The noise assessment was updated to Revision 2 following the incorporation of ENB's advice and submitted as Appendix 5 of the ERD.
ANON-T6Y8-SV8M-9	The submitter states: "Table B1, B2 of Appendix B state that the speed limit for the 2018 modelling is 70 km/h. This is incorrect, the speed limit is 60 km/h. This may explain the over prediction of noise levels in (5). If this is the case, then there has been a severe under prediction for noise sensitive receivers along High Street in the 2018 model."	Table B1, B2 of Appendix B of the noise assessment (Appendix 5 of the ERD) incorrectly contains the design speed limit of 70 km/h not the posted speed limit of 60 km/h. The noise model used the posted traffic speed of 60 km/h.
ANON-T6Y8-SV8M-9	The submitter considers that due to the vegetation present and the setback of the houses from Stirling Highway the required barrier height required will likely be lower than 5 m.	Current noise modelling (as per the ERD Appendix 5) indicates that a 5 m high noise barrier will be required at most locations to adequately mitigate traffic noise. The design of the road upgrade will continue to be refined through detailed design and where possible the heights of proposed noise walls may be reduced where compliance with noise criteria can be predicted via updated noise modelling**.**
ANON-T6Y8-SV8M-9	The submitter considers that vegetative barriers will reduce the noise levels by an extra 1-2dBA.	As a conservative approach vegetation is often not considered during the conduct of a noise assessment, as it is not considered a permanent feature. Vegetation can reduce noise, but by itself is not an effective noise barrier. A 15m deep tree belt, with 2.5m high trees planted 1m apart has an equivalent performance to a 1.5m high noise barrier (Peng et al, 2014). Main Roads will use vegetation and landscaping to soften the visual impacts of the noise walls. It is acknowledged that this may also have an additional beneficial effect on reducing noise levels within adjacent residences, but this effect has not been modelled.

Submitter	Submission and/or issue	Proposed Response
ANON-T6Y8-SV81-D	Concerns were raised by local residents immediately west of Stirling Highway in Holland Street. Submitters note that all noise monitoring was up wind for the prevailing easterly and question whether there is a possibility that noise levels could be different (higher) down wind.	The noise assessment at Appendix 5 of the ERD modelled noise throughout the development envelope including the western side of Stirling Highway. The noise measurements taken during noise monitoring were adequate for the purpose of conducting a noise assessment. Each monitoring location was at a noise sensitive receptor as described in the ERD, see Section 4.4 and Appendix 5 of the ERD. This is backed up by advice from DWER's ENB that states: *"The noise monitoring of the existing traffic noise levels was conducted at four selected locations – one on Stirling Highway and three on High Street. These selected noise monitoring locations seem representative and appropriate for this project. The measured noise levels at these four locations do not seem unreasonable to ENB."* Wind speed and direction was taken into account during noise monitoring. Meteorological factors, including temperature, wind speed and direction, rainfall and humidity, were measured during monitoring and recorded in Appendix D of Appendix 5 of the ERD. The meteorological information then affected how the noise monitoring was used in the noise assessment. Section 5.1 of Appendix 5 of the ERD details that meteorological factors noted during the noise monitoring were dealt with in the noise assessment by: "*Periods of rain >0.2mm and wind speed >5 m/s at the logger have not been included in this assessment."* This is in accordance with the SPP 5.4 Implementation Guidelines Appendix C, Section C.4.

4.5 Flora and Vegetation

Submitter	Submission and/or issue	Proposed Response
ANON-T6Y8-SV8Z-P	Submitter is concerned about the loss of mature trees and whether the plan has considering splitting the road on either side of the trees.	As discussed in Sections 1, 2, 3 and 4 of the ERD, the Proposal includes establishing a 23m wide median between Montreal Street and Wilkinson Street to retain most of the mature trees south of High Street. This wider median will have some impact on the existing public golf course fairway, but the new roadway will preserve a number of mature trees identified during the community and stakeholder consultation as highly significant to the community.
ANON-T6Y8-SV83-F	The submitter applauds Main Roads for keeping loss of mature trees to a minimum.	Noted
ANON-T6Y8-SV83-F	The submitter is concerned that future widening of High Street will result in the loss of the mature trees that are currently proposed to be retained in the median.	The High Street Upgrade project is required to improve road safety and improve traffic flow. There is currently no plan to widen this section of High Street to six lanes. Long term planning of infrastructure to service the State's ports is currently being investigated by the is dependent on the outcomes of the Westport taskforce and as part of the State Government's Westport Strategy, which it is currently in development (see www.transport.wa.gov.au). The Westport Strategy will outline a vision to guide the planning, development and growth of both the Inner Harbour at Fremantle and the Outer Harbour at Kwinana. This strategy will set out how the port and its associated landside transport linkages are expected to develop.
ANON-T6Y8-SV85-H	The submitter considers that the vegetation to be cleared consists of sparsely distributed verge trees and there is a golf course full of trees adjacent.	The verge trees on High Street have some aesthetic and ecological values and Main Roads has minimised impacts on these trees as far as practicable. It is acknowledged that the adjacent golf courses contain a number of mature trees.

Submitter	Submission and/or issue	Proposed Response
ANON-T6Y8-SV81-D	Concerns were raised by local residents immediately west of Stirling Highway in Holland Street. The submitters are concerned that the emphasis for the flora and vegetation observations undertaken was largely to the east of Stirling Highway.	The flora assessment considered all areas within the development envelope. Figure 7 of the ERD shows the tree mapping undertaken and includes the western side of Stirling Highway, including along Forrest Street and Holland Street.

4.6 Other Issues

Submitter	Submission and/or issue	Response
ANON-T6Y8-SV8Y-N	Concerns were raised by local residents immediately west of Stirling Highway in Holland Street. Submitters are concerned about the tunnel entrance for the Forrest Street underpass being close to their house.	The underpass will be designed using “Crime Prevention through Environmental Design” (CPTED) principles. CPTED uses design principles to reduce the opportunities for offending and to enhance feelings of safety. In this instance this will include: • Ensuring that there is visibility to the entrances and through the underpass • Lighting is designed to ensure there are no dark patches • Access to private spaces is controlled Main Roads will continue to liaise with all stakeholders affected by the Proposal.
ANON-T6Y8-SV81-D	Concerns were raised by local residents immediately west of Stirling Highway regarding the amenity of the local street scape and local environment. Indicate whether mature vegetation west of Stirling Highway be retained to maintain the amenity of the street scape and local environment.	Retaining as much existing landscaping and vegetation as possible provides immediate financial and social benefits. Main Roads will be endeavouring to retain as much established vegetation as possible throughout the project area, including the western side of Stirling Highway.

5 REFERENCES AND RELATED DOCUMENTS

Brechler, J and Fuka, V (2014). *Impact of Noise Barriers on Air Pollution Dispersion.* Natural Science, 6, 377-386. Accessed 22 January 2019 at http://file.scirp.org/Html/1-8301915_44602.htm.

Department of Planning, Lands and Heritage and Western Australian Planning Commission (2017). Draft State Planning Policy 5.4. Road and Rail Noise. Accessed 21 January 2019 from https://www.dplh.wa.gov.au/draftspp5-4.

Main Roads Western Australia (2018). Main Roads Operational Modelling Guidelines Version No. 1.1 Issue Date July 2018. Accessed 23 January 2019 from https://www.mainroads.wa.gov.au/BuildingRoads/StandardsTechnical/RoadandTrafficEngineering/modelling/Pages/default.aspx.

Peng, J, Bullen, R and Kean, S (2014). The effects of vegetation on road traffic noise. Conference proceedings from inter.noise 2014. 43rd International Congress on Noise Control Engineering Melbourne Australia 16-19 November 2014. Accessed 21 January 2019 from https://www.acoustics.asn.au/conference_proceedings/INTERNOISE2014/papers/p83.pdf.

United States Environmental Protection Agency (2015). *Best Practices for Reducing Near-Road Pollution Exposure at Schools*. November 2015

Western Australian Planning Commission (2009). State Planning Policy 5.4. Road and Rail Transport Noise and Freight Considerations in Land Use Planning. Gazettal date September 22 2009 Gazette No. 169 Special

Attachment 1 – EPA Services Submission

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Our ref: *CMS17483; DWERA1310*
Enquiries: *Annarie Boer, 6364 6415*
Email: annarie.boer@dwer.wa.gov.au

Ms Martine Scheltema
Environmental Manager
Main Roads Western Australia
Don Aitken Centre
Waterloo Crescent
EAST PERTH WA 6004

Dear Ms Scheltema

High Street Upgrade – Assessment No: 2181

The Air Quality Branch of the Department of Water and Environmental Regulation (DWER) conducted a more detailed review of the Air Assessment report, Appendix 4 of the High Street Upgrade Environmental Review Document (December 2018) for the High Street Upgrade proposal. The review highlighted some technical issues with the Air Assessment Report.

In light of the technical issues in Attachment 1, please confirm for the Air Assessment report whether:

- the predicted air pollutant concentrations for the proposal would change with use of an appropriate meteorological dataset as identified in the review;
- there are differences between scenario's modelled when an appropriate meteorological dataset is used; and
- there are any changes to assumptions for the NO_2/NO_x ratio considering recent literature and the use of this road as a trucking transport link to Fremantle Port.

Should you have any questions regarding this matter, please contact the Assessment Officer Annarie Boer on 6364 6415 in the first instance. Please quote the above "Our Ref" on any further correspondence.

Yours sincerely

Anthony Sutton
Executive Director
EPA Services

29 January 2019

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Att. Attachment 1

Attachment 1

Based on a review by the Air Quality Branch of DWER, the following key technical issues require a response and an updated Air Assessment Report:

Meteorology

- The meteorology data file used in the modelling is not from Swanbourne, as reported in the Air Assessment report. Please confirm the site of the meteorological dataset used.
- Meteorological data from Swanbourne (approximately 700m from the coast) or other near coastal stations is not representative of the site as the proposed upgrade is located significantly further inland (approximately 2km).
- The percentage of the calm conditions and light winds are much less at Swanbourne site compared with Wattleup and South Lake sites air quality monitoring stations.

NO_2/NO_x ratio

- Some recent literature (e.g. PAE 2015) reports that the fraction of NO_x that is emitted from traffic as NO_2 has increased in recent years to levels significantly higher than the 5% assumed in the modelling of the Air Assessment.

References:

O'Gorman S and Gehrke P, 2014, *NO_2:NO_x Ratios in Australian Road Tunnels*, 15th Australasian Tunnelling Conference, Sydney, NSW, September 2014.

PAE 2015, *A Review and Analysis of Primary Nitrogen Dioxide Emissions from Road Vehicles in Sydney*, NSW Roads and Maritime Services, 20 April 2015 http://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0006/81960/TECHNICAL-PAPER-1-A-REVIEW-AND-ANALYSIS-OF-PRIMARY-NITROGEN-DIOXIDE-EMISSIONS.pdf

Attachment 2 – Main Roads response to EPA Services submission

Enquiries: John Braid (ph: 9323 6183)
Our Ref: 18/1563
Your Ref: CMS17483; DWERA1310

1 February 2019

Anthony Sutton
Executive Director EPA Services
Locked Bag 33 Cloisters Square
Perth WA 6850

Dear Mr Sutton

High Street Upgrade - Assessment No: 2181. Response to Air Quality queries

Reference your correspondence of 29 January 2019 and email correspondence from EPA Services officers on 1 February 2019 requesting clarification of several technical issues regarding the Air Quality Assessment for the High Street Upgrade proposal (Appendix 4 of the Environmental Review Document).

The Air Quality Branch of the Department of Water and Environmental Regulation (DWER) conducted a detailed review of the Air Assessment report. This review resulted in a number of technical issues requiring a response from Main Roads Western Australia (Main Roads). Main Roads' responses to the EPA Services' three questions are provided below.

Please confirm for the Air Assessment report whether the predicted air pollutant concentrations for the proposal would change with use of an appropriate meteorological dataset as identified in the review

The meteorological data set used for the air dispersion model in the Environmental Review Document (ERD) was incorrect. Meteorological data was obtained from the Bureau of Meteorology Swanbourne site for the model year 2010 however an error was made when manipulating the data into the model. This had the effect of creating a mirror image of the wind directions around the north/south axis. As a result of identifying this error, the air dispersion model has been re-run with the correct meteorological data and the revised results are in the attached memo (Memo High Street Upgrade Updated Air Quality Model).

The revised air quality modelling shows some slight variations to the results in the original Air Assessment report, as would be expected. However the changes are negligible. There is no change to the predicted outcome for air quality as described in the ERD section 4.3.7.

Accordingly the EPA's objective for air quality will be met.

Please confirm for the Air Assessment report whether there are differences between scenarios modelled when an appropriate meteorological dataset is used

The scenarios were re-run using the appropriate meteorological data. The revised modelling shows some slight variations in the previously predicted results. All scenarios show compliance with the relevant air quality criteria. See response above.

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Please confirm for the Air Assessment report whether there are any changes to assumptions for the NO_2/NOx ratio considering recent literature and the use of this road as a trucking transport link to Fremantle Port.

On 1 February 2019, EPA Services provided the following additional information to support a response in relation to the above:

Based on other road modelling work we have reviewed, we inferred a 5 % NO2/NOx ratio for the primary emissions (directly emitted from tailpipe) to which a further 10% was added to the ratio to account for NO to NO2 conversion by background ozone to give the 15% ratio figure cited in the report.

These assumptions (used for example in 2004 Roe Hwy stage 7 modelling assessment) may not apply to the NO2/NOx ratio used in the submitted modelling. However the question of NO2/NOx ratios to use for near-road receptors is a very complex area that primarily relates to the level of conservatism present in the calculations.

The DWER Air Quality Branch noted in their advice regarding the NOx to NO_2 ratio that *some recent literature (e.g. PAE 2015) reports that the fraction of NOx that is emitted from traffic as NO2 has increased in recent years to levels significantly higher than the 5% assumed in the modelling of the Air Assessment.*

PAE (2015) states that there is evidence of primary NO_2 emissions from vehicles are increasing in the UK and Sydney. Values in the UK have been recorded around 15%. Increases of the primary NO_2 emissions from vehicles in Sydney are not as pronounced as in the UK. PAE (2015) also notes that whilst the primary NO_2 emissions from vehicles may increase further, it will not increase much and will then start to decrease.

The following is an excerpt from the GHD Air Assessment (Appendix 4 of the ERD):

The NOx to NO_2 ratio adopted for air quality studies has historically been 10% NOx as NO_2. The ratio is known to vary depending on varying emission standards (newer technology diesel vehicles emit a higher proportion of NOx as NO_2) and existing background concentrations of urban pollutants such as nitrogen dioxide and ozone. Higher NOx to NO_2 ratios are observed in urban environments with elevated ozone and nitrogen dioxide concentrations.

As such, a 15% NOx:NO_2 ratio has been used, in line with that used for the previous study (O'Gorman & Gehrke, 2014). This is considered a conservative estimate of NOx to NO_2 for typical vehicle fleets in Australia and in consideration of lower background concentrations of urban pollutants experienced in the Perth airshed.

Whilst it is acknowledged that dieselisation of the fleet leads to a higher NOx:NO_2 ratio, as newer technology (Euro 5 and 6) diesel vehicles emit a higher proportion of NOx as NO_2, the conservative assumption that the vehicle fleet does not improve in emissions performance between 2020 and 2041 will counter any potential increase in the NOx:NO_2 ratio over time and provides for a conservative assessment of predicted ground level concentrations of NO_2.

It should be noted that the vehicle fleet composition modelled in the air assessment was based on vehicle count information for the road network, with 22% of the vehicle traffic in the model defined as diesel. Heavy duty vehicles accounted for 16.4% of the total vehicle traffic, with all of these assumed to be diesel. As such, the assessment has taken into consideration both the increased proportion of diesel vehicles in the fleet (higher due to freight task) and the potentially higher proportion of NO_2 emissions per diesel vehicle (15% NOx to NO_2 ratio as compared to 5% NOx to NO_2 ratio).

Due to the incorrect meteorological data being used in the original assessment, the air

dispersion model has been re-run for all pollutants originally modelled in Appendix 4 of the ERD (Memo High Street Upgrade Updated Air Quality Model). This has provided an opportunity to model a more conservative NOx to NO_2 ratio than that originally modelled.

The revised air assessment (Memo High Street Upgrade Updated Air Quality Model) has used a conservative 15% NOx to NO_2 ratio, as was done in the original Air Assessment. However the revised model has been run twice for NO_2, once with a 15% NOx to NO_2 ratio and again with a 20% NOx to NO_2 ratio for comparison.

The NO_2 concentration in Scenario 3 (2041 scenario with upgrade) has increased slightly following the revised modelling. The predicted maximum concentration of NO_2 has risen from 42% of the criterion in the original modelling to 45% of the criterion when modelled with the corrected meteorological data. The conservative modelling of 20% NOx to NO_2 ratio shows that the predicted maximum concentration of NO_2 will be 54% of the criterion in this scenario.

Modelling NO_2 emissions for the both 15% NOx to NO_2 ratio and 20% NOx to NO_2 ratio shows that even under the most conservative assumptions, NO_2 concentrations are well below the National Environmental Protection Measure standard.

The additional modelling of the 20% NOx to NO_2 ratio shows that even an ultra-conservative NOx to NO_2 ratio will not result in concentrations close to the NO_2 criterion.

The revised air quality modelling has shown that there will be no significant impact on air quality as a result of the High Street Upgrade Project. Whilst the wind direction data used in the original Air Assessment (Appendix 4 of the ERD) was incorrect, the revised air quality modelling with the correct meteorological data has produced similar results to the original modelling. In no modelled scenario does any criteria air pollutant exceed 60% of the National Environmental Protection Measure for that pollutant.

Accordingly the EPA's objective for air quality will be met.

Should you have any questions regarding this matter, please contact John Braid on ph 9323 6183.

Yours sincerely

Martine Scheltema
Manager Environment

Enc:

Memo High Street Upgrade Updated Air Quality Model

References:

O'Gorman S and Gehrke P, 2014, *NO2:NOx Ratios in Australian Road Tunnels,* 15th Australasian Tunnelling Conference 2014, Sydney, NSW, September 2014

PAE 2015, *A Review and Analysis of Primary Nitrogen Dioxide Emissions from Road Vehicles in Sydney,* NSW Roads and Maritime Services, 20 April 2015

http://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0006/81960/TECHNICAL-PAPER-1-A-REVIEW-AND-ANALYSIS-OF-PRIMARY-NITROGEN-DIOXIDE-EMISSIONS.pdf

Memorandum

Date: **1 February 2019**

Subject: Correction of High Street Upgrade Air Quality Modelling

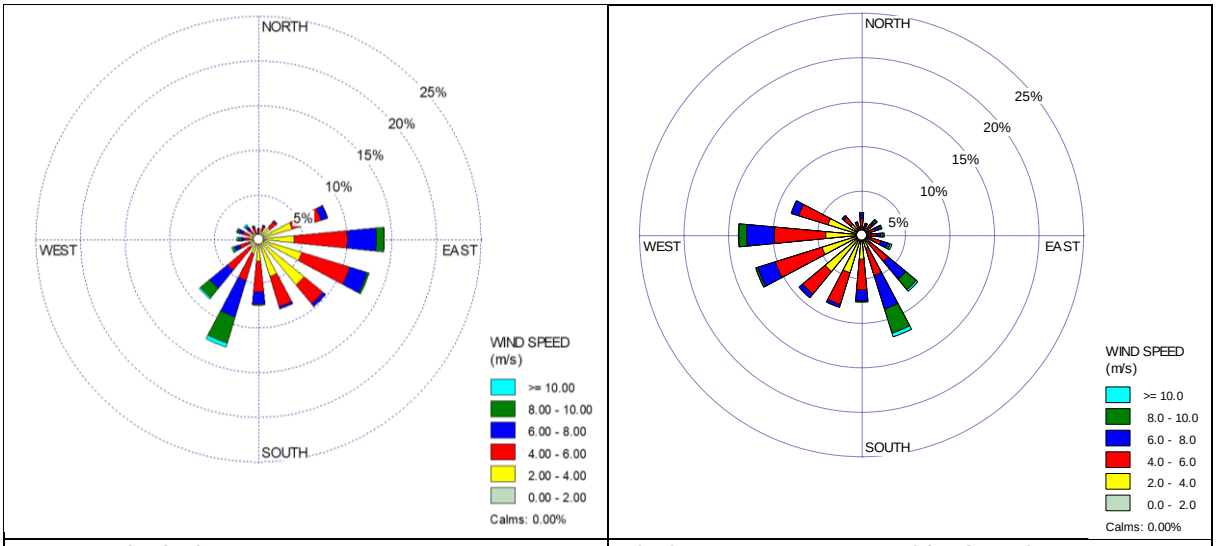
The Air Quality Branch of the Department of Water and Environmental Regulation (DWER) conducted a detailed review of the Air Assessment report, which was included as Appendix 4 of the Environmental Review Document (December 2018) for the High Street Upgrade proposal.

This review resulted in detection of an error in the development of the meteorological data file used for the assessment during the manipulation of 1-minute Bureau of Meteorology observations into a 1-hour average for use in the dispersion model.

Main Roads provides EPA Services' below updated air dispersion modelling results using a corrected meteorological data set.

Wind rose

A wind rose for the corrected met data set is shown below (left) compared with the erroneous meteorological (met) data set (right). The corrected wind rose is in agreement with the wind rose provided by DWER Air Quality Branch in subsequent correspondence via email.



Corrected wind rose	Wind rose as presented in the Air Assessment report (Figure 5-1)

Figure 1 Corrected met data set (left) compared with erroneous met data (right)

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Updated dispersion modelling results

Dispersion modelling results presented in Tables 5-3, 5-4 and 5-5 in the Air Assessment report have been updated based on the corrected met data set and provided below. The tables show both the results presented in the Air Assessment report and the corrected results.

Table 5-3 Predicted maximum concentrations - Scenario 1: Existing road network 2020

Pollutant	Background conc. (µg/m^3)	Predicted maximum concentration (µg/m^3)		Assessment criterion (µg/m^3)	Avg. period	Max % of criterion
		Discrete receptor	Auto receptor			
Results presented in Air Assessment report						
CO	625.2	718	755	11,254	8-hrs	7%
NO_2[1]	43.1	57	69	247	1-hr	28%
PM_{10}	18.9	20	20	50	24-hrs	40%
$PM_{2.5}$[2]	11.3	11	12	25	24-hrs	46%
Corrected results						
CO	625.2	690	767	11,254	8-hrs	7%
NO_2[1]	43.1	59	74	247	1-hr	30%
NO_2[2]	43.1	65	84	247	1-hr	34%
PM_{10}	18.9	19.5	19.9	50	24-hrs	40%
$PM_{2.5}$[3]	11.3	11.3	12.8	25	24-hrs	51%

Table 5-4 Predicted maximum concentrations - Scenario 2: Upgraded road network day of opening, 2020

Pollutant	Background conc. (µg/m^3)	Predicted maximum concentration (µg/m^3)		Air NEPM/WHO criterion (µg/m^3)	Avg. period	Max % of criterion
		Discrete receptor	Auto receptor			
Results presented in Air Assessment report						
CO	625.2	724	906	11,254	8-hrs	8%
NO_2[1]	43.1	60	93	247	1-hr	38%
PM_{10}	18.9	20	21	50	24-hrs	42%
$PM_{2.5}$[3]	11.3	11	12	25	24-hrs	49%
Corrected results						
CO	625.2	718	815	11,254	8-hrs	7%
NO_2[1]	43.1	62	83	247	1-hr	34%
NO_2[2]	43.1	58	96	247	1-hr	39%
PM_{10}	18.9	20	21	50	24-hrs	41%
$PM_{2.5}$[3]	11.3	11	12	25	24-hrs	48%

[1] Assessed as 15% NO_x as NO_2

[2] Assessed as 60% PM_{10} as $PM_{2.5}$

Table 5-5 Predicted maximum concentrations - Scenario 3: Year 2041

Pollutant	Background conc. ($\mu g/m^3$)	Predicted maximum concentration ($\mu g/m^3$)		Air NEPM/WHO criterion (µg/m3)	Avg. period	Max % of criterion
		Discrete receptor	Auto receptor			
Results presented in Air Assessment report						
CO	625.2	781	1102	11,254	8-hrs	10%
NO_2[1]	43.1	71	104	247	1-hr	42%
PM_{10}	18.9	20	22	50	24-hrs	45%
$PM_{2.5}$[3]	11.3	12	13	25	24-hrs	52%
Corrected results						
CO	625.2	776	955	11,254	8-hrs	8%
NO_2[1]	43.1	74	110	247	1-hr	45%
NO_2[2]	43.1	84	132	247	1-hr	54%
PM_{10}	18.9	20	22	50	24-hrs	44%
$PM_{2.5}$[3]	11.3	12	13	25	24-hrs	51%

The corrected dispersion modelling results show that the maximum percent of criterion has increased or decreased slightly for each scenario and/or each pollutant, but comfortable compliance with the criterion is demonstrated.