RiverLink

Notices of Requirement for Designations and Applications for Resource Consent

Volume Four: Supporting Technical Reports

Technical Report #11

Air Quality

IN THE MATTER OF	The Resource Management Act 1991
AND	
IN THE MATTER OF	Resource consent applications under section 88, and Notices of Requirement under section 168, of the Act in relation to the RiverLink project
BY	**Waka Kotahi NZ Transport Agency** Requiring Authority **Greater Wellington Regional Council** Requiring Authority **Hutt City Council** Requiring Authority

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RIVERLINK
TECHNICAL ASSESSMENT # 11
AIR QUALITY

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1 INTRODUCTION

1. My name is Jason Savelio Karena Pene.
2. I am a Principal Environmental Engineer of Tonkin & Taylor Ltd ("**T+T**") and in this role I provide air quality and environmental engineering consultancy services to a range of private and public sector clients.

1.1 Qualifications and experience

3. I hold a Bachelor of Engineering degree with honours in Chemical and Process Engineering from the University of Canterbury and I am a Certified Air Quality Professional of the Clean Air Society of Australia and New Zealand ("**CASANZ**").
4. I have been involved in the assessment and management of environmental impacts, with a particular focus on discharges of contaminants to air, in various roles in consultancy, for regulatory authorities and in industry for 20 years.
5. Of specific relevance to this statement of evidence, I have conducted air quality impact assessments or provided advice on the management of air emissions from a range of transport and municipal infrastructure construction projects, including:
   a. Auckland City Rail Link (construction air quality management advice for rail line, station and tunnel construction works that are currently in progress);
   b. Auckland Northern Corridor Improvements (air quality advice to a neighbouring stakeholder during detailed design phase);
   c. Auckland Manukau Eastern Transport Initiative (air quality assessment for business case);
   d. Auckland East-West Connection (air quality assessment for business case);
   e. Auckland Waterview Connection (air quality monitoring programme development and analysis from pre-consent investigations to construction phase);
   f. Transmission Gully (construction air quality management documentation development for consenting phase);
   g. wind farm developments previously proposed by Contact Energy in the North Island (construction air quality assessments and management documentation development for consenting phases); and
   h. various mineral extraction and industrial activities in New Zealand and Australia involving similar dust generating activities to those proposed.

1.2 Involvement in the Project

6. I have supervised and participated in the development of the Air Quality Assessment of the Riverlink project. I have regularly visited the Project area[1] in the past and I am familiar with the site and surrounds.

[1] Defined in the Assessment of Effects on the Environment ("**AEE**") as "*The area within the proposed designation boundary, and immediate surrounds to the extent Project works extend beyond this boundary*".

7. The Air Quality Assessment relies on information from a number of sources, including:
   a. traffic flow predictions described in the Transportation Assessment for the Project;
   b. meteorological monitoring data obtained from Greater Wellington Regional Council ("**GWRC**"); and
   c. background air quality data obtained from the GWRC and Waka Kotahi.
8. The preparation of this assessment has been assisted by other members of T+T's air quality team including Robyn Butler, Air Quality Consultant, and Richard Chilton, Principal Air Quality Scientist.

1.3 Code of Conduct

9. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. This assessment has been prepared in compliance with that Code, as if it were evidence being given in Environment Court proceedings. In particular, unless I state otherwise, this assessment is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

1.4 Purpose and scope of assessment

10. The purpose of this document is to describe the assessment of the potential air quality impacts of the Project during construction and during operation(post-construction).
11. Specifically, my assessment addresses:
    a. discharges to air that may result from the Project's activities;
    b. the environmental setting of the Project (as it relates to potential air quality impacts);
    c. the methodology that I have used to assess the air quality impacts of the Project;
    d. the results of my assessment of air quality impacts during the construction and operation phases of the Project;
    e. measures that I recommend be implemented to avoid, remedy or mitigate effects on air quality, including draft consent/designation conditions;
    f. alignment of the proposed discharges to air and associated impacts on air quality with statutory planning and policy documents; and
    g. conclusions in relation to the air quality impacts of the Project.

1.5 Assumptions and exclusions in this assessment

12. The following supporting information is attached to this report:
    a. Appendix A – Air Quality Assessment Technical Report – this report provides additional detail of the air quality assessment summarised in this document; and
    b. Appendix B – Tabulated operational air quality impact predictions.

2 EXECUTIVE SUMMARY

13. The RiverLink Project has the potential to affect local air quality and the effects on air quality will differ during the following phases:
    a. During the construction phase (as a result of dust and other construction emissions).
    b. During operation of the constructed Project (as result of changes to emissions from vehicle traffic flows on State Highway 2 ("**SH2**") and local roads).

14. I have overseen an assessment of the potential impacts on air quality from both the construction and operational phases. Full details of this assessment are provided in Appendix A.

15. In terms of sensitivity to emissions to air and degraded air quality, the local urban environment contains activities varying in sensitivity, including:

    a. high sensitivity activities that are mainly located in adjacent residential areas;

    b. moderate sensitivity commercial activities; and

    c. relatively low sensitivity light industrial activities.

16. Based on GWRC air quality monitoring results in the area (near Waterloo Train Station to the east of the Project Area) existing ambient air quality in the area is likely to be of a reasonable standard.

2.1 Construction effects and mitigation

17. The potential air quality impacts were assessed during the construction phase through a qualitative assessment of the frequency, intensity and duration of anticipated exposure, the offensiveness/character of the contaminants and sensitivity to dust in adjacent areas associated with construction activities in each geographical sector of the Project.

18. The Project construction works will involve a number of activities that have a potential to generate dust and, to a lesser degree, odour and other contaminants. The environmental setting of the construction activities is reasonably sensitive. Furthermore, given the proximity and density of sensitive activities I consider that a reasonably high standard of dust control will be required to mitigate potential air quality impacts during the construction phase. The air quality mitigation measures to be implemented should be detailed in full in a Construction Air Quality Management Plan ("**CAQMP**") once the constructor(s) for the Project has/have been identified and I have recommended a range of minimum requirements for the measures that I see as necessary to mitigate potential impacts in this environment.

19. Provided the recommended dust control, management and monitoring measures are rigorously implemented, I consider that the potential effects on air quality during the construction phase will be able to be appropriately mitigated. With the recommended mitigation measures in place, I am of the opinion that offensive or objectionable nuisance or significant air quality impacts are likely to be avoided. Furthermore, any residual effects are likely to be localised within close proximity of the Project Area and no more than minor in scale.

2.2 Operational effects and mitigation

20. The potential air quality impacts during the operational phase have been assessed through prediction of traffic emission impacts using Waka Kotahi air quality screening model and predicted traffic flows with and without the Project and considering background air quality and the proximity of sensitive activities.

21. Emissions from SH2 and local roads are currently predicted to have only a small impact on adjacent air quality (which is likely to be of a reasonable standard). The Project is predicted to incrementally increase the air quality impacts associated from SH2 traffic flows but reduce the impacts of flows along key local links, such as Ewen Bridge and Queens Drive. The predicted changes in air quality impacts associated with the Project are small in scale and ambient levels of traffic pollutants in the surrounding area are predicted to remain well within the relevant health-based assessment criteria following completion of the Project.

22. As a result, I do not anticipate that operation of the Project will result in any material increase in exposure of people in the local environment to ambient air contaminants and do not consider that further measures to mitigate operational air quality impacts are required.

3 PLANNING AND POLICY CONTEXT

23. The following national statutory and non-statutory documents are relevant to the consideration of air quality impacts of the Project:

    a. Resource Management Act 1991 (“**RMA**”); and

    b. Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (“**NES-AQ**”).

24. The following regional and district level statutory and non-statutory documents contain provisions relevant to air quality impacts of the Project:

    a. Operative Regional Policy Statement for the Wellington Region (“**RPS**”);

    b. Proposed Natural Resources Plan for the Wellington Region (“**PNRP**”); and

    c. Operative Regional Air Quality Management Plan for the Wellington Region (“**RAQMP**”).

25. I describe the relevance of policy provisions of the above documents to the discharges to air and air quality impacts of the Project below.

4 PROJECT DESCRIPTION

26. A full project description is available in the AEE. The following section relies on excerpts of the AEE relevant to the assessment of air quality impacts/effects.

27. Of relevance to the assessment of air quality impacts during the construction of the Project is that the construction phase will include the following activities with a potential to generate emissions to air:

    a. Excavation and earthmoving.

    b. Handling and stockpiling of soil and aggregate materials.

    c. Aggregate crushing and screening.

    d. Silt drying.

    e. Vehicle movements over unsealed and sealed surfaces.

    f. Building and structure demolition and removal.

28. Following construction, the Project will alter traffic flow over the Project Area and surrounds. Associated changes in the scale and distribution of vehicle emissions may result in changes in local air quality.

5 DISCHARGES TO AIR

29. Discharges to air associated with the Project include:

    a. Emissions from activities associated with the construction of the Project; and

    b. Road emissions from operation of the constructed Project.

30. During the construction of the Project emissions are likely to include:

    a. dust (particulate matter): this is the main air contaminant emitted from infrastructure construction activities of this type:

        i. The dust emissions will be predominantly comprised of coarse particulate matter associated with nuisance or property soiling effects. Coarse dust is likely to settle out of the air and deposit in close proximity to the source. The distance at which deposition of this dust can occur will depend on the scale of the emissions and meteorological conditions. However, in my experience the vast majority of dust deposition from infrastructure construction activities typically occurs within 100 m of the source and deposition beyond a distance of 200 m is minimal in most circumstances;

        ii. a small component of the dust emissions (including the fine PM_{10} fraction or hazardous components such as respirable crystalline silica, if present) has a potential to cause adverse respiratory health effects with sufficient exposure;

    b. odour: this could potentially be emitted during the construction phase if odorous contaminated soil is disturbed; and

    c. combustion by-products that are emitted in larger quantities from the constructed Project, as described further in paragraph 30 below.

31. Once constructed, road emissions from the completed Project will likely include:

    a. combustion by-products, such as the PM_{10} and $PM_{2.5}$ fractions of suspended particulate matter (particles with an aerodynamic diameter of less than 10 microns (μm) and 2.5 μm, respectively), nitrogen dioxide (NO_2) and carbon monoxide (CO): these are derived from the combustion of petroleum fuels in internal combustion engines. These contaminants can affect human health if sufficient exposure occurs in the community; and

    b. fine particulate emissions from brake, tyre and engine wear.

6 ENVIRONMENTAL SETTING

6.1 Overview of setting

32. The environmental setting of the Project as it relates to potential air quality impacts is described in detail in section 3 of Appendix A to this document.

33. The environmental setting is described in relation to the following aspects, which I summarise below:

    a. Land use and sensitivity to air pollutants.

    b. Meteorology and topography.

    c. Background air quality and emission sources.

6.2 Land use and sensitivity to air pollutants

34. The setting of the Project is an urban area of Lower Hutt that features a range of adjacent urban activities with varying sensitivity to the air contaminants likely to be emitted from the Project.

35. In general, there is likely to be a continuum of sensitivity of adjacent activities ranging from high sensitivity residential activities, through to moderately sensitive commercial activities, and to low sensitivity light industrial activities and open spaces (the latter when the open spaces are not in occupation).

36. Residential activities are mainly located in residential areas in the Western Hutt Hills to the northwest of the Project (e.g. Belmont and Harbour View) and at Melling and Boulcott at the south and north ends of the Project, respectively. Commercial activities are concentrated in the Lower Hutt central business district ("**CBD**"). Light industrial activities are limited to a small area along Pharazyn Street and open spaces generally follow the alignment of the Hutt River through the Project area.

6.3 Meteorology and topography

37. The Project area is located on the western side of the lower Hutt Valley. The bulk of the Project works will take place in relatively flat terrain on the valley floor. The adjacent hills to the west of the Hutt River and Project area will influence wind conditions and the propagation of emissions.

38. Wind and other meteorological parameters are measured by GWRC at Birch Lane approximately 1 km to the southeast of the Project area near Waterloo train station. This weather station is located reasonably centrally within the Hutt River plain and wind data from this station is likely to be representative of regional wind conditions in the lower Hutt Valley in general.

39. Birch Lane wind data illustrates a strong prevalence overall for winds from the north-northwest to north-northeast range of directions with a secondary prevalence for wind from the opposite directions. Winds are infrequent from the east and west quadrants.

40. Wind in the local area is likely to be channelled by the adjacent Western Hutt hills to some degree and winds are likely to follow more of a northeast to southwest orientation than at Birch Lane. Winds of more than 5 m/s (in which dust pick-up and propagation is most likely to occur) are most frequent at Birch Lane from the north and north-northeast – the Project area is sheltered by the adjacent hills and wind speeds are likely to be lower than at Birch Lane in these conditions.

6.4 Background air quality and emission sources

41. Background levels of contaminants emitted from the Project are likely to currently exist in the Project area and surrounds, including the following:

    a. Construction activities in the local area could also potentially have a localised impact on ambient dust levels. Alluvial dust may be generated from exposed areas of the bed and banks of the Hutt River when wind speeds are sufficiently high.

    b. PM_{10} and $PM_{2.5}$ levels are likely to be influenced by domestic solid fuel combustion in winter and from vehicle traffic on local roads throughout the year.

    c. Other combustion contaminants such as NO_2 and CO are also likely to be emitted from vehicle traffic on local roads throughout the year.

42. Based on ambient air quality monitoring conducted by GWRC in Lower Hutt, PM_{10} concentrations have remained well within the ambient PM_{10} standard specified in the NES-AQ for at least the last five years and the airshed is not currently classified as "polluted" under the NES-AQ.

43. I have considered background levels of contaminants for the purposes of assessing cumulative impacts based on Waka Kotahi geospatial background air quality estimates in my assessment of air quality impact below.

7 ASSESSMENT METHODOLOGY

44. In accordance with Waka Kotahi guidance on air quality impact assessment of roading projects[2] ("**Waka Kotahi AQA Guide**"), I have assessed the impacts of emissions to air during the construction phase of the Project and during post-construction operation.

45. A review of the Project against Waka Kotahi Environmental and Social Responsibility (ESR) Screen questions relating to air quality is provided in Table 5.1 of Appendix A. This review indicates that the risk of air quality impacts is elevated due to the following aspects:

    a. the zoning for and presence of sensitive residential activities in adjacent areas;

    b. the construction timeframe of longer than 18 months;

    c. the One Network Road Classification of SH2; and

    d. adjacent activities that could potentially involve ground contamination.

46. The Waka Kotahi AQA Guide also requires a specific checklist consideration of air quality risks associated with the construction phase. The details of this consideration for the Project are set out in Table 5.2 of Appendix A, which identifies that the construction air quality risk for the Project is "high" due to the following aspects:

    a. The scale of the proposed area and volume of earthworks.

    b. The proximity of highly sensitive receivers ("**HSRs**") to the works.

    c. The anticipated frequency of truck movements associated with the works.

47. I have taken this classification into account in the development of the assessment method for both the construction and operational phases.

48. The methodology I have used to assess the air quality effects of the Project during construction has been developed in accordance with the Ministry for the Environment ("**MfE**") guidance on dust assessment and management[3] ("**MfE Dust Guide**") with reference to the Waka Kotahi AQA Guide. The construction effects assessment has involved:

    a. spatial segregation of the Project Area and surrounds into sectors by geography and activity type for detailed assessment of construction impacts; and

    b. investigation of the following in each geographical sector:

        i. Dust generating activities (and other emission sources) associated with works proposed for the sector and the likely scale of emissions.

        ii. Consideration of the sensitivity and location of adjacent activities.

        iii. Consideration of environment influences on air quality impacts in the sector (meteorology, topography and background emission sources).

        iv. Measures that may be required to mitigate potential impacts of dust and other construction emissions on local activities.

        v. A qualitative assessment of the potential adverse air quality effects with and without mitigation through consideration of the "**FIDOL**" factors (namely the **f**requency, **i**ntensity and **d**uration of anticipated exposure, the **o**ffensiveness/character of the contaminants and sensitivity at the exposure **l**ocation).

        vi. A summary of the overall impacts of emissions from the construction works on air quality.

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[2] Waka Kotahi. 2019. "Guide to Assessing Air Quality Impacts from State Highway Projects"

[3] MfE. 2016."Good Practice Guide for Assessing and Managing Dust"

49. The methodology I have used to assess the air quality effects during operation of the Project has been developed in accordance with the Waka Kotahi AQA Guide. This has involved:

    a. review of predicted traffic flows and composition along SH2 and local road links with and without the Project and separation distances from adjacent HSR activities to identify key road links for further assessment;

    b. comparative assessment of the contribution of traffic emissions from the identified key road links to local air contaminant levels with and without the Project using the Waka Kotahi air quality screening tool;

    c. estimation of background contaminant levels for the purposes of assessing cumulative impacts with Project contributions using Waka Kotahi geospatial background air quality estimates; and

    d. predicted contaminant concentrations at HSRs have been assessed against the NES-AQ and World Health Organisation ("WHO") Air Quality Guidelines ("AQG") to assess the potential for adverse health effects in the surrounding environment.

50. As I describe below, this preliminary operational assessment indicates that material increases in local exposure to air contaminants with a potential for adverse health effects are unlikely. As a result, no further detailed assessment of air quality effects during the operational phase has been conducted.

8 ASSESSMENT OF CONSTRUCTION AIR QUALITY EFFECTS

51. The Project Area and surrounds have been divided spatially and by activity type into five following sectors for the purposes of assessing construction impacts on air quality:

    a. river works northeast of the Melling interchange;

    b. river and riverside urban construction works southwest of the Melling interchange;

    c. aggregate processing area;

    d. SH2 Melling interchange and Melling Station upgrade works; and

    e. Lower Hutt CBD urban construction works.

52. The areas encompassed by each sector are illustrated in Figure 6.1 of Appendix A.

53. An assessment of potential impacts of construction emissions based on a qualitative consideration of the FIDOL factors is described in section 6.2 of Appendix A and I summarise the conclusions in the following paragraphs.

8.1 Effects of river works northeast of the Melling interchange

54. The river works in this sector will include activities with a potential to generate dust emissions of a reasonably strong intensity if not well controlled, including:

    a. stopbank earthworks and associated material handling;

    b. on-site screening of excavated material for use in construction (via static grizzly screen and excavator-mounted screening buckets); and

c. movement of heavy construction vehicles over unsealed surfaces (such as haul routes or construction support areas).

55. As I have noted above, dust deposition from this type of activity is likely to be minimal beyond a distance of 200 m from the source in most circumstances. Work activities in this sector lie within 200 m of urban development in the suburbs of Boulcott and the Lower Hutt CBD to the southeast and Belmont and Harbour View to the northwest. The sensitivity of activities in these areas will generally be either moderate or high. Given their proximity to the works I consider that a generally high standard of dust management and control will be required to mitigate potential dust impacts upon these areas.

56. In particular, river works activities will occur in close proximity and upwind of dwellings along Connolly Street and Mills Street in the Boulcott residential area in prevailing moderate and strong winds. Particular attention to management of dust emissions should be paid to adjacent works activities in this area.

57. I discuss dust management measures in this environmental context below in section 11.

8.2 Effects of river and urban construction works southwest of the Melling interchange

58. The river works I described in paragraph 53.iwill continue in this sector along with the addition of the following potential dust generating activities:

a. Building and structure demolition and removal.

b. Road pavement removal and construction.

59. River and urban construction works in this sector will occur within 200 m of urban development in the suburbs of Melling and the Lower Hutt CBD to the southeast of SH2 and Belmont and Harbour View to the northwest. For the reasons I described in paragraph 54, a generally high standard of dust management and control will be required to mitigate potential dust impacts in these areas.

8.3 Effects of the aggregate processing area activities

60. The aggregate processing area will feature activities that have a potential to generate significant dust (if not well controlled). Specifically, aggregate crushing, screening of crushed material and silt drying for the Project is proposed to only be carried out at an aggregate processing area. Material storage and handling, screening of excavated material and vehicle movements are processing dust sources that will also occur elsewhere within the Project works areas.

61. Given the potential for dust emissions from aggregate processing, the processing area has been sited to maximise separation from dense urban development as far as practicable[4]. Activities within 100 m, where the bulk of dust deposition is likely to occur, are limited to the closest dwellings along Pomare Road in Belmont and the Transpower Substation on the opposite bank of the Hutt River. Additional dwellings along Pomare Road and Wairere Road and the nearest dwellings at Mills Street in Boulcott are located between 100 m and 200 m from the proposed processing area. As I have noted above in paragraph 29, at these distances the potential for deposition of dust from the processing area is possible but will be much reduced.

62. While the potential impacts of the processing area will be mitigated through geographical separation to some degree, I consider that further mitigation of emissions will be needed to mitigate impacts in the sensitive areas I have described in the preceding paragraph. The mitigation measures I recommend to achieve this are discussed further below (section 10).

[4] The plant is to be located within a river esplanade reserve adjacent to SH2 at Belmont

8.4 Effects of the SH2 Melling Interchange and new Melling Line Station works

63. The road and rail upgrade works include activities with a potential to generate dust emissions of a reasonably strong intensity if not well controlled. The activities that will need to be controlled include demolition, earthworks, material handling and vehicle movements on unsealed surfaces.

64. The road and rail upgrade works will be carried out within 200 m of urban development in the suburbs of Melling towards the southwest end, the Lower Hutt CBD where the existing and proposed Melling Bridges land and at Belmont and Harbour View to the northwest. For the reasons I described in paragraph 54, a generally high standard of dust management and control will be required to mitigate potential dust impacts in these areas.

65. In particular, river works activities will occur in close proximity and upwind of dwellings in the Melling residential area adjoining SH2 in prevailing moderate and strong winds. Particular attention to management of dust emissions should be paid to adjacent works activities in this area.

8.5 Effects of the Lower Hutt CBD construction works

66. Project construction works in the CBD will involve demolition activities that have the potential to generate substantial dust (if not well controlled). Other less intensive dust generating activities include removal of road pavement and material handling.

67. The works in this area will be located in close proximity to urban activities with at least a moderate sensitivity to dust, and a generally high standard of dust management and control will therefore be required to mitigate potential dust impacts.

8.6 Summary of construction air quality effects

68. The FIDOL assessments of exposure to air contaminants likely to be emitted from construction works in each sector indicate the following:

    a. The Project will include construction activities with a potential to generate dust and other construction contaminants across the Project Area. The potential for dust generation will vary by activity and certain activities, such as aggregate crushing, have a potential to generate significant emissions without suitable control measures in place.

    b. In addition to effects of dust emissions, the Preliminary Site Investigation ("**PSI**")[5] for the Project has identified potential Hazardous Activities and Industry List ("**HAIL**") sites within the Project area. Consequently, the disturbance of contaminated land may generate odorous or hazardous contaminants.

    c. The surrounding environment includes urban residential and commercial activities close enough for exposure to dust and other emissions from the works to occur. As such, the environment overall is reasonably sensitive to the potential impacts of dust and other emissions from the type of construction activities proposed.

69. I therefore consider that a reasonably high standard of control of dust and other construction activities will be required to mitigate potential adverse impacts of dust, in particular, from the construction activities.

70. Control and management measures have been considered in section 6.3 of Appendix A to account for the nature of the proposed activities and the sensitivity of the environment. As I describe below, I consider that the recommended measures will provide a suitable level of control and management of the risk of effects on air quality amenity and property in the local environment.

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[5] Contained in Technical Assessment #14 Contaminated Land

71. Provided the control measures recommended in section 6.3 of Appendix A are rigorously implemented, I consider that offensive or objectionable nuisance or significant air quality impacts are likely to be avoided. Residual nuisance or property effects are possible with the control measures in place as it is unlikely to be practicable to fully internalise or contain the construction emissions within the Project Area at all times. However, I believe the residual effects will be localised to areas close to the Project Area and minor at most in scale.

9 ASSESSMENT OF OPERATIONAL AIR QUALITY EFFECTS

72. The potential impacts of transport emissions from local roads on ambient air quality, on the basis of the Project in operation, have been assessed (and compared with corresponding impacts without the Project) using Waka Kotahi Air Quality Screening Model. This assessment is set out in Appendix A.

73. This model uses predictions of traffic flow and other traffic characteristics on local roads and the proximity of HSRs to predict the contributions that road emissions are likely to make to ambient PM_{10} and NO_2 concentrations at the nearest HSR location to each road link.

74. Waka Kotahi estimations of background PM_{10} and NO_2 concentrations in the area have been added to the predicted road contributions to estimate cumulative contaminant concentrations at the HSRs adjacent to road links.

75. I have drawn the following conclusions from the assessment of the air quality effects of operation of the completed Project:

    a. Waka Kotahi estimations of background PM_{10} and NO_2 levels in the local area indicate that background levels of these contaminants currently remain well within the NES-AQ and WHO AQG assessment criteria. The estimated background concentrations equate to an "acceptable" level of air quality under the air quality targets of the PNRP.

    b. Traffic emissions from SH2 and local road links are predicted to make relatively small contributions to ambient PM_{10} and NO_2 concentrations in the area, compared to the relevant NES and WHO air quality assessment criteria.

    c. The highest road contributions to PM_{10} and NO_2 concentrations in the area are predicted to result from SH2 by virtue of the amount of traffic utilising the highway. However, the contributions from this stretch of road are still relatively small. Without the Project, the peak contribution of SH2 emissions to annual average NO_2 concentrations at the nearest HSR equate to only 7.5% of the WHO AQG. The corresponding contribution to 24-hour average PM_{10} concentrations are predicted to be less than 1.8% of the NESAQ.

    d. Cumulative PM_{10} and NO_2 concentrations, combining the peak road contributions and the estimated background contributions, are predicted to remain well within the relevant assessment criteria. With the Project in place the highest predicted cumulative concentrations (adjacent to SH2) equate to less than 60% of the PM_{10} NES-AQ criterion and 25% of the NO_2 WHO AQG. The bulk of the cumulative concentrations are comprised of background contributions.

    e. The Project is predicted to lead to small improvements in air quality impacts from other key roads in the area, such as Ewen Bridge and the adjacent section of Queens Drive.

    f. The Project is predicted to increase air quality impacts of certain lower volume road links. The largest increase in contributions is predicted to occur at High Street (between Laings Road and Andrews Street) in the CBD, due to the scale of changes to traffic flow compared to other

CBD links. However, the predicted contributions from High Street are currently very low and with the Project in place, cumulative PM_{10} and NO_2 concentrations are predicted to remain well within assessment criteria levels.

76. Overall, the operational assessment set out in Appendix A indicates that air quality is generally likely to be of a reasonable standard in the local area with contaminant concentrations remaining well within the relevant health-based assessment criteria.

77. Contributions of local roads are predicted to be reasonably small, and while implementation of the Project is predicted to increase the air quality impacts of road emissions from SH2, impacts of other key local road links including Ewen Bridge and the adjacent section of Queens Drive are predicted to be reduced. The predicted change in air quality impacts is small and ambient levels of traffic pollutants in the local area are predicted to remain well within the relevant health-based assessment criteria following completion of the Project.

10 SUMMARY OF AIR QUALITY EFFECTS

78. The Project has the potential to have an impact on air quality during the construction phase as a result of dust and other emissions from construction works and during operation as a result in changes to road emission patterns.

79. In relation to effects during the construction phase, the urban environment of the Project is, in general, reasonably sensitive to the potential impacts of dust and other emissions from the type of construction activities proposed. A reasonably high standard of dust control will therefore be required. As I describe below a management regime for dust and other construction emissions is recommended to mitigate the potential adverse impacts on air quality. Provided the recommended measures are rigorously implemented, I consider that the potential effects on air quality during the construction phase should be appropriately mitigated and offensive or objectionable nuisance or significant air quality impacts should be avoided.

80. In relation to the effects of road emission from operation of the completed Project, ambient air quality is likely to be of a reasonable standard in the local area overall. Predicted contributions of road emissions in the area are relatively small and while impacts of traffic emissions from SH2 are predicted to increase the increases are small in scale and ambient levels of traffic pollutants in the local area are predicted to remain well within the relevant health-based assessment criteria following completion of the Project. This would indicate that operation of the Project is unlikely to result in any material increase in exposure of people in the local environment to airborne health contaminants.

11 MEASURES TO AVOID, REMEDY OR MITIGATE ACTUAL OR POTENTIAL ADVERSE AIR QUALITY EFFECTS

11.1 Proposed mitigation measures

11.1.1 Construction

81. As noted above, the surrounding environment is overall reasonably sensitive to dust and other construction emissions and management and monitoring measures for Project emissions are considered in section 6.3 of Appendix A.
82. A regime of dust management measures is recommended in Appendix A based around the principles of:
    a. minimisation of mechanical disturbance of potentially dusty materials;
    b. minimisation of wind exposure and containment of emissions;
    c. locating dust generating activities, such as aggregate processing , to maximise separation from sensitive activities; and
    d. stabilisation or agglomeration of potentially dusty material through application of water or other suppressants.
83. Monitoring of emissions and impacts typically forms an important facet of dust management and a number of monitoring options are available, including visual and instrumental monitoring. At a minimum, I recommend that the Project monitoring regime should include regular visual monitoring of activities and emissions to allow management measures to be updated and improved on an on-going basis.
84. I also recommend that the visual monitoring for dust should be supplemented with continuous instrumental monitoring of weather conditions. This could be achieved with a dedicated weather station operated within the Project Area (for instance at the aggregate processing area). Alternatively, the GWRC weather station at Birch Lane could potentially be used if access to continuous online data is available that allows Project staff to be automatically notified if wind speeds or other relevant parameters exceed predefined trigger levels.
85. The details of monitoring and management measures should be further refined once detailed design is completed and the construction contractor(s) who will be responsible for implementation are involved. At that stage, the measures should be confirmed and detailed in an Air Quality Management Plan.
86. Overall, I consider the management and monitoring measures in recommended section 6.3 of Appendix A are consistent with good air quality management practice. The measures are also consistent with measures that have provided effective dust control for other infrastructure construction projects in high and medium density urban environments that I have been involved in. I consider the recommended measures should provide an appropriate level of control in this environment.

11.1.2 Operational

87. In light of the currently low impact of road emissions in the area on air quality and the small predicted change in impacts from key road links associated with the Project, I do not consider that further operational air quality mitigation measures are required.

11.2 Proposed Conditions

88. Resource consent or designation conditions to manage potential effects on air quality during the construction phase should include:

    i. a requirement to avoid discharges to air, including discharges of dust and odour, that are noxious, dangerous, offensive or objectionable beyond the Project Area, which is the commonly applied bottom line for effects avoidance for discharges or this type in New Zealand;

    ii. adoption of minimum requirements for dust management recommended in section 6.3 of Appendix A; and

    iii. a requirement to prepare and submit a Construction Air Quality Management Plan ("**CAQMP**") to GWRC for review and certification prior to works commencing. This plan should detail the measures to be used to monitor and minimise the potential air quality impacts of the construction activities and to meet the requirements of the consent conditions relevant to air quality management. In accordance with the Waka Kotahi AQA Guide, the CAQMP "*will require independent peer review*[6] *and include a comprehensive risk-based quality assurance/quality control (QA/QC) programme to ensure risks are appropriately managed*".

89. Given the predicted low air quality impact of the Project during the operational phase, I do not recommend any specific conditions to manage these effects.

12 CONCLUSION AND RECOMMENDATIONS

90. The RiverLink Project has the potential to affect local air quality during the construction phase (as a result of dust and other construction emissions) and during post-construction operation through changes to vehicle combustion and other emissions from local roads. The potential impacts on air quality from both the construction and operational phases have been assessed (with details provided in Appendix A).

91. The urban environmental setting contains a range of activities of varying in sensitivity to degraded air quality, including high sensitivity activities mainly located in adjacent residential areas, moderate sensitivity commercial activities and relatively low sensitivity light industrial activities.

92. In relation to the construction emission impacts, the environmental setting is reasonably sensitive to the potential impacts of dust and other emissions from the type of construction activities proposed. To mitigate potential air quality impacts during the construction phase in this environment a reasonably high standard of dust control has been recommended.

93. Provided the recommended dust control measures are rigorously implemented, I consider that the potential effects on air quality during the construction phase will be able to be appropriately mitigated with the imposition of suitable controls and monitoring subject to conditions. With the recommended mitigation measures in place I am of the opinion that offensive or objectionable nuisance or significant air quality impacts are likely to be avoided. Furthermore, any residual effects are likely to be localised within close proximity of the Project Area and no more than minor in scale.

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[6] The Waka Kotahi AQA Guide states that the peer review of the CAQMP "*should be a specific peer review in accordance with the Engineering New Zealand Practice Note 2 and should be completed prior to starting relevant works or submission to any statutory authority*".

94. In relation to the operational air quality impacts of the completed Project, ambient air quality is likely to be of a reasonable standard in the local area overall. Emissions from SH2 and local roads are currently predicted to have only a small impact on adjacent air quality.

95. The Project is predicted to incrementally increase the air quality impacts associated with traffic flows SH2 (and other lower volume road links in the area) but reduce impacts associated with flows along key local links, such as Ewen Bridge and Queens Drive. The predicted changes in air quality impacts associated with the Project are small in scale and ambient levels of traffic pollutants in the local area are predicted to remain well within the relevant health-based assessment criteria following completion of the Project.

96. As a result, I do not anticipate that operation of the Project will result in any material increase in exposure of people in the local environment to ambient air contaminants or that further measures are required to mitigate operational air quality impacts.

Jason Pene

23 July 2021

Appendix A – Air Quality Assessment Technical Report

REPORT

Tonkin+Taylor

RiverLink Air Quality Technical Assessment

Technical Report

Prepared for
Isthmus Group Ltd

Prepared by
Tonkin & Taylor Ltd

Date
July 2021

Job Number
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Exceptional thinking together

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Document Control

Title: RiverLink Air Quality Technical Assessment					
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1 Introduction

Tonkin & Taylor Ltd (T+T) has been commissioned by Isthmus Group Ltd on behalf of the RiverLink project partners Greater Wellington Regional Council (GWRC), Hutt City Council (HCC) and Waka Kotahi NZ Transport Agency (Waka Kotahi) to assess the effects of the RiverLink project ("the Project") on air quality[1].

The purpose of this report is to provide background information and additional assessment detail for the Air Quality Assessment Report for the Project to which this report is appended.

[1] In accordance with our accordance with our engagement dated 8 July 2019 and subsequent variations.

2 Understanding of the Project

2.1 Overview of the Project

RiverLink is a partnership project between GWRC, HCC and Waka Kotahi, together with Mana Whenua partners Ngāti Toa Rangatira (Ngāti Toa) and Taranaki Whānui ki Te Upoko o Te Ika (Taranaki Whānui), collectively known as the Project Partners. RiverLink has arisen to address flood protection issues, transport resilience, accessibility, efficiency and safety issues at the Melling intersection on State Highway 2 (SH2) and urban renewal and regeneration of Lower Hutt's Central Business District (CBD). RiverLink seeks to resolve these issues and provide an integrated design solution that achieves the best outcome for Lower Hutt.

RiverLink is also a brand adopted by the Project Partners for the collective and integrated approach to a series of projects within a 3-kilometre section of the Te Awa Kairangi/Hutt River (the River) between Kennedy Good Bridge and Ewen Bridge and the immediate urban environs on either side, including the edge of Lower Hutt as it meets the CBD.

RiverLink's three separate but interdependent projects include:

- Flood Protection (GWRC) - widening Te Awa Kairangi/Hutt River channel and berms and raising the height of the stopbanks
- Urban regeneration (HCC) - urban renewal and regeneration through improved access from the CBD to and alongside the river through the creation of a promenade, a new pedestrian bridge, a riverside park and attractive supporting development; and
- Melling Intersection Improvements (Waka Kotahi) - a new grade separated interchange and river bridge at Melling, new intersections with local roads, enhanced pedestrian and cycle routes and better public transport integration at a new Melling Railway Station.

The Project Partners are lodging a Notice of Requirement (NOR) and applications for resource consent (collectively referred to as "the Application") for the RiverLink project (the Project).

2.2 Summary of works

The key components of the project are as follows:

a Upgrade and raising of existing and construction of new stopbanks on both sides of Te Awa Kairangi/Hutt River between Ewen Bridge and Mills Street

b Instream works between the Kennedy Good and Ewen Bridges to realign and widen the active river channel

c The replacement of the two signalised at-grade intersections of SH2/Harbour View Road/Melling Link and SH2/Tirohanga Road with a new grade separated interchange

d Construction of an approximately 215 m long and up to 7 span road bridge with a direct connection across the River from the new interchange to Queens Drive

e Changes to local roads

f Changes to the Melling Line rail network and supporting infrastructure

g Construction of an approximately 177 m long and 4 span pedestrian/cycle bridge over the River

h Construction of a promenade located along the stopbank connecting with future development, running between Margaret Street and High Street. This includes new steps and ramps to facilitate access between the city centre and the promenade

i Integration of infrastructure works with existing or future mixed-use development

j Establishment of a riverside park, and k Associated works including construction and installation of culverts, stormwater management systems, signage (including signage for health and safety, recognition of cultural sites, interpretation and wayfinding), lighting, network utility relocations, landscape and street furniture, pedestrian/cycle connections and landscaping within the Project Area.

Project features and associated construction works are described in further detail in the Assessment of Effects report.

3 Discharges to air

3.1 Construction discharges to air

3.1.1 Construction contaminants and potential effects

The predominant air contaminant emitted from infrastructure construction activities is dust (particulate matter). Particulate matter is generally categorised by particle size (denoted by aerodynamic diameter of particles) as follows:

- Deposited dust – particulate of generally greater than 30 microns (µm) in diameter. This coarse size fraction falls out of the air relatively rapidly and deposits on exposed surfaces. Deposition on surfaces can cause nuisance effects on amenity and soiling effects on property. Due to the mass of individual particles of this fraction and gravitational settling, most deposition occurs within 100 m of the source and deposition is typically minimal beyond 200 m in most conditions.
- Total suspended particulates (TSP) - particulate of generally less than 30 µm in diameter. Particulate of this size fraction remains suspended in air for longer than larger fractions. TSP (particularly the coarse fractions of greater than 10 µm) can potentially affect visibility.
- Fine inhalable or respirable fractions of TSP such as PM_{10} and $PM_{2.5}$ (comprised of particles of aerodynamic diameters of less than 10 µm and 2.5 µm, respectively) can penetrate the nose or mouth under normal breathing conditions and are the most commonly used indicators of the potential for health effects of particulate matter in New Zealand.

The particulate emitted from the Project construction activities will be primarily of the coarse deposited fraction, from which nuisance and amenity effects are most prevalent. The emitted dust is likely to contain a small fraction of fine particulate (which can cause respiratory health effects with sufficient exposure in the community).

Characteristics of the dust emissions may also be influenced by its chemical components. Crystalline silica maybe present in aggregate material used in construction or in material removed through demolition. Exposure of humans to high concentrations of crystalline silica in the respirable size fraction (respirable crystalline silica) can cause respiratory health effects. Odorous or hazardous components could also be emitted if contaminated material is encountered and disturbed in excavations.

Combustion by-products will also emitted from internal combustion engines used to power mobile and stationary equipment used during the construction of the Project. Certain combustion by-products, such as nitrogen dioxide (NO_2), fine particulate matter (including PM_{10} and $PM_{2.5}$ fractions) and carbon monoxide (CO) have the potential to affect human health with sufficient exposure to the contaminant.

Emissions of the contaminants from construction equipment are likely to be relatively small in scale and impacts are likely to be localised within close proximity of the activity. Waka Kotahi guidance on air quality assessment[2] considers dust to be the main air pollutant from road construction activities and that exhaust emissions from earthworks and construction machinery are typically negligible.

[2] Waka Kotahi. 2019. "*Guide to Assessing Air Quality Impacts from State Highway Projects*"

3.1.2 Dust generating activities and factors influencing dust generation

Various construction activities associated with the RiverLink Project, generally involving mechanical disturbance or handling of soil, aggregate or bulk solid materials, have a potential to generate dust emissions. These activities and factors influencing dust generation from them is described in Table 3.1.

Table 3.1: Description of dust generating activities during construction

Activity	Description
Excavation and earthmoving	The scale of dust emissions from excavation will be influenced by a range of factors, including: • Volume and areal extent of excavation activities (undefined at present). • Particle size of the excavated material. Coarse material with low fine particle content is unlikely to give rise to dust emissions whereas soil or aggregate material with a high fines content will pose a greater risk of dust emissions. • Moisture content of the excavated material. Moisture content (e.g. as a result of ground water, rainfall or application of dust suppression water) will suppress dust generation through agglomeration of dust particles. • Wind conditions during excavation – higher wind speeds will result in increased transport and propagation of disturbed dust. Wind speeds will generally be reduced by depth of excavation below ground.
Handling and stockpiling of soil and aggregate materials	Once excavated, material is likely to be stockpiled on-site prior to reuse or removal from site. Disturbance of dust from stockpiling (and associated handling) of material may occur mechanically or through wind erosion. The scale of dust emissions from stockpiling will be influenced by a range of factors, including: • Degree of disturbance – dust emissions will generally increase with increased mechanical disturbance (e.g., rehandling of material). • Moisture content agglomerates dust particles to reduce potential lifting and discharge. Moisture content of the stockpiled material, which will be influenced by moisture content at placement, rainfall and application of water for dust suppression. • Wind exposure of stockpiled material – dust generation through wind erosion of exposed surfaces can start to occur when hourly average wind speeds exceed 5 m/s and significantly increase above 10 m/s [3]. Stockpile emissions can be reduced by through enclosure or covering of piles and reducing stockpile and drop heights.
Aggregate crushing	Aggregate crushing is proposed at the aggregate processing plant to reduce the size of excavated material for reuse as aggregate. Crushing and associated handling may generate dust, the scale of which will depend on the rate of crushing and moisture content of the material (application of water can be used to control dust). If the crushed aggregate material contains an elevated crystalline silica content, crushing is likely to be one of the main potential sources of RCS emissions. Transport of generated dust will depend on wind conditions.
Aggregate screening	Screening of excavated and/or crushed aggregates is proposed to grade the material for reuse on-site. Screening involves separation of excavated material by particle size in order, typically through use of vibrating screens to provide size classified aggregate material for use in construction or earthworks. Static grizzly screens and excavator-mounted screening buckets may be used adjacent to excavations where the excavated material is to be re-used nearby. Mobile screening plant may be used to grade crushed aggregate within the aggregate processing area.

[3] Air and Waste Management Association. 2000. "Air Pollution Engineering Manual". 2nd Edition.

<table>
<tr><th>Activity</th><th>Description</th></tr>
<tr><td></td><td>Disturbance of material during handling and at the screen can generate dust. The scale of dust generation will depend on the particle size distribution of material, soil moisture content of the material being screened, and drop heights from conveyors. Transport and propagation of generated dust will depend on wind conditions including wind speed.</td></tr>
<tr><td>Silt drying</td><td>Silt drying is proposed at the aggregate processing plant to allow re-use of excavated material on site. This material is likely to be fine, so wind erosion of material is more likely as the material dries. The scale of dust emissions from this activity will depend on:
Moisture content of the drying material – moisture content will initially be high and progressively reduced over the drying process. The risk of dust emissions is therefore highest towards the end of the drying process and will be dependent on target moisture content. If material is allowed to dry to a dusty consistency the potential for dust emissions will increase substantially.
Particle size of dry material – silt generally has a high fines content, which increases the risk of dust emission and propagation.
Surface area of drying material with greater surface area allowing for increased risk of wind erosion.
Degree of disturbance when handling the dried material as the risk of dust emissions increase with increased mechanical disturbance (rehandling of material).
Wind exposure of drying material – higher wind speeds will lead to increased transport and propagation of disturbed dust. Wind speeds will be reduced by using wind break fencing or drying under cover.</td></tr>
<tr><td>Vehicle movements over unsealed ground</td><td>Due to the extent of unsealed access routes, vehicle movements over unsealed surfaces are typically one of the larger potential dust sources associated with linear infrastructure construction works. Dust emissions from this activity will be influenced by:
Frequency of movements over unsealed surfaces.
Extent of unsealed surfaces featuring traffic movements.
Speed of vehicles – dust generation generally increases with vehicle speed.
Size of vehicles – dust generation will increase with size of vehicles traversing exposed surfaces.
Particle size of surface material – fine material has a higher potential for dust disturbance. Vehicle movements may result in pulverisation and size reduction of surface material.
Surface moisture content and surface condition – moisture will agglomerate surface particles and more resilient agglomeration may be achieved through application of chemical surface stabilising agents.
Wind conditions will influence the transport and propagation of disturbed materials.</td></tr>
<tr><td>Vehicle movements over sealed ground</td><td>Sealing will prevent disturbance of underlying material and dust generation from sealed surfaces will only be expected if material is deposited on the sealed surface through spills, deposition of dust or tracking on vehicle wheels. Deposited material may then be re-entrained in air through mechanical disturbance (e.g., vehicle movements) or wind erosion but will be reduced by moisture content of the deposited material (which may in turn be increased through rainfall or water application).</td></tr>
<tr><td>Building and structure demolition and removal;</td><td>Demolition of buildings and structures and removal/handling of demolition material can generate dust emissions. The scale and nature of demolition dust emissions will be dependent on the scale of the buildings or structures demolished, the nature of construction materials and demolition and handling methods.</td></tr>
</table>

3.2 Vehicle emissions during operational phase

Combustion by-products (as described in Section 3.1.1) are also emitted from motor vehicle traffic on SH2 and local roads.

Changes in traffic patterns resulting from the completed Project will lead to corresponding changes in vehicle emission patterns. Increases in traffic volumes or changes to other traffic parameters could result in increased contributions to local ambient air contaminant levels and potential adverse health effects.

4 Existing environment

4.1 Land use and sensitivity to air pollutants

The sensitivity of neighbouring activities to air pollutants, such as dust and vehicle combustion contaminants, varies depending on a range of factors including expectations for amenity, duration of human occupation, and presence of particularly sensitive sectors of the community.

The nature of activities present is broadly represented by zoning and the type of land use provided for. Figure 4.1 shows the zoning of the Project Study Area and surrounds under the Hutt City District Plan.

Descriptions of the zones and their general sensitivity to air pollutants (including dust and vehicle combustion contaminants) are presented in Table 4.1.

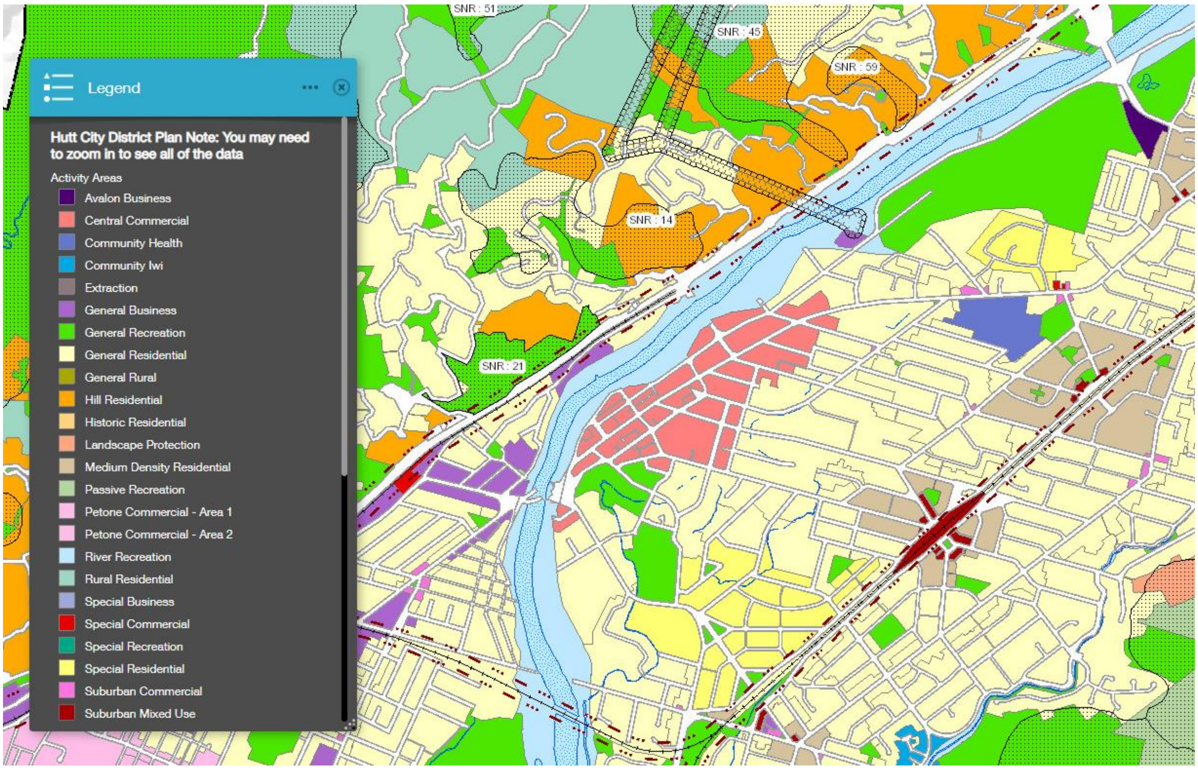

Figure 4.1: Hutt City District Plan zones in the Riverlink Study Area

Table 4.1: Description of adjacent designated land use zones to the Project Area and an assessment of sensitivity to dust

Zone	Description	Sensitivity to air pollutants
General Residential	This zone features low to medium density residential development, including dwellings and outdoor space.	High: Expectation of amenity (and sensitivity to dust deposition) at these locations will generally be high. Given potential for continuous occupation and presence of sectors of the community susceptible to respiratory ailments (e.g., infants and the elderly) at residential properties, sensitivity to combustion contaminants will also be high.
Hill Residential	Residential development on the hills to the west of the Hutt River.	
Special Residential	Low density residential development.	
Central Commercial	Area of the central city including commercial activities comprising of office, financial professional or other business services, but not including industrial activities. This area is located to the south of the Project Area	Moderate to high: Commercial properties are likely to be occupied primarily during office/retail hours. Expectations of amenity are likely to be moderate in general though may be increased at outdoor amenity spaces (e.g., outdoor food service areas) or where there are mixed use/upper floor dwellings.
Avalon Business	This zone includes the former National Film Unit site on Fairway Drive now housing GNS Science offices.	
General Business	A mixture mainly of commercial, retail, recreational and tertiary education services. The zone is intended to provide for non-industrial activities; however, light industrial activities (such as manufacturing and vehicle servicing) exist within the zone (e.g., at Pharazyn Street).	Moderate: Sensitivity will be similar to other business zones except at existing light industrial properties where sensitivity in general is likely to be low.
General Recreation	These areas will be intermittently occupied throughout the day.	Low to moderate: Although the expectation of amenity will be high in open recreation spaces, there will be a limited duration of exposure.
River Recreation	This area is designated for areas around that occur on the surface of rivers and adjoining banks. This zone is located within the Project Area will not be able to be accessed for the duration of the project.	

4.2 Meteorology and topography

4.2.1 Topography

The Project Area is situated along the Hutt River and adjacent section of SH2 between the Ewen and Kennedy Goode Bridges. The Project Area is situated primarily in the Hutt River valley and is largely flat and is adjoined by elevated terrain to northwest at the Western Hutt Hills.

The local topographical features will influence local meteorology in the Project Area as winds will likely be channelled by the Western and Easter Hutt Hills, modifying overlying regional wind flows towards a southwest-northeast orientation of the lower Hutt Valley (discussed further in Section 4.2.2).

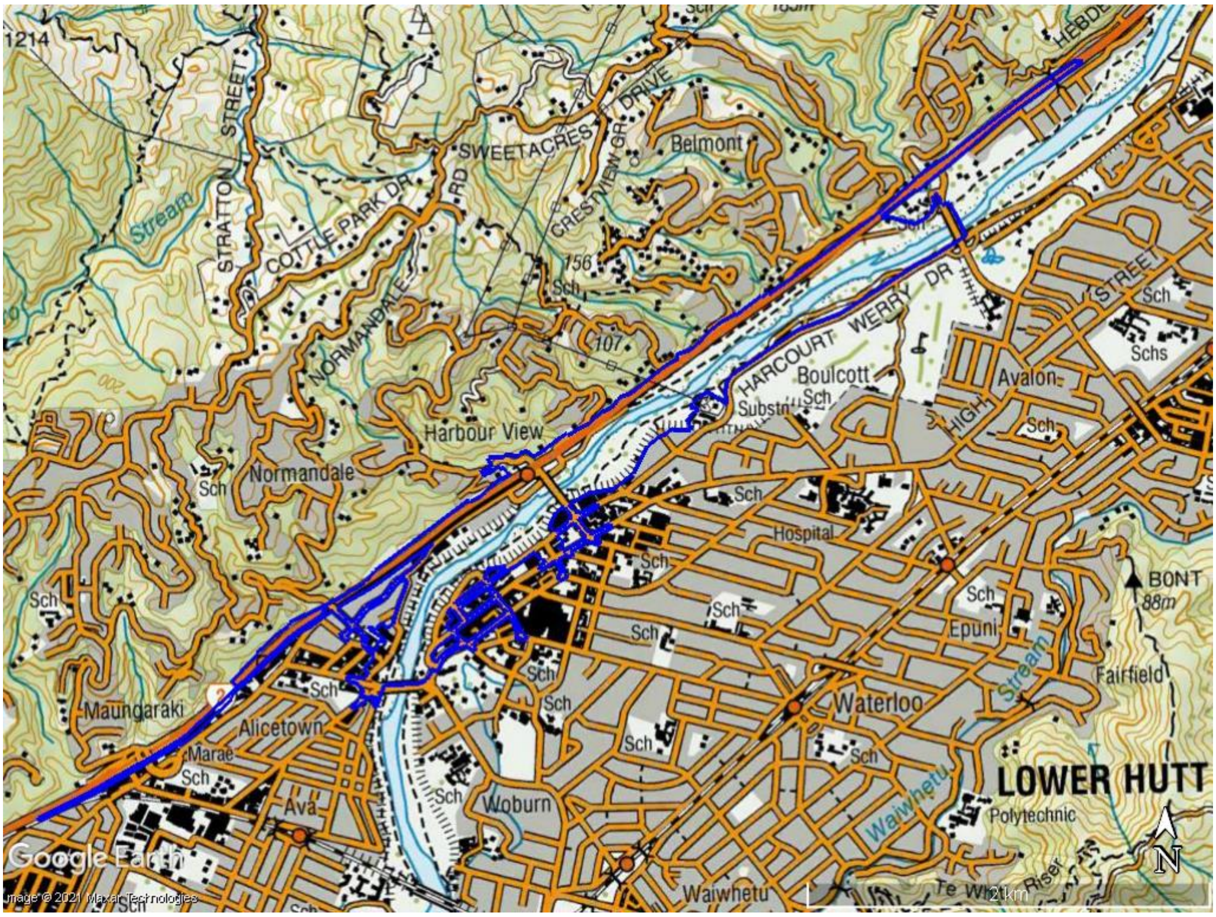

Figure 4.2: Topography over the Project Area (Source: NZ Topo 50 maps - LINZ data service)

4.2.2 Meteorology

Local wind conditions will influence the dispersion of dust into the surrounding environment and towards existing sensitive activities.

A GWRC meteorological station is located at Birch Lane (Phil Evans Reserve), Lower Hutt, approximately 1 km to the southeast of Project Area near Waterloo Train Station. Figure 4.3 illustrate the frequency of wind speeds and directions measured at Birch Lane from 2017 to 2019 (inclusive).

The Birch Lane weather station is located centrally in the Hutt River valley and its wind measurements are representative of general regional wind conditions at in the Lower Hutt Valley. As the Project is situated adjacent to the Western Hutt Hills, local topography is likely to channel winds at the Project Area to some degree with a higher frequency of winds in from the southwest and northeast than measured at Birch Lane.

As noted in Section 3.1.1, generation of dust through wind erosion will typically commence in wind speeds of more than 5 m/s and will become more significant in wind speeds of more than 10 m/s.

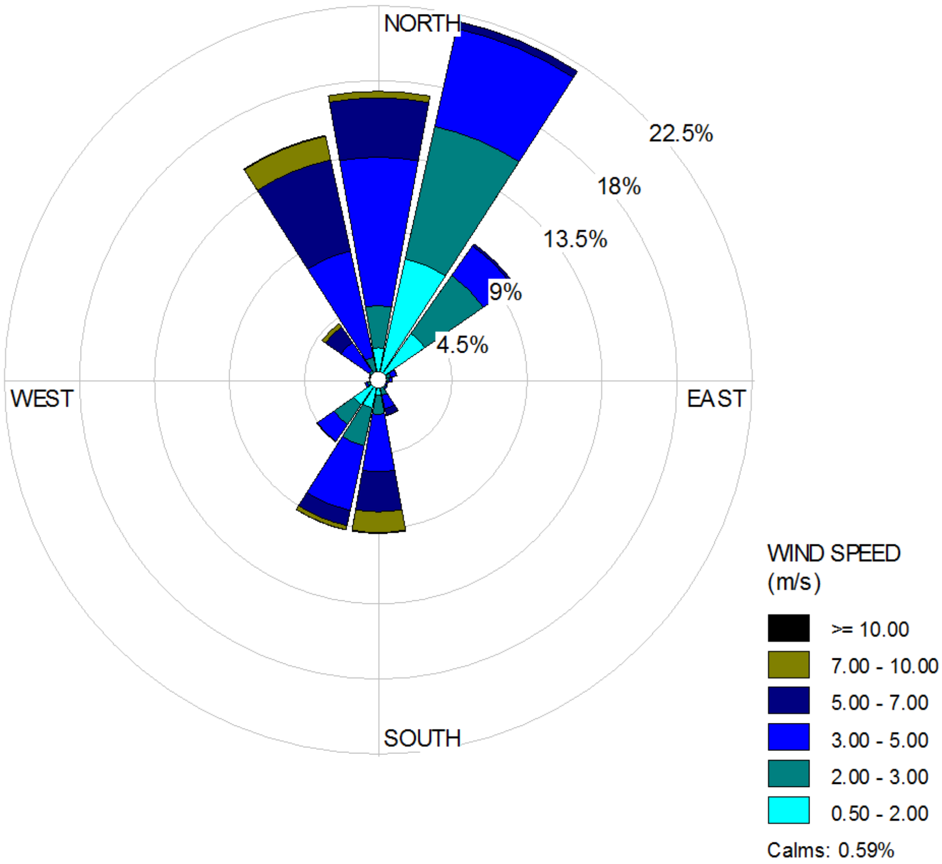

Figure 4.3: Wind rose analysis of 1-hour average winds measured between 2017-2019 at Birch Lane (winds blowing from) (Source: GWRC Environmental Monitoring & Research database)

Winds of speeds greater than 5 m/s at Birch Lane are predominantly from northerly and north-northwesterly directions (60% of winds above 5 m/s and 11% of winds overall come from these directions). Winds from these directions would tend to blow from the Project Area towards the Lower Hutt central business district (CBD). However, the Project Area is sheltered in winds from these directions by the Western Hutt Hills and wind speeds in these conditions may be lower than measured at Birch Lane.

There is a less pronounced prevalence for winds of greater than 5 m/s from the south to south-southwest (26% of winds above 5 m/s and 5% of winds overall come from these directions). Winds from these directions would tend to blow from the Project Area towards the hillside residential areas across the Hutt River. The frequency of strong winds from other directions is likely to be low.

Propagation of dust generated through mechanical disturbance (e.g., from activities such as dry spoil handling and aggregate crushing) may occur at lower wind speeds. Given the channelling of wind likely to result from the adjacent topography, the predominant wind direction is likely to be from the northeast to north-northeast, with a corresponding secondary prevalence from the opposite directions (southwest and south-southwest).

Rainfall and evaporation will affect moisture content of surface material. Evaporation data is not available from the Birch Lane station for the purposes of calculating net rainfall.

Dry days have therefore been broadly defined in this assessment as days where cumulative rainfall over 24-hours has not exceeded 2 mm. Figure 4.4 shows the monthly average number of dry days over the 2018-2020 annual period.

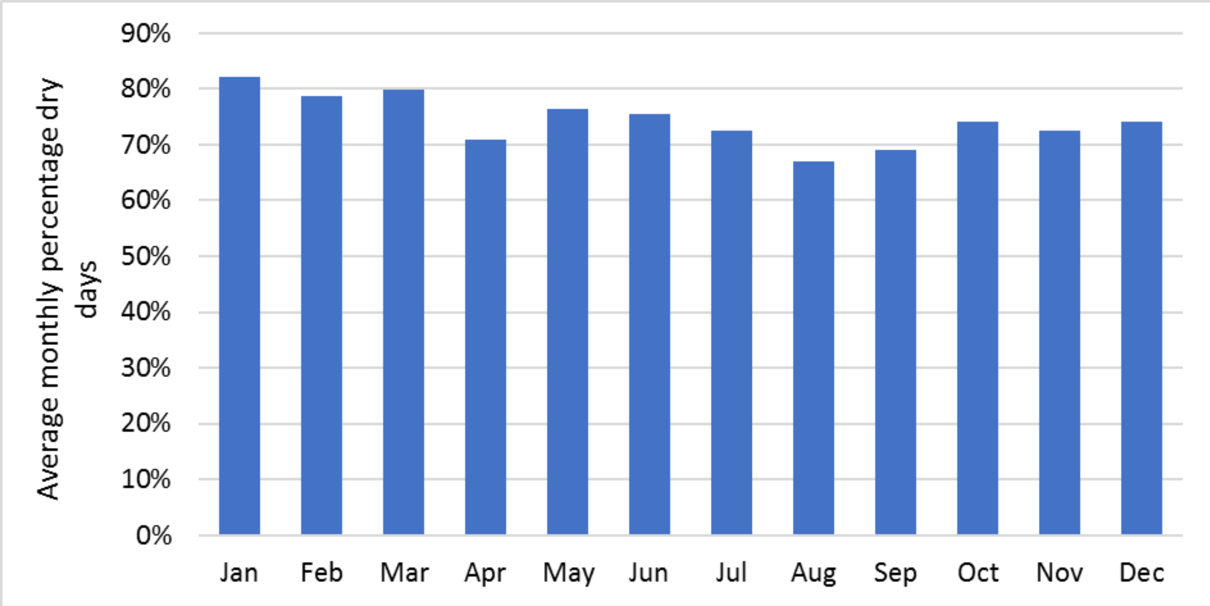

Figure 4.4: Average percentage dry days by month (cumulative rainfall <2 mm) over the 2018-2020 period (Source: GWRC Environmental Monitoring & Research database)

Historically, dry days occur for over three quarters of the year (77%). The frequency of dry days varies throughout the year. Generally, summer months of January to March are drier, with a lower frequency of dry days generally occurring in a letter half of the year (July to December).

4.3 Background air quality and emission sources

Ambient PM_{10} concentrations measured by GWRC at its Birch Lane monitoring station are likely to be indicative of concentrations currently experienced in the Study Area.

The main background sources of PM_{10} around the Project Area will include domestic heating (in winter), road emissions and natural sources such as alluvial dust from the Hutt River and sea salt aerosols from Wellington Harbour. Contributions of industrial sources are likely to be minimal and localised as there are no significant industrial emission sources in the Study Area.

Figure 4.4 shows 24-hour average PM_{10} concentrations measured at Birch Lane in 2018 and 2019. The maximum measured concentration during this time was 35.8 micrograms per cubic meter of air (µg/m^3) with a mean concentration of 11.5 µg/m^3, both below NES-AQ ambient air quality standard for 24-hour PM_{10} concentrations of 50 µg/m^3.

Exceedances of the NES-AQ ambient air quality standard for PM_{10} have not been recorded at Birch Lane in more than five years and the Lower Hutt airshed is not deemed to be “polluted” under Regulation 17 of the NES-AQ.

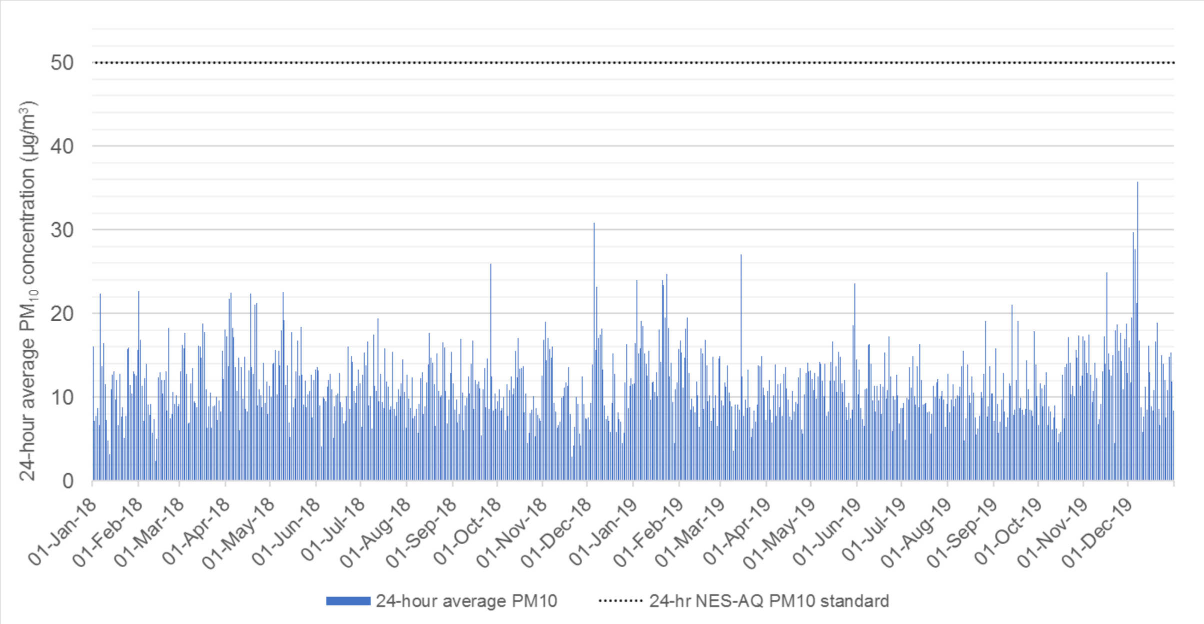

Figure 4.5: 24-hour average PM_{10} concentrations (µg/m^3) measured at Birch Lane monitoring station during 2018 – 2019 (Source: GWRC Environmental Monitoring & Research database)

Waka Kotahi geospatial background air quality estimates[4] of 24-hour average PM_{10} and annual average NO_2 concentrations for the Study Area are shown in Table 4.2 and compared with health-based air quality assessment criteria described in Section 5.3.

Both the background 24-hour average PM_{10} and annual average NO_2 concentration estimates are well within the corresponding assessment criteria.

Table 4.2: Waka Kotahi estimated background PM_{10} and NO_2 concentrations in the study area

Census Area Unit (CAU) name	CAU number	Background concentration (µg/m3)	
		24-hour average PM_{10}	Annual average NO_2
Hutt Central	569100	28.5	8.4
Assessment criteria		50*	40**

*NES-AQ ambient air quality standard

**World Health Organization (WHO) Air Quality Guideline (AQG)

[4] https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/tools/air-quality-map/

5 Assessment methodology

5.1 Overview of assessment methodology

The Waka Kotahi Environmental and Social Responsibility (ESR) Screen includes questions that can highlight potential air quality risks during construction or later operation of a roading project.

These questions are evaluated in relation to the Riverlink Project in Table 5.1.

Table 5.1: Consideration of ESR Screen questions relating to air quality impacts

Number	Question	Evaluation
G1	What is the zoning of adjacent land?	Surrounding areas are zoned residential, commercial and park/open space
G3	What is the construction timeframe?	Greater than 18 months
HH1	What is the One Network Road Classification?	High Volume/National (SH2)
HH2	Is the area of interest designated as a non-compliant airshed?	The Lower Hutt airshed is not currently polluted under NES-AQ Regulation 17 (based on GWRC PM_{10} concentration measurements)
HH3	Are there medical sites, rest homes, schools, childcare sites, residential properties, maraes or other sensitive receivers located within 200 m of the area of interest?	Sensitive activities (including residential properties) are located within 200 m
HH4a	Does land use within 200 m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination?	Light industrial activities (including manufacturing and spray painting/panel beating) are located on Pharazyn Street within the Study Area. These activities may have involved the use and storage of hazardous materials.
HH4b	Are there HAIL or SLUR (contaminated) sites within 200 m of the area of interest?	The preliminary site investigation (PSI)[5] has identified sites with HAIL activities within the Project Area.

[5] Part of Technical Assessment #11 – Contaminated Land

Overall due to following aspects highlighted in response to the above ESR questions, the ESR screening assessment indicates an elevated risk of air quality impacts associated with the Project:

- the zoning for and presence of sensitive residential activities in adjacent areas (questions G1 and HH3);
- the construction timeframe of greater than 18 months (G3);
- the "High Volume" and "National" One Network Road Classification of SH2 in the area (HH1); and
- the presence of activities that could potentially involve ground contamination and HAIL contaminated sites (HH4a and HH4b).

The level of risk has been considered in the development of the air quality assessment methodology for the Project, which is set out in relation to construction impacts (Section 5.2) and operational impacts (Section 5.3), below.

5.2 Assessment methodology for Construction Impacts

The key consideration when assessing nuisance effects of dust is whether the discharge gives or may give rise to 'offensive or objectionable' effects beyond the site boundary.

The Ministry for the Environment (MfE) guidance on dust assessment and management[6] (MfE Dust GPG) sets out methods or techniques for assessing dust and whether it may cause 'offensive or objectionable' effects. Waka Kotahi guidance on air quality impact assessment of roading projects[7] (Waka Kotahi AQA Guide) briefly provides guidance specifically in relation to the assessment of road construction air quality impacts, with reference to the MfE Dust GPG.

The Waka Kotahi AQA Guide sets out construction air quality risk assessment checklist questions to provide a preliminary indication of the potential for dust nuisance effects, which are considered in relation to the Riverlink Project in the following table:

Table 5.2: Construction air quality risk assessment checklist

Topic	Key Question	Evaluation
Scale of earthworks	Is the total site area > 10,000 m^2 or the total volume of material to be moved > 100,000 m^3?	The overall earthworks will be greater than 10,000 m^2 in area and 100,000 m^3 in volume
Proximity to highly sensitive receivers	Are there more than 50 High Sensitivity Receptors (HSRs) within 200 m?	More than 50 highly sensitive receptors are located within 200 m
Anticipated truck movements	Will there be more than 50 outward truck movements per day?	Outward truck movements are anticipated to exceed 50 movements per day

As the response to at least two of the questions is affirmative, the preliminary evaluation indicates the construction air quality risk for the Project is high.

For the purposes of providing a more detailed assessment of construction air quality impacts and given the breadth and varied nature of the proposed works and their environmental setting, the Study Area has been spatially compartmentalised into sectors for further assessment.

[6] MfE. 2016." *Good Practice Guide for Assessing and Managing Dust*"
[7] Waka Kotahi. 2019. "*Guide to Assessing Air Quality Impacts from State Highway Projects*"

Within each sector, an assessment of the risk of dust impacts has been conducted based on a qualitative consideration of what are termed as the FIDOL factors. The FIDOL factors provide an objective framework for evaluating nuisance effects and commonly used to assess nuisance air quality impacts in New Zealand. The FIDOL factors are described in Table 5.3.

Table 5.3: Description of FIDOL factors

Factor	Description
Frequency	The frequency of exposure to dust impacts experienced at a given receptor location. The frequency of exposure depends on both the frequency of occurrence of discharges and the frequency of weather conditions that could propagate dust emissions towards the receptor location. In the case of meteorological conditions, although conditions at specific locations in the Study Area may be influenced by local topography or buildings, structures and vegetation, conditions are generally likely to be as described in Section 4.2.2. There is likely to be a prevalence of winds of speeds above 5 m/s from the north and north-northwest at most locations. Receptors to the south and south-southeast of dust sources are therefore likely to be exposed most frequently to winds conducive to dust propagation from the upwind sources. The secondary prevalence of strong winds from the south and south-southwest will tend to expose receptors to the north and north-northeast to potential dust emissions. Dust generation will be inhibited in wet weather conditions and promoted in high evaporation conditions (sunny conditions with reduced humidity and elevated temperatures). As noted in Section 4.2.2, wet days are predicted to occur for just under a quarter of the year, most frequently in the latter half (July to December). Dry, high evaporation conditions are most likely to occur in summer from December to March.
Intensity	The intensity of exposure to dust impacts experienced at a given receptor location. The intensity depends primarily on: • the intensity of dust emissions at source (which in turn depends on the scale and nature of the source activities and the controls employed); and • the extent of transport or dilution of the emitted dust en-route to the receptor location (which is dependent on separation distance, topography and wind conditions)
Duration	The frequency of exposure to dust impacts experienced at a given receptor location. Influences on duration of exposure will be similar to those for frequency of exposure.
Offensiveness/ character	The offensiveness or character of dust relates to the nature of the dust in terms of its character or ability to cause nuisance or soil or damage property. In this case the character of the dust is likely to be broadly consistent across the Study Area, consistent with soil or mineral dust typically generated from construction activities and similar in nature to alluvial dust currently emitted from the Hutt River. As such, the dust is not expected to be especially offensive in character. The character of dust may be degraded if contaminated soil is disturbed,
Location/ sensitivity	The location factor relates to the sensitivity of activities present at the receptor location. Various activities will feature on a continuum of sensitivity to dust ranging from high sensitivity residential or medical care activities, through moderate sensitivity commercial activities to low sensitivity open space (when not in occupation).

The FIDOL assessment has been informed by the nature of activities proposed as part of the Project, the nature of adjacent conditions, weather data and topography. This focuses on the occurrence of strong winds during dry weather, as these are typically the most conducive weather conditions for causing significant unmitigated dust emissions from earthworks and construction activities.

The sector FIDOL assessments have considered potential exposure with and without the recommended mitigation measures in place. Measures to achieve the level of mitigation described in the FIDOL assessments for each sector have been considered.

5.3 Operational impacts assessment method

As noted in Section 5.1, the ESR screening assessment for the Project indicates a high risk of air quality impacts. As a result, a preliminary assessment of operational air quality impacts has been undertaken in accordance with the Waka Kotahi AQA Guide. Operational air quality impacts have been assessed for “with Project” and “without Project” scenarios.

The assessment of operational impacts is set out in Section 7. Peak contributions of emissions from SH2 and other key road links to ambient PM_{10} and NO_2 concentrations at adjacent HSR locations have been predicted using the Waka Kotahi air quality screening tool[8]. Cumulative impacts of the road and background contributions have been assessed through incorporation of Waka Kotahi background air quality estimates (refer Section 4.3). “With Project” and “without Project” from 2030[9] have been compared to determine the impact of the Project on air quality.

Predicted contaminant concentrations have been compared with NES-AQ ambient air quality standards (where available) to assess potential for human health effects. For contaminants or averaging periods for which NES-AQ and Ambient Air Quality Guidelines (AAQGs) published by MfE are not available, predicted ambient contaminant concentrations have been compared with Air Quality Guidelines (AQGs) published by the World Health Organisation (WHO)[10].

As the preliminary assessment described in Section 7 has not identified a risk of adverse health effects, a further, more detailed assessment based on dispersion modelling is not considered to be required in this instance.

[8] https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/tools/air-quality-screening-model/
[9] Traffic predictions were for the year 2036 but 2030 is the final analysis year available in the screening model
[10] WHO Europe. 2006. “*Air Quality Guidelines - Global Update 2005*”.

6 Assessment of construction air quality effects

6.1 Overview of construction air quality effects

Due to the varying nature of emission sources and sensitivity of adjoining areas, the Study Area been divided spatially and by activities into five sectors for the purposes of assessing construction air quality impacts. The five sectors are described as follows and are shown in Figure 6.1.

- River works northeast of the Melling interchange;
- River and riverside urban regeneration works southwest of the Melling interchange;
- Aggregate processing plant (Belmont);
- SH2 Melling interchange and Melling Station upgrade works; and
- Lower Hutt CBD urban regeneration works.

Potential air quality amenity and property effects resulting from emissions construction activities in each sector are assessed in Section 6.2 based on a qualitative consideration of the FIDOL factors.

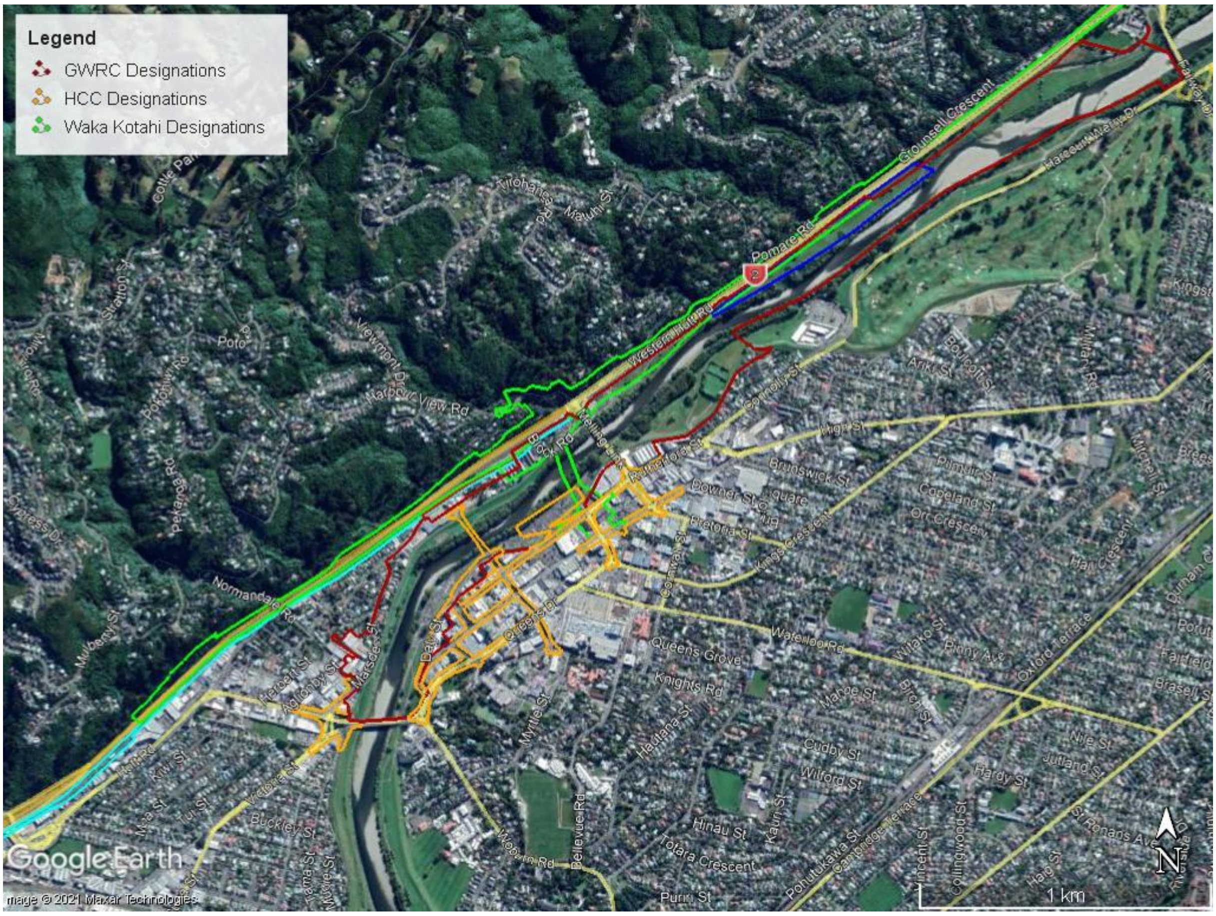

Figure 6.1: Project sectors for assessment of effects of construction discharges to air (approximate)

6.2 Assessment of air quality effects by Project section

6.2.1 River works northeast of the Melling interchange

This sector will feature stopbank upgrade and other floor protection works on both banks and within the bed of the Hutt River. The aggregate processing plant is in this area but has been discussed separately in Section 6.2.3.

Figure 6.2: River works designation and adjacent buildings – northeast of the Melling interchange

Construction activities in this sector that have the potential to generate dust include:

- Stopbank earthworks including excavation and bulk handling;
- Handling and stockpiling of excavated materials;
- Screening of excavated materials for reuse; and
- Vehicle movements over unsealed surfaces, including site access routes, yard and construction areas.

HSRs located within 200 m of this section of river works include:

- Dwellings in the residential area adjacent to the existing stopbank and river esplanade reserve at Boulcott, including along Connolly Street and Mills Street;
- Dwellings in the Hill Residential zone suburbs to the northwest, including along Tirohanga Road and Pomare Road;
- Riverleigh Residential care home on Connolly Street;
- The Rutherford Clinic (healthcare services) on Connolly Street;
- Millie's House Early Learning Centre on Connolly Street;

A Transpower substation at the northeast end of Connolly Street houses electrical equipment that may be sensitive to dust deposition.

An assessment of potential nuisance impacts of dust and other emissions from this section of river works considering the FIDOL factors is provided in Table 6.1. The location/sensitivity is considered first to identify receptor locations of interest. Frequency and duration of exposure are related and considered simultaneously.

Table 6.1: FIDOL nuisance assessment for emissions from river works northeast of the Melling interchange

Factor	Description
Location/ sensitivity	There is a reasonably high density of HSRs in the residential area at Boulcott (including dwellings along Connolly Street and Mills Street adjacent to stopbank works) and to a lesser extent in the Hill Residential zone suburbs to the northwest of SH2. Sensitivity to dust will be high in these areas. The Transpower substation at Connelly St may feature electrical and electronic equipment that may be sensitive to dust soiling and may be of a moderate or even high sensitivity to dust as a result (depending on the sensitivity and protection of equipment). Much of the true left bank in this area lies adjacent to the Boulcoutt's Farm Golf Club. While golf course users may have a generally high expectation of amenity, their occupation of adjacent areas of the course will be intermittent and of very low density. Sensitivity to dust will vary over the course and is likely to be low at most locations but intermittently high at locations occupied by users. Commercial activities at the northern fringe of the Lower Hutt CBD will generally have a moderate sensitivity to dust, except at outdoor dining or amenity areas where it is likely to be high while the outdoor areas are in use.
Frequency and duration	The frequency and duration of dust exposure at receptor locations in this area will depend on the following: • The frequency and duration of operation of site dust sources: – Construction hours for the river works are undefined at present but construction is more likely to occur during daylight hours. During construction specific activities in an area will vary but construction activities are likely to occur consistently during the hours the construction site is in operation. Generation of dust through wind erosion of unsealed surfaces or stockpile could potentially occur outside of these hours in strong winds, which are less frequent outside of daylight hours. • The frequency of meteorological conditions that may propagate emissions toward receptors: – Dwellings in the Boulcott residential area and commercial properties at the northeastern fringe of the CBD will be downwind of adjacent stopbank works in the predominant direction of strong and moderate winds. – The Transpower substation will also be downwind of works on the opposite bank in the same conditions. – Dwellings in the Hill Residential zone along Tirohanga Road and Pomare Road on the opposite side of SH2 will be downwind of river works in the secondary prevailing direction of strong and moderate winds.
Intensity	The intensity of dust exposure at receptor locations will depend on the following: • The scale of emissions from dust sources: The river works include a number of activities that could generate substantial dust emissions if not well controlled, such as: – Stopbank earthworks; – Stockpiling, handling and screening of excavated material; and – Vehicle movements over unsealed access routes.

Factor	Description
	• The distance separating the sources and receptors: – Overall, the majority of works in this sector are located within 200 m of commercial or residential zones. – Dwellings in the Boulcott residential area and commercial properties at the northern fringe of the Lower Hutt CBD are located in close proximity to stopbank works (the existing stopbank abuts dwellings along Mills Street and Connolly Street). – The Transpower substation will be separated from works by the Hutt River (approximately 100 m from works on the opposite bank). – Dwellings along Tirohanga Road, Pomare Road on Wairere Road on the opposite side of SH2 will be separated from the works by SH2 but the nearest dwelling will lie within 100 m of stopbank works. Dwellings in this area will generally be at higher elevation.
Offensiveness/ character	Dust in this area is likely to be comprised primarily of alluvial and crustal material and is not expected to be especially offensive in character.

The following conclusions are drawn from the FIDOL nuisance assessment for the proposed river works northeast of the Melling interchange:

- A number of activities have the potential to generate dust emissions of a reasonably high intensity, if not well controlled. These activities include aggregate screening, earthworks, material handling and vehicle movements on unsealed surfaces. Dust emissions from these activities will occur primarily during working hours.
- The majority of the works in this section are located within 200 m of urban residential or commercial activities with at least a moderate sensitivity to dust and a generally high standard of dust management and control will be required to mitigate potential dust impacts. Dust management is discussed further in Section 6.3.
- Dwellings and other activities in the Boulcott residential area along Connolly Street and Mills Street will have a high sensitivity and will be located in close proximity and downwind of construction works in prevailing moderate and strong winds. The potential for dust impacts in this section of the works is highest in this area and particular attention to management of dust emissions will be required for activities for adjacent works activities in order to mitigate the potential for adverse nuisance or property effects.

6.2.2 River and urban construction works southwest of the Melling interchange

The river works referred to in Section 6.2.1, will continue downriver to Ewen Bridge. This sector will also feature riverside urban construction works, including the following:

- Construction of a new pedestrian/cycle bridge connecting Melling Station and the Lower Hutt CBD;
- Construction of a new walking promenade located between Margaret Street and Andrews Avenue;
- Realignment of Marsden Street and Pharazyn Street;
- Construction of cycle and pedestrian paths along both banks of the river.

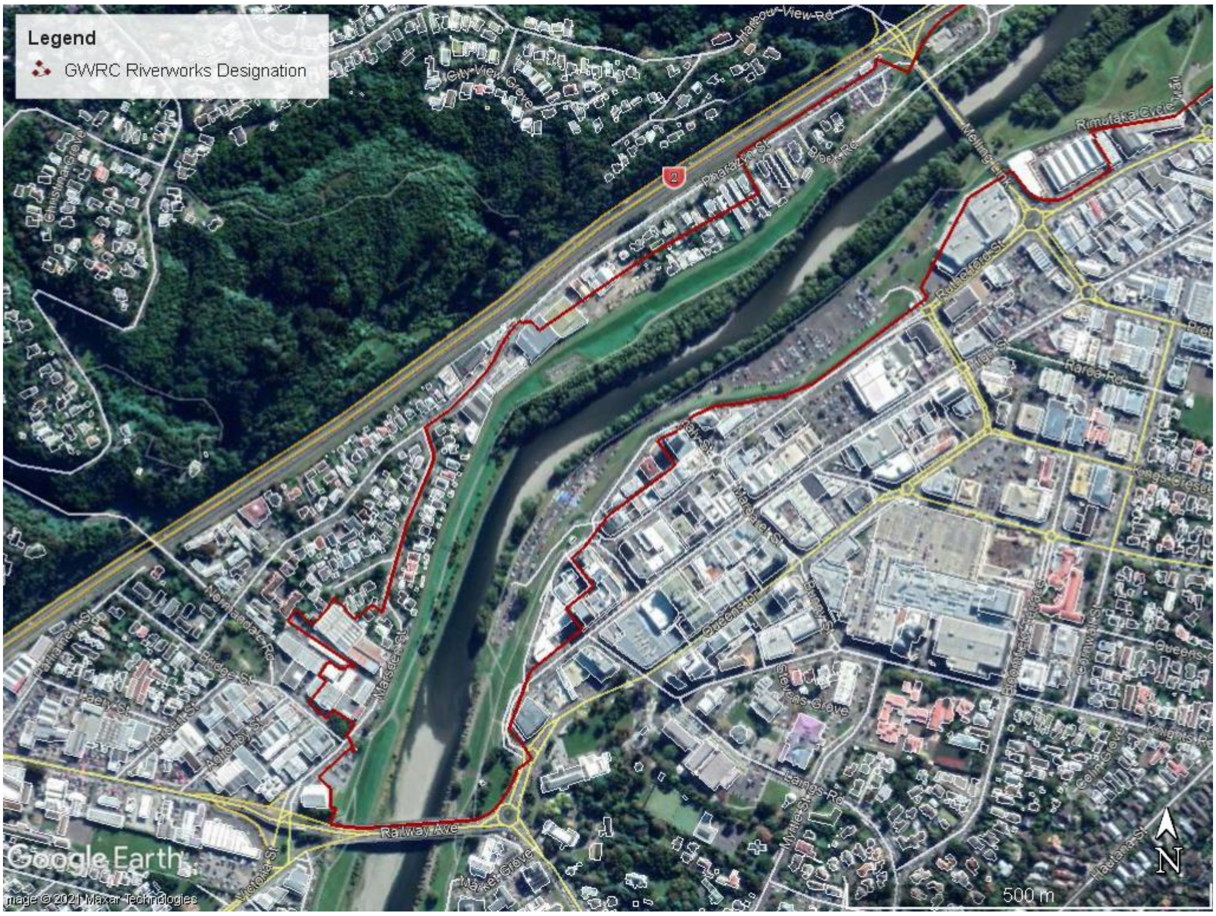

Figure 6.3: River works designation and adjacent buildings – southwest of the Melling interchange

Construction activities in this section of the Project are similar to those described in Section 6.2.1 with additional inclusion of the following activities:

- Building and structure demolition and removal;
- Site establishment activities, including site access points, road sealing, access tracks, construction yards, temporary local road realignments and fencing;
- Protection and/or relocation of existing network utilities.

HSRs located within 200 m of the river protection works in this area include:

- Dwellings in the residential area at Melling between the works and SH2, along Pharazyn Street, Marsden Street and Williams Grove:
- Dwellings in the Hill Residential zone to the northwest of SH2, including on Harbour View Road and Jenness Grove;
- Upper floor dwellings at mixed use properties in the Lower Hutt CBD, including along Rutherford Street, Dudley Street and High Street; and
- Childcare facilities on Pharazyn Street.

An assessment of potential nuisance effects, impacts of dust and other emissions from construction activities in this section of works considering the FIDOL factors is provided in Table 6.2.

Table 6.2: FIDOL nuisance assessment for emissions from river and urban construction works southwest of the Melling interchange

Factor	Description
Location/ sensitivity	Dwellings in the Melling residential area and in the Hill Residential zone, along Harbour View Road and Jenness Grove, adjacent to the works, feature a reasonably high density of HSRs and an overall high sensitivity to dust. Commercial activities in the Lower Hutt CBD will generally have a moderate sensitivity to dust, except at outdoor amenity areas or at upper floor dwellings where it is likely to be high while in occupation.
Frequency and duration	The frequency and duration of dust exposure at receptor locations in this area will depend on the following: • The frequency and duration of operation of site dust sources: – Specific activities may occur intermittently, but construction activity (including potential dust sources) is likely to occur consistently during the hours the construction site is in operation. • The frequency of meteorological conditions that may propagate emissions toward receptors: – Areas of the CBD will be downwind of adjacent stopbank and river promenade works in the predominant direction of moderate and strong winds. – Hill Residential zone properties along Harbour View Road and Jenness Grove will be downwind of stopbank, demolition and roading works in the secondary prevailing wind direction. – Other areas (including the Melling residential area) will not be downwind of construction works in the most frequent directions of moderate and strong winds.
Intensity	The intensity of dust exposure at receptor locations will depend on the following: • The scale of emissions from dust sources: – The river works will feature similar dust generating activities to those described for the river works northeast of the Melling interchange in Table 6.1, but will likely include additional dust generating activities, such as: o Demolition of buildings and structures; o Road pavement removal. • The distances separating dust sources and receptors: – All of works in this sector are likely to be located within 200 m of commercial or residential zones. – Dwellings in the Melling residential area and commercial properties in the Lower Hutt CBD are located in close proximity to stopbank and roading works. Commercial properties in the CBD abut an existing stopbank and works will occur across Marsden Street from dwellings (likely within 20 m). – Dwellings Harbour View Road and Jenness Grove on the opposite side of SH2 will be separated from the works by SH2 (at least 50 m from works) and will be at higher elevation.
Offensiveness/ character	As described in Table 6.1, the dust associated with the works is expected to be typical of dust generated in the wider receiving environment and not especially offensive in character. This is with the exception of where contaminated soil is disturbed or demolition works involves removal of hazardous or odorous material. The Contamination Preliminary Site Assessment indicates that historical Hazardous activities and industries list (HAIL) activities have been located on certain properties in the commercial/industrial area along Pharazyn Street and Marsden Street within this sector of works.

The following conclusions are drawn from the FIDOL dust nuisance assessment for river and urban regeneration works southwest of the Melling interchange:

- A number of activities associated with the works in this section have the potential to generate dust emissions of a reasonably strong intensity, if not well controlled, including demolition, earthworks, aggregate screening, material handling and vehicle movements on unsealed surfaces. Dust emissions from these activities will occur primarily during working hours.
- All of the works in this section are likely to be located within 200 m of urban residential and commercial activities with at least a moderate sensitivity to dust and a generally high standard of dust management and control will be required to mitigate potential dust impacts.

Commercial properties in the Lower Hutt CBD (generally of moderate sensitivity but may occasionally include high sensitivity activities) will be located in close proximity and downwind of construction works in prevailing moderate and strong winds. Likewise, dwellings in the Hill Residential zone along Harbour View Road, Jenness Grove and Tirohanga Road will be exposed to an elevated frequency of moderate and strong winds from the works. Particular attention to management of dust emissions will be required for adjacent works activities in order to mitigate dust impacts on these properties.

6.2.3 Aggregate processing area

Except for screening of excavated aggregate for re-use, processing of aggregate for the Project is proposed to be carried out in a dedicated area of esplanade reserve on the true right bank of the Hutt River, adjacent to SH2 and Pomare Road, Belmont.

Processing activities in this area will include:

- Aggregate crushing;
- Screening of crushed aggregate;
- Drying of silt materials; and
- Stockpiling of aggregate material.

Figure 6.4: Aggregate processing area and adjacent buildings

The location of the proposed aggregate processing area has been selected to maximise separation from sensitive activities. Notwithstanding this, HSRs are located within 200 m of the processing area, including:

- Hill Residential zone dwellings on Pomare Road and Wairere Road;
- The nearest dwellings in the Boulcott residential area on Mills Street (the bulk of the Boulcott residential area lies further than 200 m from the plant area); and
- The Transpower substation on Connolly Street.

An assessment of the potential for dust nuisance effects from the aggregate processing area considering the FIDOL factors is provided in Table 6.2.

Table 6.3: FIDOL nuisance assessment for emissions from the aggregate processing area

Factor	Description
Location/ sensitivity	In relation to the sensitivity to dust in areas adjacent to the processing area: • Sensitivity will be high in the Hill Residential zone along Pomare Road and Wairere Road and in the Boulcott residential area along Mills Street. • Sensitivity at the Transpower substation at Connelly St may be moderate or even high (depending on the sensitivity and protection of equipment). • Sensitivity is likely to be reasonably low at the Boulcoutt's Farm Golf Course.
Frequency and duration	The frequency and duration of dust exposure at adjacent receptor locations will depend on the following: • The frequency and duration of operation of site dust sources: – Plant operating hours are undefined, but operation is more likely to occur during daylight hours. The requirement for crushing and screening will be dictated by demand but could potentially occur consistently during plant operating hours when demand is high. • The frequency of meteorological conditions that may propagate emissions toward receptors: – The Transpower substation and Mills Street dwellings will be downwind of the processing plant compound in the predominant direction of moderate and strong winds. – Hill Residential zone properties along Pomare Road and Wairere Road will be downwind of the processing plant compound in the secondary prevailing wind direction.
Intensity	The intensity of dust exposure at receptor locations will depend on the following: • The scale of emissions from dust sources: – A number of activities will be located at the plant that could potentially generate significant dust emissions if not well controlled, in particular aggregate crushing and screening, vehicle haulage movements, silt drying and to a lesser extent aggregate storage and handling. • The distances separating dust sources and receptors. – The plant has been located to maximise separation distance from sensitive areas. There are no immediately adjoining HSRs and except for the nearest dwellings along Pomare Road and Wairere Road there are no HSRs within 100 m. Additional HSRs within 200 m include further distant dwellings along Pomare Road and Wairere Road as well as dwellings at the end of Mills Street, Boulcott.
Offensiveness/ character	As described in Table 6.1, the dust associated with the works is generally likely to be typical of dust generated in the wider receiving environment and not especially offensive in character.

The following conclusions are drawn from the FIDOL dust nuisance assessment for the aggregate processing area:

- The aggregate processing area is intended to house activities such as aggregate crushing/screening and silt drying that have the potential to generate dust emissions of a strong intensity if not well controlled. Dust emissions from these activities will occur primarily during working hours though emissions from silt drying may occur at any time subject to low silt moisture content and strong wind conditions.

- The processing area is located to maximise separation distances from sensitive activities. However, urban activities with a moderate or high sensitivity to dust, including Hill Residential zone dwellings on Pomare Road and Wairere Road and Transpower substation on the opposite riverbank (both likely to be exposed to an elevated frequency of strong and moderate winds from the plant) and dwellings on Mills Street potentially lie within 200 m. Given the potential scale of uncontrolled dust emissions from crushing activities, particular attention to management of the crushing emissions will be required in order to mitigate dust impacts on these properties.

6.2.4 SH2 Melling interchange and Melling Station upgrade works

This sector will feature demolition and construction works associated with the following:

- Construction of a new SH2 interchange at Melling;
- Replacement and relocation of the existing Melling River Bridge,
- Realignment of adjoining local roads;
- Replacement and relocation of Melling Train Station;
- Construction of park and ride facilities;
- Construction of a new pedestrian bridge linking Melling Station and the Lower Hutt CBD.

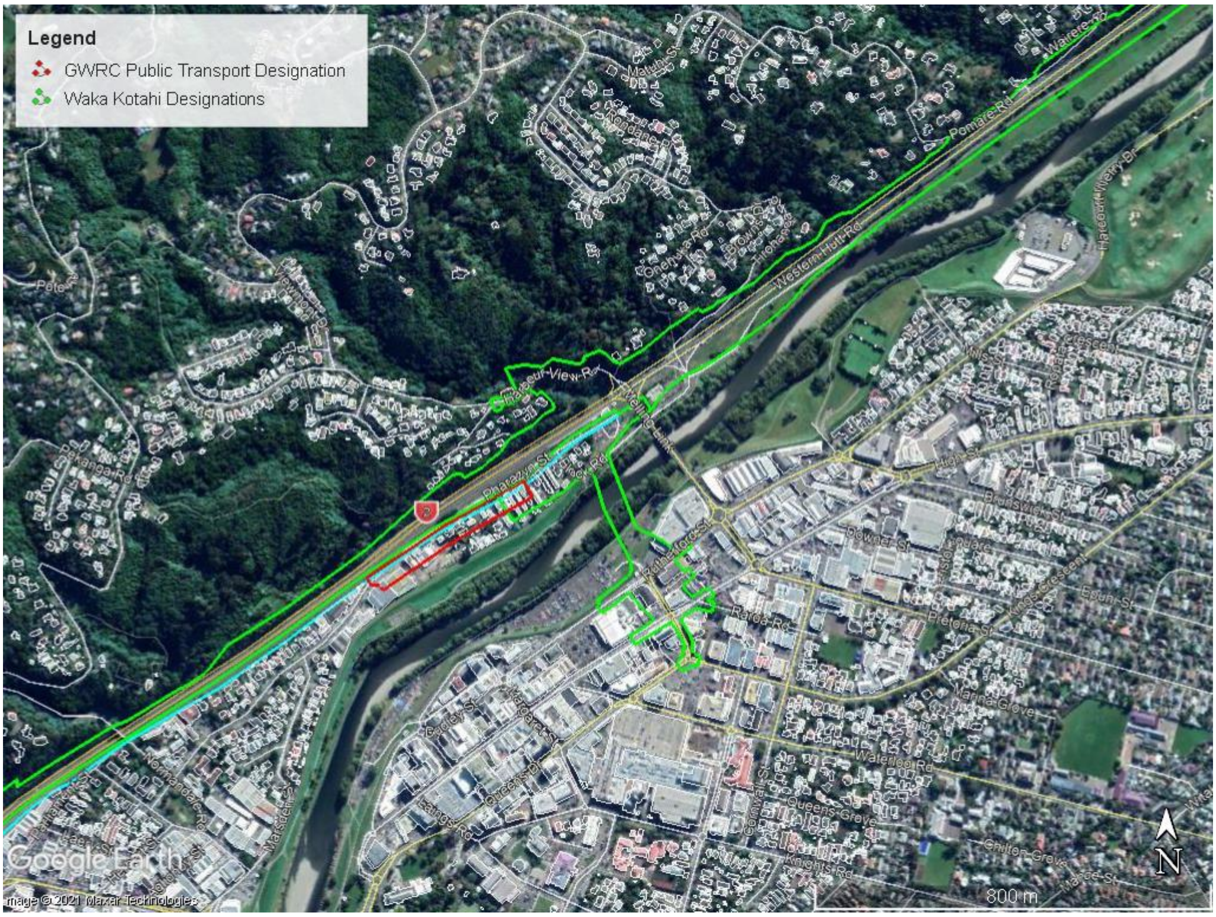

Figure 6.5: SH2 and Melling line designation in Study Area and adjacent buildings

Activities in this sector that have the potential to generate dust include:

- Earthworks including excavation and bulk handling;
- Stockpiling and handling of materials;

- Screening of excavated materials for reuse;
- Demolition of buildings and structures;
- Construction of roads, bridges, buildings and other structures; and
- Vehicle movements over unsealed ground.

HSRs located within 200 m of the road and rail upgrade works include:

- Dwellings in the residential area at Melling between the works and SH2, along Pharazyn Street, Marsden Street and Williams Grove:
- Dwellings in the Hill Residential zone to the northwest of SH2, including on Harbour View Road, Jenness Grove and Tirohanga Road; and
- Childcare facilities on Pharazyn street.

A FIDOL assessment of potential nuisance impacts of dust and other emissions from construction activities in this sector is discussed in Table 6.4.

Table 6.4: : FIDOL nuisance assessment for emissions from Melling interchange and Melling Station upgrade works

Factor	Description
Location/ sensitivity	In relation to the sensitivity to dust in adjacent areas: • Sensitivity will be high in the Hill Residential zone and in the Melling residential area. • Commercial activities along Pharazyn Street and in the Lower Hutt CBD will generally have a moderate sensitivity to dust, except at outdoor amenity areas where it is likely to be high while in occupation.
Frequency and duration	The frequency and duration of dust exposure at receptor locations in this area will depend on the following: • The frequency and duration of operation of site dust sources: – Specific activities may occur intermittently, but construction activity (including potential dust sources) is likely to occur consistently during the hours the construction site is in operation. • The frequency of meteorological conditions that may propagate emissions toward receptors: – Dwellings in the Melling residential area will be downwind of road and rail construction works in the predominant direction of moderate and strong winds. Commercial properties in the Lower Hutt CBD will also be downwind of road and bridge construction works in these conditions. – Hill Residential zone properties along Harbour View Road, Jenness Grove and Tirohanga Road will be downwind road and rail construction works in the secondary prevailing wind direction. – Other areas are not downwind of the processing plant in the most frequent directions of moderate and strong winds.
Intensity	The intensity of dust exposure at receptor locations will depend on the following: • The scale of emissions from dust sources: – The road and rail construction works include a number of activities that could generate substantial dust emissions if not well controlled, such as: o Demolition of buildings and structures; o Earthworks; o Stockpiling, handling and screening of excavated material;

Factor	Description
	o Road construction works; o Vehicle movements over unsealed access routes. • The distances separating dust sources and receptors. – All of the roading and rail upgrade works are likely to be carried out within 200 m of commercial or residential zones. – Dwellings on Harbour View Road, Jenness Grove and Tirohanga Road will be is close proximity to SH2 construction works (properties will likely lie within 20 m of works). – Dwellings in the Melling residential area and commercial properties will be adjacent to road and/or rail construction works along Pharazyn Street (residential and commercial properties currently abut the rail line) and in the Lower Hutt CBD (commercial properties adjoin the existing Melling Bridge and new bridge locations).
Offensiveness/ character	As described in Table 6.1, the dust associated with the works is generally likely to be typical of dust generated in the wider receiving environment and not especially offensive in character.

The following conclusions are drawn from the FIDOL dust nuisance assessment for the SH2 Melling interchange and Melling Station upgrade works:

- A number of activities associated with the road and rail upgrade works have the potential to generate dust emissions of a reasonably strong intensity if not well controlled, including demolition, earthworks, material handling and screening and vehicle movements on unsealed surfaces. Dust emissions from these activities will occur primarily during working hours.
- The road and rail upgrade works throughout the area are located within 200 m of urban residential and commercial activities with at least a moderate sensitivity to dust and a generally high standard of dust management and control will be required to mitigate potential dust impacts.
- Dwellings and other activities in the Melling residential area along Pharazyn Street, Marsden Street and Williams Grove will have a high sensitivity and will be located in close proximity and downwind of construction works in prevailing moderate and strong winds. Likewise, dwellings in the Hill Residential zone along Harbour View Road, Jenness Grove and Tirohanga Road will be exposed to an elevated frequency of moderate and strong winds from the works. Particular attention to management of dust emissions will be required for activities in this area in order to mitigate dust impacts on these properties.

6.2.5 Lower Hutt CBD construction works

Construction works within the Lower Hutt CBD proposed as part of the Project include:

- Modification of local roads, including realignment or stopping of roads, modifications to intersections and construction or modification of cycleways;
- Demolition and ground improvement works at CBD properties located within GWRC, HCC and Waka Kotahi designations for the Project.

Activities in this area with a potential to generate dust include:

- Building and structure demolition and removal;
- Removal and replacement of road pavement; and
- Demolition and construction material handling.

HSRs located within 200 m of the CBD regeneration works include:

- Upper floor dwellings at mixed use properties in the Lower Hutt CBD.

An assessment of potential nuisance effects impacts of dust and other emissions from Lower Hutt CBD regeneration works considering the FIDOL factors is provided in Table 6.2.

Table6.5 FIDOL dust nuisance assessment for Lower Hutt CBD urban construction works

Factor	Description
Location/ sensitivity	Commercial activities in the Lower Hutt CBD will generally have a moderate sensitivity to dust, except at outdoor amenity areas or at upper floor dwellings where it is likely to be high while in occupation.
Frequency and duration	The frequency and duration of dust exposure at receptor locations in this area will depend on the following: • The frequency and duration of operation of site dust sources: – Specific activities may occur intermittently, but construction activity (including potential dust sources) is likely to occur consistently during the hours the construction site is in operation. • The frequency of meteorological conditions that may propagate emissions toward receptors: – Given the works are proposed in the CBD and are surrounded by commercial properties, exposure of commercial properties is likely to occur to some degree in winds from all directions.
Intensity	The intensity of dust exposure at receptor locations will depend on the following: • The scale of emissions from dust sources: – The construction works include demolition activities that could generate substantial dust emissions if not well controlled. Other less intensive dust generating activities include Removal of road pavement and associated excavation. • The distances separating dust sources and receptors. – Commercial properties in the Lower Hutt CBD will be adjacent (and in close proximity) to construction works.
Offensiveness/ character	As described in Table 6.1, the dust associated with the works is generally likely to be typical of dust generated in the wider receiving environment and not especially offensive in character, except where contaminated soil is disturbed, or demolition works involves removal of hazardous material.

The following conclusions are drawn from the FIDOL dust nuisance assessment for the urban construction works proposed in the Lower Hutt CBD:

- Works in this area include demolition activities that have the potential to generate dust emissions of a reasonably strong intensity (if not well controlled) and less intensive dust generating road construction activities. Dust emissions from these activities will occur primarily during working hours.
- The works in this area will be located in close proximity to urban activities with at least a moderate sensitivity to dust and a generally high standard of dust management and control will be required, particularly for demolition works, to mitigate potential dust impacts.

6.3 Management of construction emissions and mitigation of construction air quality impacts

As described in Sections 3.1 and 6.2, the Project includes a range of activities with a potential to generate dust emissions of a reasonably strong intensity if not well controlled. Furthermore, as noted in Section 6.2, urban receptor activities of moderate and high sensitivity have a potential to be exposed to emissions from Project construction activities and a generally high standard of dust management and control will be required to mitigate potential dust impacts at these receptor locations. Management and control measures for dust and other emissions from Project construction activities are considered in this context in Table 6.6.

Specific management measure recommendations are provided in Table 6.6 for mobile activities (e.g. earthworks, aggregate screening) occurring within 200 m of HSRs. Given the urban nature of the surrounding environment, these recommendations are likely to encompass the majority of works activities.

Air quality and emission monitoring measures can provide useful feedback to inform and improve dust management and are discussed in Table 6.7.

Overall, the measures described in Table 6.6.and Table 6.7 are consistent with dust management and monitoring guidance recommendations of the MfE Dust GPG and should provide a high standard of protection from dust nuisance and property impacts in this relatively sensitive urban environment.

Construction emission management measures and procedures to be employed for the Project should be confirmed and detailed in a Construction Air Quality Management Plan (CAQMP) prior to commencement of dust generating activities. In accordance with the Waka Kotahi AQA Guide, the CAQMP will require independent peer review[11] and is required to include *"a comprehensive risk-based quality assurance/quality control (QA/QC) programme to ensure risks are appropriately managed*"[12].

[11] The Waka Kotahi AQA Guide specifies that "*the peer review should be a specific peer review in accordance with the Engineering New Zealand Practice Note 2 and should be completed prior to starting relevant works or submission to any statutory authority*".
[12] At section 7.3.3, p35 of the Waka Kotahi AQA Guide

Table 6.6: Consideration of measures to control emissions from construction activities and mitigate off-site air quality effects

Activity	Recommended dust control measures	Recommended minimum requirements for dust control
Demolition and removal of buildings, structures, and pavement	• Water application or fogging sprays should be used to control emissions from demolition activities, concrete breaking and cutting where there is a potential for off-site dust emissions towards HSRs. • Pre-identification of asbestos (and other materials with a potential to generate hazardous dust emissions) and removal should be carried out in accordance Health and Safety at Work (Asbestos) Regulations. • Wind break fencing is available to reduce wind speeds over demolition activities if visible windblown dust emissions occur, or to provide visual screening.	• Wet suppression (or an equivalent dust suppression option) should be used for demolition of buildings or structures constructed of concrete, plaster or other dusty construction materials within 200 m of HSRs. • Only wet concrete cutting should be undertaken.
Excavation, earth moving and material handling	• The extent of excavation areas open at any time should be minimised as far as practicable and exposed areas that are not required for further construction promptly stabilised. • Excavation, handling or other disturbance activities in exposed areas should be minimised in dry, high wind speed conditions. • Where excavation material is dry and there is a potential for off-site dust emissions towards HSRs, water application should be used in dry conditions to dampen material. • Drop heights (e.g., from excavators, loaders or conveyors) should be minimised as far as practicable during material handling • Loads of fine materials should be covered during transport. • Wind break fencing is available to reduce wind speeds over earth moving and handling activities if windblown dust emissions occur, or to provide visual screening.	• Wet suppression (or an equivalent dust suppression option) should be used for excavation or handling of dry material in dry conditions within 200 m of HSRs.
Stockpiles and storage of materials	• Stockpiles should be located to maximise separation from HSRs and/or minimise dust exposure as far as practicable. • Heights of outdoor, uncovered stockpiles should be minimised as far as practicable to reduce wind entrainment. • Inactive stockpiles should be stabilisation or covered. • Drop heights (e.g., from excavators, loaders or conveyors) should be minimised as far as practicable during handling of stockpiled material. • Maintenance of exposed stockpiles in damp condition through watering may be required in dry conditions if visible dust emissions occur.	• Uncovered stockpiles located within 200 m of HSRs should be of no greater than 3m in height, where practicable.

Activity	Recommended dust control measures	Recommended minimum requirements for dust control
	• Covers and wind break fencing are available to reduce wind exposure of stockpile surfaces if visible windblown dust emissions occur.	
Aggregate crushing	• Wet suppression is typically an important control mechanism for crushing activities and should be used for all crushing activities in this instance. This can include application of water to material prior to crushing, at the crushing box and prior to stockpiling. • Drop heights to and from the plant should be minimised as far as practicable. • Enclosure or the crushing plant to contain emissions can augment or provide an alternative to wet suppression where water availability is limited. • Crusher plant should be located to maximise separation from HSRs and/or minimise dust exposure.	• Either wet suppression (including application of water prior to or at the crusher box) or enclosure within a contained building should be used to control dust from the crusher plant at all times while in use. • The crusher plant should be located within the aggregate processing plant area to maximise separation and avoid frequent upwind exposure of HSRs, as far as practicable.
Aggregate screening (including mobile screening)	• Wet suppression is also a common control mechanism for screening of dry material and should be used for screening activities where there is a potential for off-site dust emissions towards HSRs. This can include application to material prior to screening and over the screen(s). • Location of screening plant to maximise separation from HSRs and/or minimise dust exposure.	• Wet suppression should be used to control dust from screening of dry material occurring within 200 m of HSRs. • Mobile screening equipment should be located to maximise separation from and avoid frequent upwind exposure of HSRs, as far as practicable.
Silt drying	• Silt drying activities should be located to maximise separation from HSRs and/or minimise dust exposure, particularly where material will be dried to a dusty consistent. • Application of water to drying silt to prevent moisture content reducing below desired range. • When handling dried material, drop heights should be minimised as far as practicable.	• Silt drying activities where silt is to be dried to a dusty consistency should not be conducted within 200 m of HSRs.
Vehicle movements over unsealed surfaces	• Vehicle speed limits over unsealed surfaces should be specified to minimise disturbance and pulverisation of surface material. • Chemical surface stabilisation treatments can provide a temporary alternative to sealing or to the use of vehicle speed limits for suppression of dust from vehicle movements. Vehicle speed limits may not be required the exposed surface has been successfully stabilised through the application of this type of treatment.	• Vehicle speed limits over unsealed surfaces of 15 km/h (or lower), except where surfaces are stabilised or treated to provide sustained control of dust emissions from vehicle movements. • Wet suppression (or equivalent dust suppression options) should be used in dry conditions to maintain

Activity	Recommended dust control measures	Recommended minimum requirements for dust control
	• Frequently used access routes should be metalled or otherwise stabilised to minimise dust emissions from vehicle movements. • Wet suppression or equivalent dust suppression options should be used to maintain unsealed access routes in damp condition where there is a potential for off-site dust emissions towards HSRs. • Wheel cleaning facilities should be operated at site exits to minimise tracking of mud off-site.	unsealed access routes in damp condition within 200 m of HSRs.
Vehicle movements over sealed surfaces	• Sealing of the surface provides the main mitigation measure for emissions from these surfaces. • Spilled or deposited material should be removed from sealed surfaces (e.g. using wet suction sweeping) or water should be applied in dry conditions to suppress dust generation.	
General	• Response procedures outlined in a Contamination Site Management Plan for the works should be implemented in the event that odorous contaminated material is encountered during works activities. Response actions may include: – Limiting the extent and duration of exposure of the odorous material; – Application of inert and non-odorous cover material; – Prompt removal of odorous material from site; and – Application of chemical counteractants. • Vehicle and equipment engines should be serviced in accordance with manufacturers' requirements (at a minimum) and whenever visible emissions occur outside of cold start-up period.	

Table 6.7: Consideration of air quality monitoring measures for the construction activities

Activity	Recommended dust control measures	Recommended minimum requirements for dust control
Weather monitoring	• Continuous monitoring of local meteorological conditions can provide useful feedback for dust management and allow for modification of management measures if conditions require. • Monitoring of wind speed and direction and rainfall are a priority and monitoring of temperature and relative humidity can also provide useful information. • Access to data from an existing local weather station may provide an alternative to operation of an on-site weather station.	• Where instantaneous access to weather data from the GWRC Birch Lane weather station is not available, continuous monitoring of wind speed and direction and rainfall should be installed at least one location within the Project Area and provide automated alerts of high wind speed conditions that may require management modifications.
Visual monitoring	• Regular visual inspection of dust generating activities and potential for visible dust emissions should be used to provide feedback for dust management.	• Visual inspection of dust emissions from dust generating activities occurring within 200 m of HSRs should be carried out on a daily basis in dry conditions.
Instrumental dust monitoring	• Continuous measurement of ambient dust/particulate concentrations may be used to provide quantitative feedback on ambient dust levels at specific locations of interest in the environment (e.g., downwind of sources or at specific receptor locations). • Instrumental monitoring is likely to be restricted to specific locations with available electrical supply. Given the broad spatial extent of the Project and variable nature of the construction activities at any location, effective instrumental dust monitoring may be difficult to employ effectively in this instance. However, dust monitoring could be considered in the vicinity of stationary dust generating activities (such as the aggregate processing plant). • Dust deposition monitoring would provide information on long term trends in dust levels but would not provide instantaneous feedback for dust management and is not recommended in this instance.	

6.4 Summary of construction effects on air quality

Activities associated with the construction of the Project have the potential to generate and emit dust and other contaminants to air with a potential to cause nuisance, soil property or affect human health. The FIDOL assessments of exposure to air contaminants emitted from each section of the Project works indicate that the dust generating construction activities will be undertaken throughout the Project Area and that the surrounding urban environment is reasonably sensitive to construction emissions.

Control and management measures are recommended in Section 6.3 to account for the sensitivity of the environment which will be confirmed in a CAQMP for the Project. These measures should provide a high standard of protection from potential air quality amenity and property.

Provided the recommended control measures are rigorously implemented, offensive or objectionable nuisance or significant air quality impacts should be avoided and the potential effects on air quality during the construction phase appropriately mitigated. Residual nuisance or property effects are possible with the measures in place as it is likely to be impracticable to fully internalise emissions within the Project Area in all circumstances. However, those residual effects localised within close proximity to the Project Area and should be no more than minor in scale.

7 Assessment of air quality effects during operation of the completed Project

The Waka Kotahi Air Quality Screening Model has been used to predict the potential impact of transport emissions from Study Area roads on local air quality with and without the Project in place.

Specifically, the contributions of transport emissions from local road links to ambient concentrations of PM_{10} (24-hour average concentrations) and NO_2 (annual average concentrations) at the nearest HSRs have been predicted based on modelled traffic characteristics and separation distances. Waka Kotahi geospatial estimates of background contaminant concentrations have then been used to predict cumulative contaminant concentrations.

The operational air quality effects of the Project have been assessed through screening model predictions at HSRs adjacent to key road links with and without the Project. Specifically, the screening model has been applied to road links with:

- The highest annual average daily traffic (AADT) in the “with Project scenario”;
- The highest gains in AADT in the “with Project” scenario; and
- The greatest reduction in AADT in the “with Project” scenario.

As noted in Section 5.3, predicted road contributions and cumulative concentrations have been compared with the NES-AQ ambient standard for 24-hour average PM_{10} concentrations and the WHO AQG for annual average NO_2 concentrations to assess the potential for adverse health effects.

Tabulated PM_{10} and NO_2 concentrations predicted at HSRs adjacent to each of the analysed road links are provided in Appendix C. Peak 24-hour average PM_{10} concentrations and annual average NO_2 concentrations with and without the Project are compared in in Table 7.1 and Table 7.2 respectively.

Table 7.1: Comparison of 24-hour average PM_{10} concentrations predicted at HSRs adjacent to key road links (with and without Project)

Road link	Distance to nearest HSR (m)[13]	Predicted peak 24-hour average PM_{10} concentration at nearest HSR (µg/m^3)			
		Contribution from road emissions		Cumulative concentration (including background)	
		Without Project	With Project	Without Project	With Project
Highest traffic flow links					
SH2 (north of Melling Interchange)	50	0.6	0.6	29.1	29.1
SH2 (south of Melling Interchange)	35	0.9	1.0	29.4	29.5
Ewen Bridge	50	0.6	0.5	29.1	29.0
Queens Drive (High Street to Ewen Bridge)	45	0.5	0.3	29.0	28.8
Links with greatest traffic flow increases					
High Street (Andrews Avenue to Laings Road)	10	0.2	0.4	28.7	28.9
Links with greatest traffic flow reductions					
Daly Street (south, to be discontinued with Project)	55	0.2	-	28.7	28.5
High Street (Daly Street to Queens Drive)	40	0.3	0.1	28.8	28.6
Assessment criterion		**50 (NES-AQ)**			

[13] Distance determined in accordance with Waka Kotahi. Air Quality Screening Model – User's notes – June 2014

Table 7.2: Comparison of annual average NO_2 concentrations predicted at HSRs adjacent to key road links (with and without Project)

Road link	Distance to nearest HSR (m)[14]	Predicted peak annual average NO_2 concentration at nearest HSR (µg/m³)			
		Contribution from road emissions		Cumulative concentration (including background)	
		Without Project	With Project	Without Project	With Project
Highest traffic flow links					
SH2 (north of Melling Interchange)	50	2.4	2.7	10.8	11.1
SH2 (south of Melling Interchange)	35	3.0	3.6	11.4	12.0
Ewen Bridge	50	2.3	1.8	10.7	10.2
Queens Drive (High Street to Ewen Bridge)	45	1.9	1.3	10.3	9.7
Links with greatest traffic flow increases					
High Street (Andrews Avenue to Laings Road)	10	0.5	1.1	8.9	9.5
Links with greatest traffic flow reductions					
Daly Street (south, to be discontinued with Project)	55	0.7	-	9.1	8.4
High Street (Daly Street to Queens Drive)	40	1.1	0.5	9.5	8.9
Assessment criterion		**40 (WHO AQG)**			

The following conclusions are drawn from the preliminary screening model assessment of the air quality effects of operation of the completed Project:

- Waka Kotahi estimates of background PM_{10} and NO_2 levels in the Study Area indicate that background levels of these contaminants currently remain well within the NES-AQ and WHO AQG assessment criteria in the area. The estimated background PM_{10} concentration equates to an "acceptable" level of air quality under the regional ambient air quality targets of the PNRP.
- The highest traffic flows (and correspondingly, the highest road contributions to ambient contaminant concentrations) in the Study Area are currently associated with SH2, north and south of the Melling interchange. The following conclusions are drawn in relation to the predicted air quality impacts of SH2:
  - Predicted contributions from SH2 traffic to local PM_{10} concentrations without the Project in place are predicted to be small in scale (at most equating to 1.8% of the NES-AQ standard at the nearest HSR). The Project is predicted to result in incremental

[14] Distance determined in accordance with Waka Kotahi. Air Quality Screening Model – User's notes – June 2014

increases in contributions from SH2 to local PM_{10} levels, but the predicted increases are small (increasing to 2% of the NES-AQ standard at the same HSR). Cumulative PM_{10} concentrations in the area (resulting from emissions from SH2 and background PM_{10} contributions) are predicted to remain well within the NES-AQ standard without the Project and this is not predicted to change with the Project in place.

  – Predicted contributions from SH2 without the Project to local NO_2 concentrations are predicted to be higher relative to the corresponding assessment criterion than PM_{10} contributions (at most equating to 7.5% of the WHO AQG at the nearest HSR) and also predicted to increase with the Project (increasing to 9% of the WHO AQG). However, background NO_2 levels are low and cumulative NO_2 concentrations are predicted to remain well within the WHO AQG with and without the Project.

- Within the local roading network, peak traffic flows (and predicted air quality impacts) without the Project are associated with Ewen Bridge and the adjacent section of Queens Drive. The Project is predicted to reduce traffic flows along these links and result in an incremental reduction in the associated impacts on local air quality.
- Modest improvements in air quality impacts are also predicted to result from the completion of the Project at other local road links, such as the southern section of Daly Street (from High Street to Andrews Street, which is proposed to be blocked to traffic) and the adjacent section of High Street (from the intersection with Queen Street).
- The largest increases in air quality impacts are predicted to result from increases in traffic along High Street (between Laings Road and Andrews Street) in the Lower Hutt CBD. However, the predicted contributions from High Street are currently very low and are ambient PM_{10} and NO_2 concentrations are predicted to remain well within the relevant assessment criteria with the Project in place.

Overall, the implementation of the Project is predicted to result in incremental increases in the air quality impacts of traffic flow along SH2 (and other lower volume links in the area) as well as reductions in impacts of other key local links, such as Ewen Bridge and Queen Street. The scale of the predicted changes in air quality is small – air quality is generally of a reasonable standard in Lower Hutt (with PM_{10} and NO_2 concentrations having remained well within the relevant health-based assessment criteria in recent years) and this is not predicted to change as a result of the Project. Completion of the Project is not anticipated to result in any discernible increase in effects on human health as a result of exposure to transport related air pollution. No further measures to mitigate operational impacts on air quality are considered to be required.

8 Conclusions

This report describes an assessment of air quality impacts of the RiverLink Project and the following conclusions may be drawn from the assessment:

- Discharges to air associated with the Project include the following (each of which has been assessed in this document):
  - emissions associated with the construction of the Project (primarily dust, which can cause nuisance or soil property with sufficient exposure);
  - road emissions from operation of the construction Project (primarily combustion contaminants, which can adversely affect human health with sufficient exposure)
- The environmental setting of the Project contains a range of activities of varying in sensitivity to degraded air quality. These activities range in sensitivity from relatively low sensitivity light industrial activities, through moderate sensitivity commercial activities to high sensitivity dwellings and other sensitive activities located in local residential areas.
- For the purposes of assessing the potential air quality effects of construction discharges to air the Project has been segregated geographically and by activity into five sectors. Construction air quality effects have been assessed in each sector through qualitative consideration of the FIDOL factors.
- The sector construction emission impact assessments indicate that a range of dust generating construction activities will be undertaken throughout the Project Area in reasonably close proximity to urban activities of moderate to high sensitivity to dust.
- A range of construction emission management measures are recommended to control emissions and mitigate potential impacts within this reasonably sensitive urban environment. These measures, to be confirmed through an Air Quality Management Plan for the Project, should provide a high standard of protection from air quality amenity and property impacts in this urban environment. Provided the recommended control measures are rigorously implemented, offensive or objectionable nuisance and the potential effects on air quality during the construction phase should be appropriately mitigated. Residual nuisance or property effects are possible as it is likely to be impracticable to completely internalise the emissions within the Project Area at all times. However, the residual effects of construction emissions localised within areas close to the Project Area and should be minor at most in scale.
- The effects of road emissions during operation of the constructed Project have been assessed through a preliminary screening model assessment. The results of this assessment indicate that:
  - Ambient levels of air pollutants associated with vehicle traffic in the Study Area are currently likely to be well within the relevant health-based assessment criteria.
  - The Project is likely to result in small increases in the air quality impacts of emissions from SH2 (as the most significant road links in the area but also small reductions in other key local road links (including Ewen Bridge and Queens Street).
  - The predicted changes in air quality impacts associated with the Project are small and ambient traffic combustion pollutant levels in the Study Area are currently likely to remain well within the relevant health-based assessment criteria following completion of the Project. The Project is therefore not anticipated to result in any discernible increase in effects on human health.
  - No further measures to mitigate operational impacts on air quality are considered to be required.

9 Applicability

This report has been prepared for the exclusive use of our client, Isthmus Group Ltd on behalf of the RiverLInk project partners, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and that Greater Wellington Regional Council and Hutt City Council, as the consenting authorities, will use this report for the purpose of assessing that application.

Tonkin & Taylor Ltd

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Appendix B – Tabulated operational air quality impact predictions.

Road link	Distance to nearest HSR (m)	Predicted peak 24-hour average PM_{10} concentration at HSR (µg/m³)*				Predicted peak annual average NO2 concentration at HSR (µg/m³)*				AQ screening model parameters				Speed (km/h)	Speed (km/h)
		Contribution from road emissions		Cumulative concentration (including background)		Contribution from road emissions		Cumulative concentration (including background)		AADT		% heavy vehicles			
		Without project	With project	Without project	With project	Without project	With project	Without project	With project	Without project	With project	Without project	With project	Without project	With project
Highest traffic flow links						Highest traffic flow links									
SH2 north of Melling Interchange	50	0.6	0.6	29.1	29.1	2.4	2.7	10.8	11.1	39394	43834	6%	5%	91	87
SH2 south of Melling Interchange	35	0.9	1.0	29.4	29.5	3.0	3.6	11.4	12.0	39845	47419	5%	5%	99	86
Ewen Bridge	50	0.6	0.5	29.1	29.0	2.3	1.8	10.7	10.2	37288	29492	6%	7%	43	48
Queens Drive (High Street - Ewen Bridge)	45	0.5	0.3	29.0	28.8	1.9	1.3	10.3	9.7	29532	19534	6%	6%	51	52
Melling Bridge	125	0.1	0.1	28.6	28.6	0.7	0.9	9.1	9.3	21740	26107	4%	4%	38	52
Links with greatest traffic flow increases						Links with greatest traffic flow increases									
Queens Drive (Rutherford St - High Street)	60	0.1	0.1	28.6	28.6	0.4	0.6	8.8	9.0	7852	11858	3%	3%	35	36
Andrews Avenue	10	0.0	0.2	28.5	28.7	0.0	0.6	8.4	9.0	263	3676	3%	6%	0	37
High Street (Andrews Avenue - Laings Road)	10	0.2	0.4	28.7	28.9	0.5	1.1	8.9	9.5	3027	6297	5%	6%	37	35
Dudley Street (Andrew Ave - Margaret St)	5	0.0	0.2	28.5	28.7	0.0	0.7	8.4	9.1	0	2618	0%	6%	0	48
Bunny Drive	85	0.0	0.0	28.5	28.5	0.1	0.2	8.5	8.6	1277	3887	5%	3%	37	36
Links with greatest traffic flow reductions						Links with greatest traffic flow reductions									
Daly Street South	55	0.2	0.0	28.7	28.5	0.7	0.0	9.1	8.4	11997	0	7%	0%	0	47
Pretoria Street (between High Street and Melling Link)	100	0.1	0.0	28.6	28.5	0.4	0.1	8.8	8.5	10881	1619	3%	3%	35	48
High Street (Daly Street - Queens Drive)	40	0.3	0.1	28.8	28.6	1.1	0.5	9.5	8.9	16184	7060	6%	6%	43	48
Pretoria Street (between High Street and Cornwall Street)	50	0.1	0.0	28.6	28.5	0.5	0.2	8.9	8.6	8310	3483	4%	2%	37	48
Daly Street North	35	0.1	0.0	28.6	28.5	0.4	0.0	8.8	8.4	4674	0	9%	0%	0	48

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