Staff Report to Council

Engineering

FILE: 11-5240-01/20

REPORT DATE: November 30, 2020 **MEETING DATE:** December 08, 2020

TO: Mayor and Council

FROM: S. Ahrabian, Manager of Engineering & Facilities

SUBJECT: **Airport Way Noise Barrier Feasibility Study**

CHIEF ADMINISTRATIVE OFFICER REVIEW/APPROVAL:

RECOMMENDATION(S): THAT Council:

A. Receive for information the Staff Report titled 'Airport Way Noise Barrier Feasibility Study' as presented at the December 8, 2020 Council Meeting; AND

B. Direct staff to include a 4.5m tall localized sound attenuation wall along the south side of Airport Way on the list of considered projects during the next DCC Program and Bylaw Update; AND

C. Direct staff to request and negotiate a fair contribution from Onni towards the sound attenuation wall cost, recognizing the majority of sound impacts arise from their Golden Ears Light Industrial Business Park traffic activities while also adhering to Good Neighbour principles; OR

D. Other.

PURPOSE

The intent of this report is to provide a summary of the feasibility study recently completed for a localized noise barrier along the south side of Airport Way and provide recommendations for Council's consideration.

☐ Information Report ☐ Decision Report ☒ Direction Report

DISCUSSION

Background:

The City received a number of recent traffic noise complaints from residents living south of Airport Way. Staff were directed to undertake a noise barrier feasibility study that contemplates potential mitigation solutions, such as a sound attenuation wall, to alleviate road traffic noise affecting existing and future residents fronting the south side of Airport Way. The study assessed the following: location, mitigation impact, height and estimated costs.

Relevant Policy, Bylaw or Legislation:

Development Cost Charges Bylaw No.2382.

Analysis:

The area assessed extended from the northwest corner of the Nature's Walk Development to the City's eastern border at the Golden Ears Way Roundabout. The area and three divided sections (720m in total) are shown in the Figure below.

Figure 1 – Area of Proposed Noise Barrier

The first section extends from the residences on the northeast corner of Silverthorne Place to Southgate Road (170m). Section two extends west of Southgate Road to Bonson Road (360m). Section 3 fronts the residence at Nature's Walk (190m).

To optimize the effectiveness of a noise barrier, the barrier shall either be close to the source or the receiver. To accommodate access for maintenance activities along the City's drainage network, the barrier needs to go on the south side of Katzie Slough. With this, the barrier should be installed adjacent to the northern property lines of the nearby residences, south of the Trans Canada Trail (Figure 2 below).

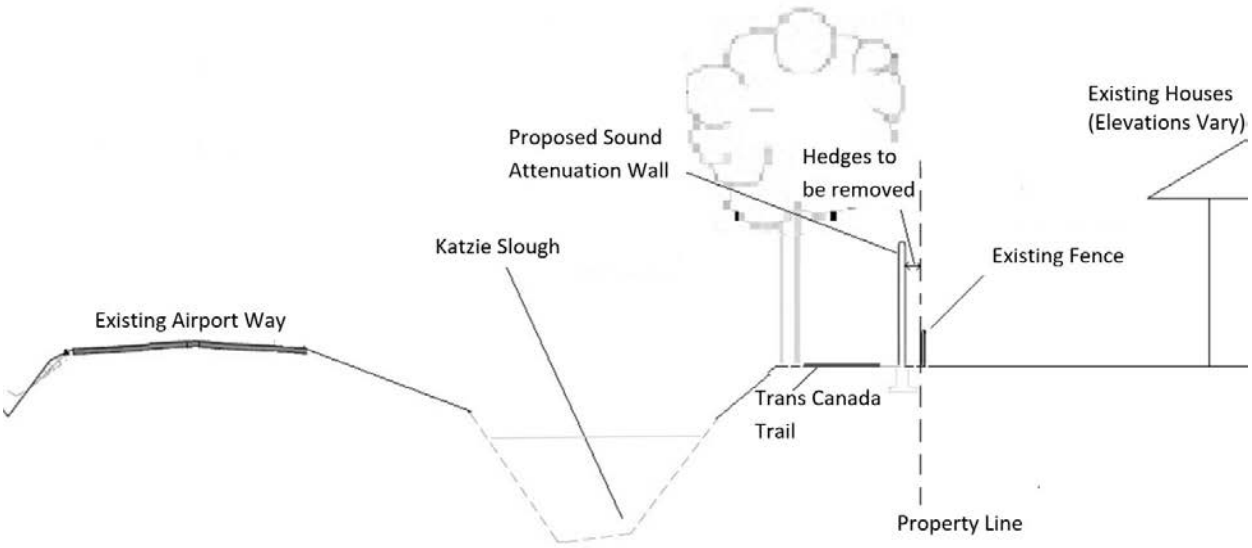

Figure 2 – General Cross-Section

In order for a barrier to be considered effective, a minimum noise reduction of 5 decibels (dB) is needed. Considering this, BKL modelled various wall heights (2.5m – 5m) and the associated noise reduction at both the first and second level of the adjacent residences. For the barrier to have an effect of noise on the second floor, a minimum of 4.5m high wall is needed. There is not a substantial change in noise reduction with a 5m high wall in most locations. Residences in Section 1 would not observe as much of a reduction in noise levels on the second floor due to their proximity to road traffic noise from the Golden Ears Bridge and associated on/off ramps, as well as, the variation in topography. With a 4.5m high wall, the following noise level reductions are experienced:

- For first floor façade and yard area receptors;
  - 6db for section 1
  - 8db for section 2
  - 10db for section 3
- For second floor receptors
  - 3db in section 1 (note that this is below 5dB effective reduction)
  - 5db in section 2
  - 5db in section 3

Noise reduction levels were not modelled for the more southern residences (second or third row); however, the benefits of noise reduction diminish the farther away one is from the wall. There residences are currently more shielded from the traffic noise.

Extension of the wall to the south on the east side of the Bonson Landing area was also explored. Due to the elevation differential, the required wall height would be much greater than 5m to achieve any realistic benefit, which is not recommended due to the costly structural requirements and obtrusiveness of the structure.

A sound attenuation wall would partially impede northern views from adjacent residences. No shading impacts are expected on the southern parcels, but there would be shading impacts to the Trans Canada Trail. In addition, any trees or shrubbery between the existing fences and the proposed wall would need to be removed and would likely not be suitable for relocation.

Typically, noise barriers are formed of reinforced concrete or aluminum. Alternative materials such as acrylic or wood could be considered provided that the panels have a minimum surface weight of 20 kg/m^2. Upon further discussion with several suppliers, other advantages and disadvantages of material selection would be based on non-acoustic related issues such as structural integrity, longevity, durability, installation cost, maintenance, and esthetics.

As the proposed noise barrier would be within 30m of Katzie Slough, environmental regulations may be applicable to the project. The environmental impacts would be assessed during the detailed design. There would also be consideration for drainage to ensure that water does not pond or saturate the soil on either side of the barrier and associated foundation. The wall design would also consider the specific details and impacts of the Airport Way widening project.

Earth berms are not feasible in this location, as there is not enough space available to construct a useful berm.

In summary, to keep the height consistent along the whole segment and to effectively reduce the levels of noise for second level of the residences, staff recommend a 4.5m sound attenuation wall be installed along the whole section.

Alternatively, a 5m wall could be selected. This would have a bit more of an impact on the look/presence, northern shading and foundation requirements. A 5m wall would result in a further noise reduction of approximately 1dB in most locations, which isn't considered to be of significance.

For reference, the existing sound attenuation wall along Lougheed Highway is 3.5m tall.

For the complete feasibility study, refer to Attachment A.

COUNCIL STRATEGIC PLAN ALIGNMENT

☐ Principled Governance ☐ Balanced Economic Prosperity ☐ Corporate Excellence
☐ Community Spirit & Wellbeing ☒ Transportation & Infrastructure Initiatives
☐ Not Applicable

FINANCIAL IMPLICATIONS

☐ None ☐ Budget Previously Approved ☐ Referral to Business Planning
☒ Other

There are different factors affecting the cost of the sound attenuation wall installation including, but are not limited to, site preparation, vegetation clearing, hedge remove/additional plantings, drainage, ground conditions, access, material selection, site survey, and environmental permits.

One of the largest impacts on the cost is soil conditions and the associated effects on the necessary foundations. A 4.5m wall would typically require a deep foundation, but a lighter material (metal) would help reduce the necessary foundation size while also increasing durability and associated maintenance. The proximity to the slough and the type of soil in the area could also considerably influence the cost.

For the purpose of a high-level budgetary estimate, a construction cost of $400/m^2 has been included based on recent conversations with suppliers.

Table 1 – Estimated Cost Summary	
Activity	Estimated Cost
Construction Cost	$1,296,000*
Design and Consultant team	$60,000
Site Preparations and Regulatory Permits	$40,000
Contingency (~15%)	$210,000
Total	**$1,606,000**
* Note that this cost is slightly higher than the attached BKL review due to recent conversations with wall suppliers.	

The BC Development Cost Charges (DCC) Best Practices Guide outlines noise attenuation structures to be a suitable road DCC project. An update to the City's DCC program and associated bylaw is planned to start in mid-2021, with adoption planned by the end of 2022. Note that the allocation of project costs (portion funded by DCC reserves and portion funded by City reserves) is assessed during the detailed review of the DCC Program, which is subject to approval by the Inspector of Municipalities.

Following that approval, staff will bring the amended DCC Program and Bylaw to Council for consideration along with the associated funding plan for installation of the sound attenuation wall.

In regards to timeline, a DCC project can be front-ended by City reserves once it is added to the DCC program until enough DCCs are collected to reimburse the City reserves. This would allow completion of the sound attenuation wall in 2023, assuming Council's approval and sufficient funding. This wall construction timeline is within the anticipated Golden Ears Business Park building construction and off-site works, such as the widening of Airport Way.

In addition, staff will be in contact with Onni for further discussion on potential contribution to the noise barrier construction cost.

PUBLIC PARTICIPATION

☒ Inform ☐ Consult ☐ Involve ☐ Collaborate ☐ Empower

Comment(s):

With the amount of feedback received to date, staff do not foresee a need to further consult with adjacent residents. Alternatively, Council may wish to direct staff to consult with the directly impacted residents and confirm support from the majority before proceeding to the next step.

KATZIE FIRST NATION CONSIDERATIONS

Referral ☒ Yes ☐ No

Due to the proximity of the proposed noise wall to the Katzie Slough, Katzie First Nation would be consulted prior to implementation.

SIGN-OFFS

Written by:	Reviewed by:
Salia Ahrabian, Manager of Engineering & Facilities	Samantha Maki, Director of Engineering & Operations

ATTACHMENT:

A. Noise Barrier Feasibility Study by BKL on October 14, 2020

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T 604-988-2508 W www.bkl.ca E sound@bkl.ca

October 14, 2020

File: 3006-20A

City of Pitt Meadows
12007 Harris Road
Pitt Meadows, BC
V3Y 2B5

Attention: Salia Ahrabian

Dear Salia:

Re: Noise Barrier Feasibility Study – Airport Way, Pitt Meadows

BKL Consultants Ltd (BKL) have been commissioned by The City of Pitt Meadows (the City) to provide a feasibility study for a proposed noise barrier to be located on an area of land to the south of Airport Way. The barrier is proposed to be installed to mitigate road traffic noise impacting existing and future residences fronting the road.

The City has requested for us to provide comment on the quantifiable mitigation of the noise barrier, the optimum barrier location, extent and height, outline guidance on the barrier construction materials and approximate costings.

Design Criteria

We are not aware of any specific city requirement, document or policy offering guidance on the assessment of road traffic noise or associated noise barriers. Therefore, we have adopted the BC Ministry of Transportation and Infrastructure document: *2016 Policy for Assessing and Mitigating Noise Impacts from New and Upgraded Numbered Highways* (the Policy) to rate the effectiveness of a potential noise barrier.

The Policy lists noise barriers as one the general mitigation options to mitigate against highway noise and provides guidance on the determination of their suitability. To be considered sufficiently effective, the Policy states that the reduction in road traffic noise provided by mitigation should be at least 5 decibels (dB) at fronting residences.

We are of the opinion that the Policy criteria provides a reasonable approach to the assessment, calculation and determination of the feasibility of a noise barrier installation at the site.

Study Area

For the purpose of this assessment, the study area was limited to the predicted mitigation of noise from road traffic on Airport Way to both existing and proposed residences fronting directly onto the road. This included residences on Silverthorne Place, Southgate Road, Blaney Drive, Blaney Crescent, Bonson Road and future residences of the 11431 Bonson Road development.

The residences were split into three sections. Section 1 residences extended from the north east corner of Silverthorne Place, adjacent to the Golden Ears Bridge on-ramp, to Southgate Road. Section 2 residences extend west of Southgate Road to Bonson Road. Section 3 residences incorporate the proposed residential development to be located north of Sutton Avenue (11431 Bonson Road).

The three residential sections are outlined in Figure 1.

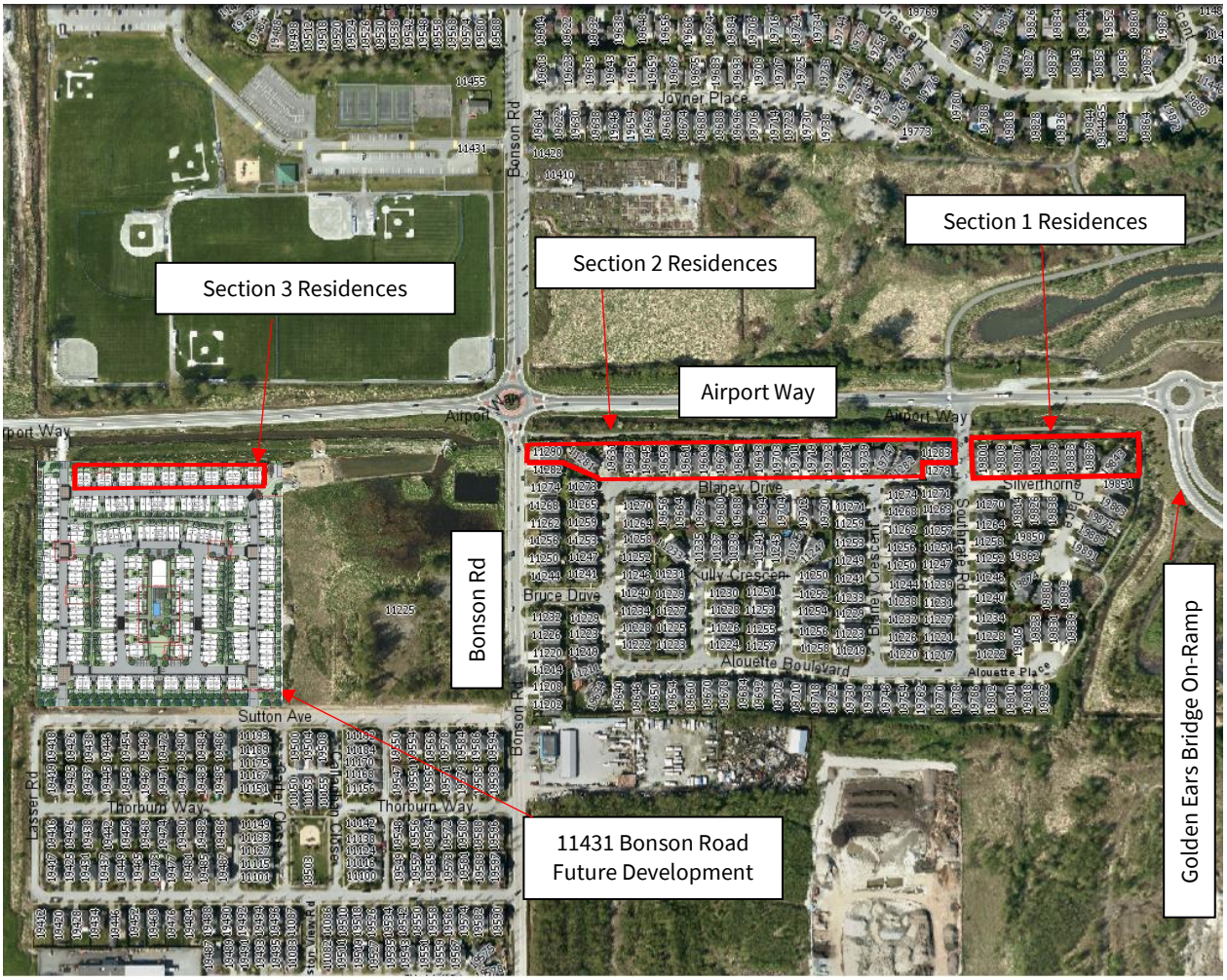

Figure 1: Study Area Residences

Noise Modelling

A noise model was created of the study area using the environmental noise modelling software Cadna/A Version 2020. The model includes ground contours and topography, obtained from the City, and was scaled using GIS maps and aerial images. The proposed 11431 Bonson Road development was included using a context plan obtained from the City. It has been assumed that homes on the new development will be the same height and design as those in neighbouring residential areas.

The model was used to determine the difference in noise levels with and without a barrier at the first-floor facade and yard areas as well as the second floor facade level of the residences. We are limited to predicting noise differences because in order to predict absolute noise levels, a more detailed assessment including traffic predictions and baseline measurements will be required.

We have assumed first floor receptors at a height of 1.5 m and second floor receptors at a height of 4.3 m. These receptor locations will be used to determine the reduction provided by the noise barriers at varying heights.

We have modelled reflective barriers, assumed soft ground, such as grassland, to be absorptive and hard ground, such as roads, to be reflective.

Three conceptual noise barrier segments were modelled. The first segment, Section 1, extended from the residences on the north east corner of Silverthorne Place to Southgate Road. The total length of the Section 1 barrier is 170 m. Section 2 extends west of Southgate Road to Bonson Road and has a total barrier length of 360 m. Section 3, the proposed residential development at 11431 Bonson Road, has a total barrier length of 190 m. Each barrier segment was located adjacent to the residential property line, with gaps, where required, to avoid crossing existing roads as shown in Figure 2.

Figure 2: Modelled Location of Noise Barrier Alignments

Alignment and Barrier Heights

We were requested to assess the optimum extent of the noise barrier, with particular regard to the eastern boundary around the residences on Silverthorne Place.

Following a review of the noise model, we determined the optimum alignment for Section 1 to extend east only so far as covering the yard area of 19843 Silverthorne Place, as shown in Figure 2. Any further extension of the noise barrier toward the south is not predicted to provide significant additional noise reduction to traffic noise from Airport Way as traffic noise from Golden Ears Bridge and associated roads become more dominant.

The Policy limits the height of vertical noise barriers to 5 metres, earth berms could be considered if there is enough right-of-way available to construct a useful berm however, this may not be feasible due to the proximity of the Katzie Slough and Trans-Canada trail.

Due to the topography, the optimum location for the barriers is immediately to the north of the residence's property lines, and south of the Trans-Canada trail.

Based on our noise modelling, we predict that the minimum noise barrier height would need to be at least 2.5 m in order to provide a benefit meeting the Policy guidelines. To ensure we provide a suitable variance to our assessment, we have modelled the benefit of noise barriers at heights of 2.5 m, 3 m, 3.5 m, 4 m, 4.5 m and 5 m.

Assessment

We have predicted the noise reduction to each of the residences fronting Airport Way as a result of constructing a noise barrier of the aforementioned heights, and calculated the median noise reduction, in decibels, to residences behind each of the three noise barrier sections.

Following the Policy guidelines, the median noise reduction is then evaluated based on whether or not it provides at least a reduction of 5 dB.

Table 1 outlines the predicted reduction to the first-floor level worst affected facades and yards.

Table 2 outlines the predicted reduction to the same residences second-floor levels.

The barrier reduction to residences in the east of Section 1 will be limited in part by their proximity to road traffic noise from the Golden Ears Bridge and associated on/off ramps. As such Section 1 reductions will be lower than those in Sections 2 and 3.

Table 1: Predicted Median Noise Reduction of Noise Barriers to First Floor and Yard Area Receptors

Barrier Height (m)	Residential Section	Predicted Median Noise Reduction (dB)	Meets or Exceeds 5 dB Reduction?
2.5	Section 1	2	No
	Section 2	3	No
	Section 3	5	Yes
3.0	Section 1	3	No
	Section 2	5	Yes
	Section 3	6	Yes
3.5	Section 1	4	No
	Section 2	6	Yes
	Section 3	8	Yes
4.0	Section 1	5	Yes
	Section 2	7	
	Section 3	9	
4.5	Section 1	6	Yes
	Section 2	8	
	Section 3	10	
5.0	Section 1	7	Yes
	Section 2	9	
	Section 3	10	

Table 2: Predicted Noise Median Reduction of Noise Barriers to Second Floor Receptors

Barrier Height (m)	Residential Section	Predicted Median Noise Reduction (dB)	Meets or Exceeds 5 dB Reduction?
2.5	Section 1	0	No
	Section 2	0	
	Section 3	0	
3.0	Section 1	0	No
	Section 2	0	
	Section 3	0	
3.5	Section 1	1	No
	Section 2	1	
	Section 3	1	
4.0	Section 1	3	No
	Section 2	3	
	Section 3	4	
4.5	Section 1	3	No
	Section 2	5	Yes
	Section 3	5	Yes
5.0	Section 1	4	No
	Section 2	6	Yes
	Section 3	7	Yes

As shown in Table 1, in order to achieve a median reduction of 5 dB for first floors and yards, the noise barrier will need to have a minimum of:

- 4 metres in height for residences in Section 1;
- 3 metres in height for residences in Section 2; and
- 2.5 metres in height for residences in Section 3.

As shown in Table 2, for second floors, a minimum 4.5 metre barrier height will be required for Sections 2 and 3 to achieve the 5 dB reduction. A 5 metre barrier will only provide a 4 dB reduction to Section 1 which would not meet the Policy guideline.

Noise Barrier Costs

According to the latest budget estimates from various local noise barrier suppliers, installed costs for noise barriers vary from $125 to $420 per square metre. Factors that affect the costs of noise barriers include, but are not limited to, the soil composition of ground, total quantity of noise barriers, access for construction, and noise barrier heights. Details on costing would need to be negotiated with the potential noise barrier supplier.

For the purpose of a high level budgetary comparison, we have undertaken a brief cost analysis to determine the approximate cost for the noise barriers at varying heights, assuming an average cost of $300 per square metre and a total wall length of 720 m as shown in Table 3:

Table 3: Estimated Noise Barrier Installed Costs

Barrier Height (m)	Approximate Wall Area (m^2)	Approximate Cost (CAD)
2.5	1,800	$540,000
3.0	2,160	$648,000
3.5	2,520	$756,000
4.0	2,880	$864,000
4.5	3,240	$972,000
5.0	3,600	$1,080,000

Discussion

Considerations

The Policy states that vegetation buffer strips are often proposed as noise barrier alternatives or improvements, but a single row of trees or hedges placed between a noise source and receiver does not provide any acoustical benefit. However, studies have found that trees or hedging that obstructs the view of noise sources can provide a psychological benefit, since people tend to perceive sounds as being quieter when the noise source cannot be seen. Hence, a row of trees would provide a positive psychological effect.

Other studies have found that trees placed near noise barriers can reduce the acoustical benefit of the noise barrier because sound is scattered and redirected downwards as it passes through tree foliage above noise barriers. These factors should be considered when assessing noise mitigation options.

With noise barriers in-situ, additional shading in yards, combined with the loss of view from windows on the north facades, may create more of an imposition on home owners than any potential noise from the widening of Airport Way. It may be worth considering the impact of these factors on the residents in combination with any acoustical improvement.

Comments on Noise Barrier Construction

The specification for noise barriers should include requirements for structural integrity, long-term durability, drainage considerations and other non-acoustical contractual issues that should be specified by a qualified civil engineer. Aesthetics is another consideration that does not necessarily affect the acoustical performance but should be covered in the specification.

Typically, noise barriers are formed of reinforced concrete, aluminum or steel posts, panels, and cap rail. Alternative materials such as acrylic or wood could be considered provided that the panels have a minimum surface weight of 20 kg/m^2.

Panels should be connected to the structure without any gaps or, if mounted on ground, stripped of topsoil and backfilled. It should be ensured that airtight joints are formed to all locations, including joints between the panels and the cap rail and also between the planks and the vertical posts to mitigate any sound leakage. Drains are acceptable at intervals to permit storm runoff from one side of the barrier to the other. Panel and framing widths vary by manufacturer and should be considered as part of a more detailed design.

Example Noise Barrier Photos

Some examples of noise barriers are shown in the below figures.

Figure 3: Concrete Panel Noise Barrier along Golden Ears Way, Pitt Meadows

Figure 4: Example Metal Noise Barrier along 1st Avenue, North Vancouver

Figure 5: Example Plastic/Vinyl Noise Barrier

Figure 6: Example Timber Panel Concrete Post Noise Barrier

Limitations of Feasibility Study

The feasibility study is limited to the predicted noise reduction of barriers constructed along Airport Way and does not provide any guidance associated with the quantifiable impact associated with the widening of the road on existing and future residences.

An increase in the overall traffic volume and/or percentage of trucks on Airport Way will increase the noise level of the road.

BKL can provide a comprehensive study to determine the likely impact, arising from a change in future traffic volumes, on the identified residences. This study may require the assessment of baseline environmental noise levels, modelling of current and future traffic volumes and determination of these impacts on residences.

Closure

This completes our assessment on the feasibility of noise barriers for Airport Way. We are happy to discuss the contents of this letter and next steps with you in a meeting.

Sincerely,

BKL Consultants Ltd.
per:

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