MARSHALL DAY Acoustics

ARGENT LANE EXTENSION PROJECT
ENVIRONMENTAL EFFECTS ASSESSMENT

Rp 001 R01 20190930 | 6 December 2019

84 Symonds Street
PO Box 5811 Wellesley Street
Auckland 1141 New Zealand
T: +64 9 379 7822 F: +64 9 309 3540
www.marshallday.com

Project: **MILLDALE INFRASTRUCTURE PROJECT 1 – ARGENT LANE EXTENSION**

Prepared for: **Mott MacDonald**
Level 2
139 Pakenham Street West
Wynyard Quarter
Auckland 1010

Attention: **Sven Exeter**

Report No.: **Rp 001 R01 20190930**

Disclaimer

Reports produced by Marshall Day Acoustics Limited are based on a specific scope, conditions and limitations, as agreed between Marshall Day Acoustics and the Client. Information and/or report(s) prepared by Marshall Day Acoustics may not be suitable for uses other than the specific project. No parties other than the Client should use any information and/or report(s) without first conferring with Marshall Day Acoustics.

The advice given herein is for acoustic purposes only. Relevant authorities and experts should be consulted with regard to compliance with regulations or requirements governing areas other than acoustics.

Copyright

The concepts and information contained in this document are the property of Marshall Day Acoustics Limited. Use or copying of this document in whole or in part without the written permission of Marshall Day Acoustics constitutes an infringement of copyright. Information shall not be assigned to a third party without prior consent.

Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Draft	-	Client review	18 Sep 2019	M Mrost	S Wilkening
Draft	01	AT comments	6 Dec 2019	M Mrost	S Wilkening
Final	02	Mott MacDonald comments	16 Sep 2020	M Mrost	S Wilkening

TABLE OF CONTENTS

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

1.0 SUMMARY

Mott MacDonald engaged Marshall Day Acoustics to assess the acoustic effects from the proposed new road and upgrade of Pine Valley Road and Dairy Flat Highway, including the intersection of Dairy Flat Highway and Pine Valley Road. The new roading infrastructure is part of the 'Milldale Infrastructure Project 1 – Argent Lane Extension', required for the Milldale residential development. This project is led by Auckland Transport.

The project will occur in two stages:

- Stage 1 proposes a new two-lane road with off-carriageway pedestrian paths and cycleways. The road will be from Old Pine Valley Road, via a new 250m alignment, to Pine Valley Road and from Pine Valley Road to Dairy Flat Highway. Widening of Dairy Flat Highway is also proposed. The widening includes an additional eastbound lane and upgrades to the Pine Valley Road and Dairy Flat Highway intersection.
- Stage 2 proposes widening Pine Valley Road to four lanes

In both stages, the outer traffic lane that is nearest to receivers, remains unchanged, so this assessment has focused on the new road and upgrades for both stages.

We predicted the traffic noise levels using traffic data supplied by Stantec for the forecasted traffic volumes after the completion of the Milldale residential development. We predict the traffic noise levels due the road upgrades will not significantly change. So, there will be no additional traffic noise effects on neighbouring sites.

Construction may exceed the Unitary Plan noise limits briefly at some of the few properties that currently accommodate buildings. These exceedances can be managed with a Construction Noise and Vibration Management Plan (CNVMP) and the effects reduced with proactive communication with affected parties.

We predict that construction vibration will comply with the cosmetic building damage limits.

A glossary of acoustic terminology can be found in Appendix A.

2.0 PROJECT DESCRIPTION

2.1 Location

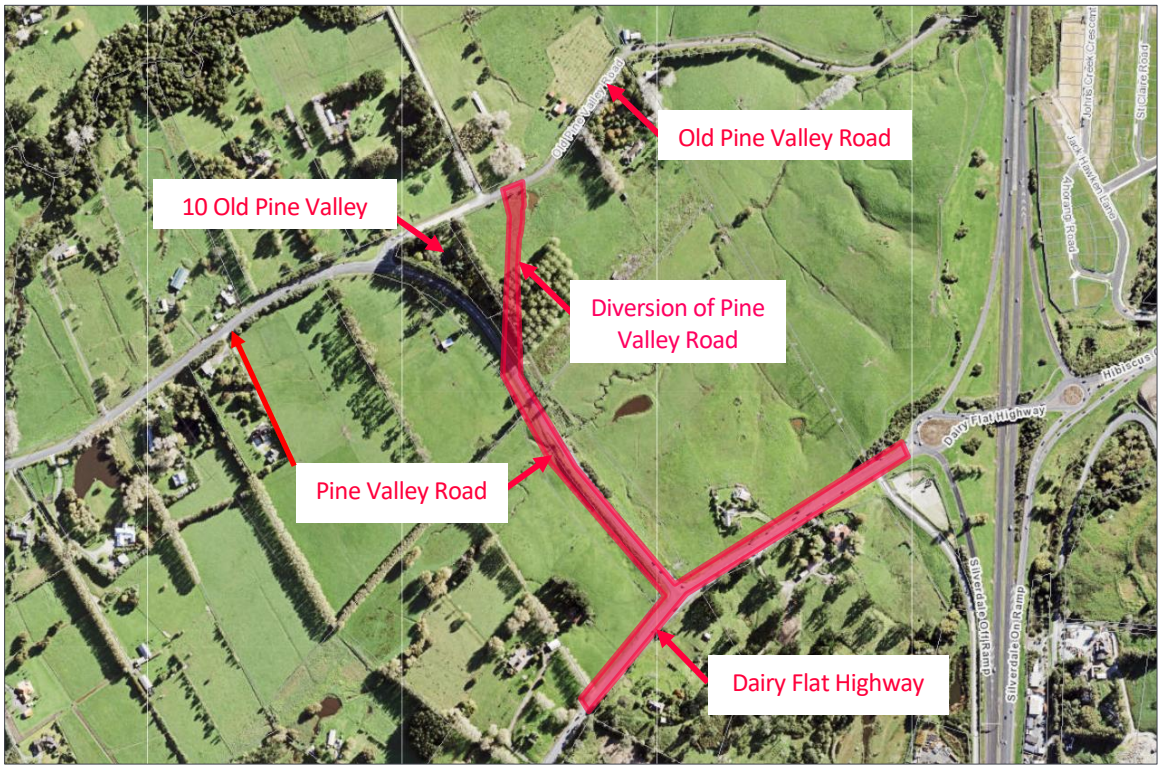
The road widening is planned to support the future growth of Milldale over the next 20 years. The project area is shown in Figure 1 overleaf. A more detailed drawing of the project works is attached in Appendix B1.

The works include realigning Pine Valley Road to connect with Old Pine Valley Road on the eastern side of the dwelling at 10 Old Pine Valley Road (this is shown in Appendix B1).

Appendix B2 and B3 shows that the nominal road width for both stage 1 and stage 2 road designs remains unchanged.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Figure 1: Project location



2.2 Traffic Data

Future traffic volumes after the completion of the Milldale residential development have been provided by Stantec and are displayed in Table 1. The percentage of heavy commercial vehicles has been obtained from the mobileroad.org website and confirmed with current Auckland Transport traffic count data.

Table 1: Annual Average Daily Traffic Data (AADT) for the year 2026

Road	AADT	%HCV*
Pine Valley Road (North of Dairy Flat Highway)	20,800	7
Dairy Flat Highway (East of Pine Valley Road)	23,800	10
Dairy Flat Highway (West of Pine Valley Road)	17,840	17
Old Pine Valley Road	12,930	5

*Heavy Commercial Vehicles

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

3.0 NOISE PERFORMANCE STANDARDS

3.1 Traffic Noise – NZS 6806:2010

The Auckland Unitary Plan Operative in Part (AUP) has adopted the New Zealand Standard NZS 6086:2010 'Acoustics – Road-traffic noise – New and altered roads' for the assessment of road traffic noise. We have assessed whether this standard applies to the project from the criteria below:

- The standard only applies to new and altered roads predicted to carry more than 2,000 AADT at the design year;
- Protected premises and facilities (PPFs) in urban areas are located within 100m of the edge of the closest traffic lane for the new or altered road;
- The do-minimum[1] noise environment at PPFs would be greater than or equal to 64 dB $L_{Aeq(24h)}$ and, if no specific noise mitigation was undertaken, the alterations would increase road-traffic noise at assessment position(s) by 3 dB or more at the design year, when compared with the do-nothing[2] noise environment; OR
- The do-minimum noise environment at PPFs would be greater than or equal to 68 dB $L_{Aeq(24h)}$ and, if no specific noise mitigation was undertaken, the alterations would increase road-traffic noise at assessment position(s) by 1 dB or more at the design year, when compared with the do-nothing noise environment.

The design year AADT in Table 1 for the Project roads exceed the 2,000 AADT threshold, and there are six properties which are located within 100m of the edge of the road. So, we have predicted the noise levels at these receivers and the results are shown in Table 2.

Table 2: Predicted noise levels*

House / (Façade)	Predicted Existing Level (dB $L_{Aeq(24h)}$)	Predicted post-construction level (dB $L_{Aeq(24h)}$)	Does NZS 6086:2010 apply?	Comments
46 Old Pine Valley Road / (N)	68.3	68.9	No	Increase due road widening
37 Old Pine Valley Road / (SE)	69.0	69.8	No	Increase due road widening
10 Old Pine Valley Road / (W – existing, E – post-construction)	72.1	68.2	No	Decrease due road diversion
1700 Dairy Flat Highway / (W)	70.2	70.5	No	Increase due road widening
1731 Dairy Flat Highway / (S)	72.2	72.6	No	Increase due road widening
1732 Dairy Flat Highway / (NW)	73.2	73.7	No	Increase due road widening

* While normally traffic noise levels are not presented to the accuracy of a decimal point, as the prediction method has an accuracy of ±2 decibels, we have presented the decimal points here to show the small noise level changes predicted.

[1] A future 'do-minimum' scenario, represents the circumstances at the design year where a project has been implemented without any specific noise mitigation. For example, without taking into consideration noise generating characteristics when selecting a road surface material.

[2] A future 'do-nothing' scenario represents a scenario at the design year where a project has not been implemented, however, traffic volumes and subsequent noise levels have changed (likely increased), over time.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

The 'predicted existing level' has been calculated with the design year traffic volumes in Table 1. This considers the area will soon have a larger residential population (as the land is zoned Future Urban in the AUP) and thus, higher traffic noise levels, even without any road widening.

The increase in traffic noise due to road widening is insignificant, so we consider that NZS6806 does not apply to this Project and have not assessed it further.

3.2 Construction Noise – NZS 6803:1999

AUP Rule E25.6.27 provides construction noise limits applicable to this project. For construction works with a duration longer than 20 weeks, the noise limits when applied at 1m from an occupied building are:

Table 3: Construction noise limits

Time of Week	Time Period (hrs)	Noise Limits	
		dB L_{Aeq}	dB L_{AFmax}
Building with activities sensitive to noise			
Weekdays	0630 – 0730	55	70
	0730 – 1800	70	85
	1800 – 2000	65	80
	2000 – 0630	40	70
Saturdays	0730 – 1800	70	85
	1800 – 0730	40	70
Sundays and public holidays	0730 – 1800	50	80
	1800 – 0730	40	70
Building with all other activities			
All days	0730 – 1800	70	-
	1800 – 0730	75	-

Rule E25.6.1.3 states that the noise from construction must be measured and assessed in accordance with New Zealand Standard NZS 6803: 1999 'Acoustics - Construction Noise'.

Road widening may have to be done at night to avoid traffic disturbance. Rule E25.6.29 relating to works within the road allows an exceedance of the noise limits provided the works do not extend for more than three nights and a CNVMP is prepared.

3.3 Construction Vibration

AUP Rule E25.6.30.1 sets out construction vibration limits in two clauses.

Clause (a) protects buildings from cosmetic damage. Vibration levels are assessed using German Standard DIN 4150-3 (1999): Structural Vibration – Part 3 Effects of Vibration on Structures. These limits are shown overleaf.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Table 4: Construction vibration limits

Type of Structure	Short-term vibration*				Long-term vibration
	PPV at the foundation at a frequency of			PPV at horizontal plane of highest floor (mm/s)	PPV at horizontal plane of highest floor (mm/s)
	1-10Hz (mm/s)	10-50Hz (mm/s)	50-100Hz (mm/s)		
Commercial / industrial	20	20 – 40	40 – 50	40	10
Residential / school	5	5 – 15	15 – 20	15	5
Historic / sensitive structure	3	3 – 8	8 – 10	8	2.5

* The Standard defines short-term as "*vibration which does not occur often enough to cause structural fatigue, and which does not produce resonance in the structure being evaluated*".

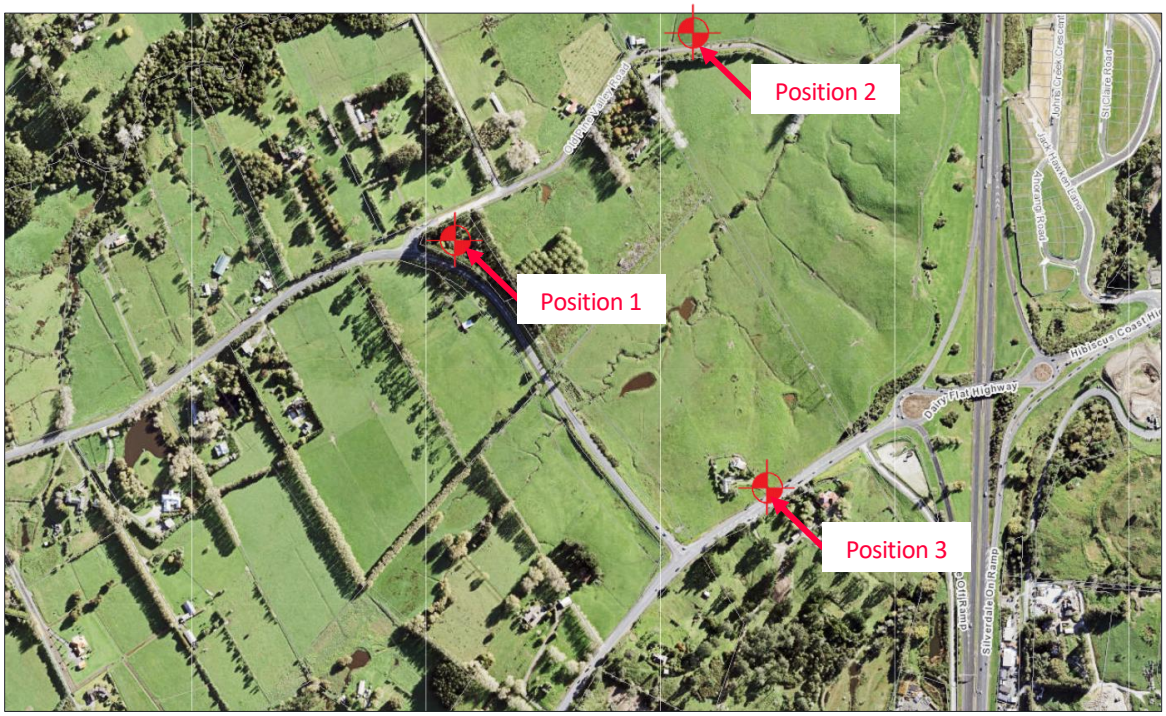
Clause (b) provides vibration amenity limits when measured within an occupied building sensitive to noise. During daytime between 0800 – 2200 hrs, the limit is 2mm/s Peak Particle Velocity (PPV). But, the rule allows for up to three days of more intensive works provided it is less than 5mm/s PPV and that prior notification is given to receivers within 50m of the works.

Note that Clause (b) of the rule should be used as a trigger for consultation and should not be used as the construction vibration limits, which are set out in Clause (a).

4.0 EXISITNG NOISE ENVIRONMENT

We measured the existing ambient noise levels, in accordance with New Zealand Standard NZS 6801:2008 'Acoustics – Measurement of environmental sound', at three locations shown in Figure 2.

Figure 2: Ambient noise measurement locations



This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Table 5 displays the results.

Table 5: Ambient Noise measurements

Survey Position	Location Description	Time	Measured Noise Level		Noise sources
			dB L_{Aeq}	dB L_{A90}	
1	Front lawn of 10 Old Pine Valley Road	15:01	55	49	Traffic form Pine Valley Road dominant, birds, Cessna plane flyover, two car pass-bys on Old Pine Valley Road, distant rooster
2	4m from edge of 46 Old Pine Valley Road Silverdale	15:01	49	46	Traffic from Dairy Flat Highway and Pine Valley Road dominant, occasional traffic from SH1, birds, crickets, trees rustling
3	At farm gate of 1731 Dairy Flat Highway, 14m from road edge	15:01	70	56	Traffic from Dairy Flat Highway dominant, birds

The above noise levels show that the area is already somewhat affected by man-made noise, generally traffic on the local roads. This noise generation will increase over time, with more people moving into the area as is anticipated by the Future Urban Zone growth.

5.0 CONSTRUCTION NOISE ASSESSMENT

5.1 There may be some night works

Night works may be required for road widening works to avoid traffic disruption, particularly on Dairy Flat Highway due to the high traffic volumes here. But we assume that most works will occur between 7:30am to 6pm Monday to Saturday.

The duration of the construction works is likely to be longer than 20 weeks.

5.2 Construction noise levels will comply at 50 metres

Table 6 below sets out common construction equipment for roading projects and their noise levels at various distances. Piling works are also required to construct retaining walls around wetlands.

Table 6: Indicative construction noise levels with no mitigation

Plant	Sound Power Level dB L_{wA}	dB L_{Aeq} @ 10 m	dB L_{Aeq} @ 20 m	dB L_{Aeq} @ 50 m
Wheeled mobile Crane (400T)	106	81	75	66
Tracked mobile crane (600T)	100	74	68	59
Motor scraper	109	82	76	68
Bulldozer	109	82	76	68
Hydraulic excavator	107	79	73	65
Dump truck	108	81	77	69
Roller (static or vibratory)	103	75	69	61
SP compactor	100	72	66	58

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Plant	Sound Power Level dB L_{wA}	dB L_{Aeq} @ 10 m	dB L_{Aeq} @ 20 m	dB L_{Aeq} @ 50 m
Loader	112	84	78	70
Bitumen emulsion	94	66	60	52
Hotmix application	100	72	66	58
Large bored piling rig	111	83	77	69

We predict that noise levels at any buildings more than 50 metres from the construction area would comply with the 70dB L_{Aeq} daytime construction noise limit without the need for mitigation. Mitigation, such as temporary noise barriers can provide up to 10 decibels of shielding and would reduce the general setback distance to 20 metres.

There are two existing dwellings which are within 20m of the road construction, these are:

- 1731 Dairy Flat Highway at approximately 20m
- 1732 Dairy Flat Highway at approximately 15m

We consider the construction noise effects for the dwellings on Dairy Flat Highway to be less pronounced due to the high ambient noise levels (see Table 5).

All other dwellings will be more than 50 metres from the construction site. We predict the construction noise levels at these dwellings will comply with the noise limits.

We note that at the time of implementation of this Project there may already be new buildings constructed in the vicinity of the roads. These buildings will need to be assessed for construction noise effects at the time of construction.

5.3 The construction noise effects are reasonable

Construction noise levels will generally comply with the noise limits set out in Section 3.2 and we consider the construction noise effects will be reasonable.

Construction activities may exceed the noise limits for limited times and for some receivers. When this is likely to occur, the contractor should investigate all practicable options to mitigate noise. We recommend the contractor implements a CNVMP as a guide to manage and mitigate construction noise.

5.4 Construction vibration levels will generally comply

Most receivers are more than 50 metres from the construction. We predict that construction equipment will generally comply with the vibration limits stated in Section 3.3 above.

For the residential dwellings listed above, which are within 20m of earthworks, cosmetic building damage is unlikely, but there may be a reduction in amenity. Equipment such as vibratory rollers and large excavators should be used with caution, and on-site measurements used to confirm relevant setback distances. Communication with these receivers and appropriate equipment selection will be necessary.

5.5 Manage & mitigate construction noise and vibration

Below, we discuss measures to mitigate potential adverse effects from construction noise and vibration.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

5.5.1 Notify any affected parties

The contractor should communicate with any persons likely to be affected by construction noise. This includes all dwellings within 50 metres of the proposed works for Monday to Saturday construction activities.

We recommend that notification be provided prior to works starting, by means of a letter drops or similar. Include the details and timing of the proposed works and a contact phone number should anyone have any concerns or need more information.

5.5.2 Use noise barriers

The contractor should use noise barriers where they are effective and where the noise levels are likely to exceed the noise limits. Temporary noise barriers, such as sheets of plywood or construction noise curtains, can reduce noise levels by up to 10 decibels.

We recommend noise barriers for activities where works will occur in one location for an extended period, such as concrete cutting.

5.5.3 Adopt general best practice

The following general noise mitigation measures should be implemented throughout the construction of the project:

- Train personnel to operate equipment quietly and with little vibration
- Maintain equipment to ensure noise and vibration levels remain as low as practicable
- Select low noise and vibration plant wherever practical and mitigate noisy plant, such as with silencers or enclosures. Plant that generates low levels of vibration shall be preferred over vibration intensive plant, where practicable
- Only operate at night when noise limits can be complied with, or when daytime works are not a practicable alternative. When operating at night-time, all practicable measures must be implemented to reduce noise emissions as per the CNVMP
- Deactivate tonal reversing alarms or replace them with a suitable alternative such as a visual or broadband alarm if required for night-time works (and ideally at any time of day). This approach has been successfully implemented on several NZTA projects

If noise from construction is likely to exceed the noise limits for a specific activity or in a specific area, and the general mitigation measures discussed above are not enough to fully comply, the contractor should investigate and implement further mitigation measures where practicable.

5.5.4 Prepare a CNVMP

A CNVMP should be prepared and would generally include information set out in NZS6803:1999 in Section 8 and Annex E2, such as:

- The project noise limits contained within this assessment
- The assessments/predictions contained within this assessment
- General construction practices, management and mitigation
- Noise management and mitigation measures specific to activities and/or receiving environments
- Monitoring and reporting requirements
- Procedures for handling complaints
- Procedures for review of the CNVMP throughout the project

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

A CNVMP should be implemented on site for the duration of the construction works. The CNVMP is considered a living document and should be kept up to date regarding actual timing/equipment use and methodologies, should these change throughout the construction process.

6.0 CONCLUSION

'Milldale Infrastructure Project 1 – Argent Lane Extension' includes a new road, and upgrade of Pine Valley Road and Dairy Flat Highway, including the intersection of Dairy Flat Highway and Pine Valley Road. This is to support the future growth over the next 20 plus years.

We predicted the traffic noise levels using traffic data for the design year 2026 after the completion of the Milldale residential development. We predict the traffic noise levels due the road upgrades will not significantly change. So, there will be no additional traffic noise effects on neighbouring dwellings, and effects will be insignificant.

Construction may exceed the AUP noise limits briefly due to the proximity to some dwellings. These exceedances can be managed with a Construction Noise and Vibration Management Plan and the effects reduced with proactive communication with affected parties.

We predict that construction vibration will comply with the cosmetic building damage limits. Vibration amenity should be monitored and addressed case by case.

Overall, we conclude that the roading project can be constructed and operated within reasonable noise and vibration levels.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

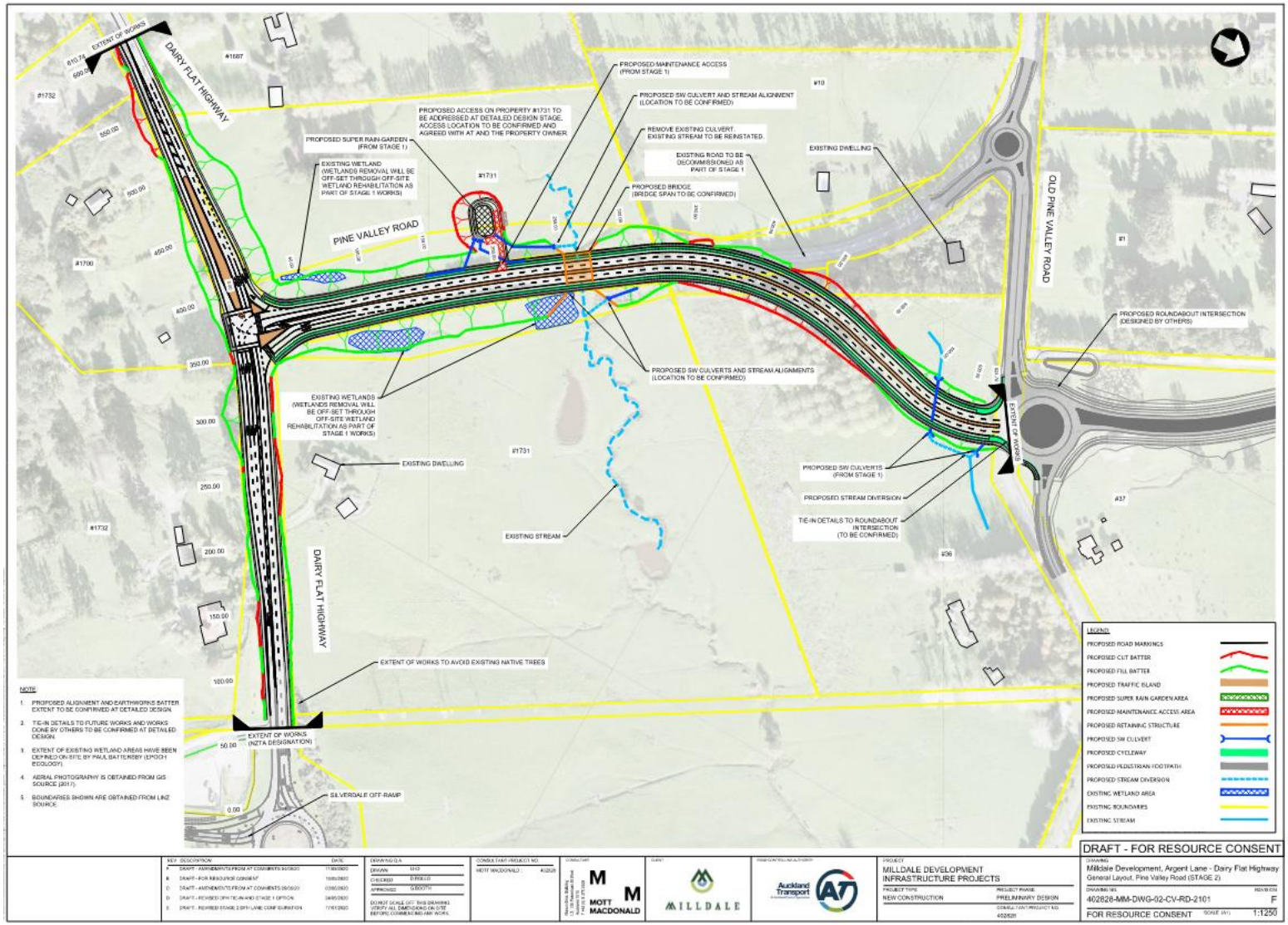
APPENDIX A GLOSSARY OF TERMINOLOGY

Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa i.e. dB = 20 x log(P/Pr)
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
$L_{Aeq\ (t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
$L_{A90\ (t)}$	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
Noise	A sound that is unwanted by, or distracting to, the receiver.
Vibration	When an object vibrates, it moves rapidly up and down or from side to side. The magnitude of the sensation when feeling a vibrating object is related to the vibration velocity. Vibration can occur in any direction. When vibration velocities are described, it can be either the total vibration velocity, which includes all directions, or it can be separated into the vertical direction (up and down vibration), the horizontal transverse direction (side to side) and the horizontal longitudinal direction (front to back).
PPV	Peak Particle Velocity For Peak Particle Velocity (PPV) is the measure of the vibration aptitude, zero to maximum. Used for building structural damage assessment.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

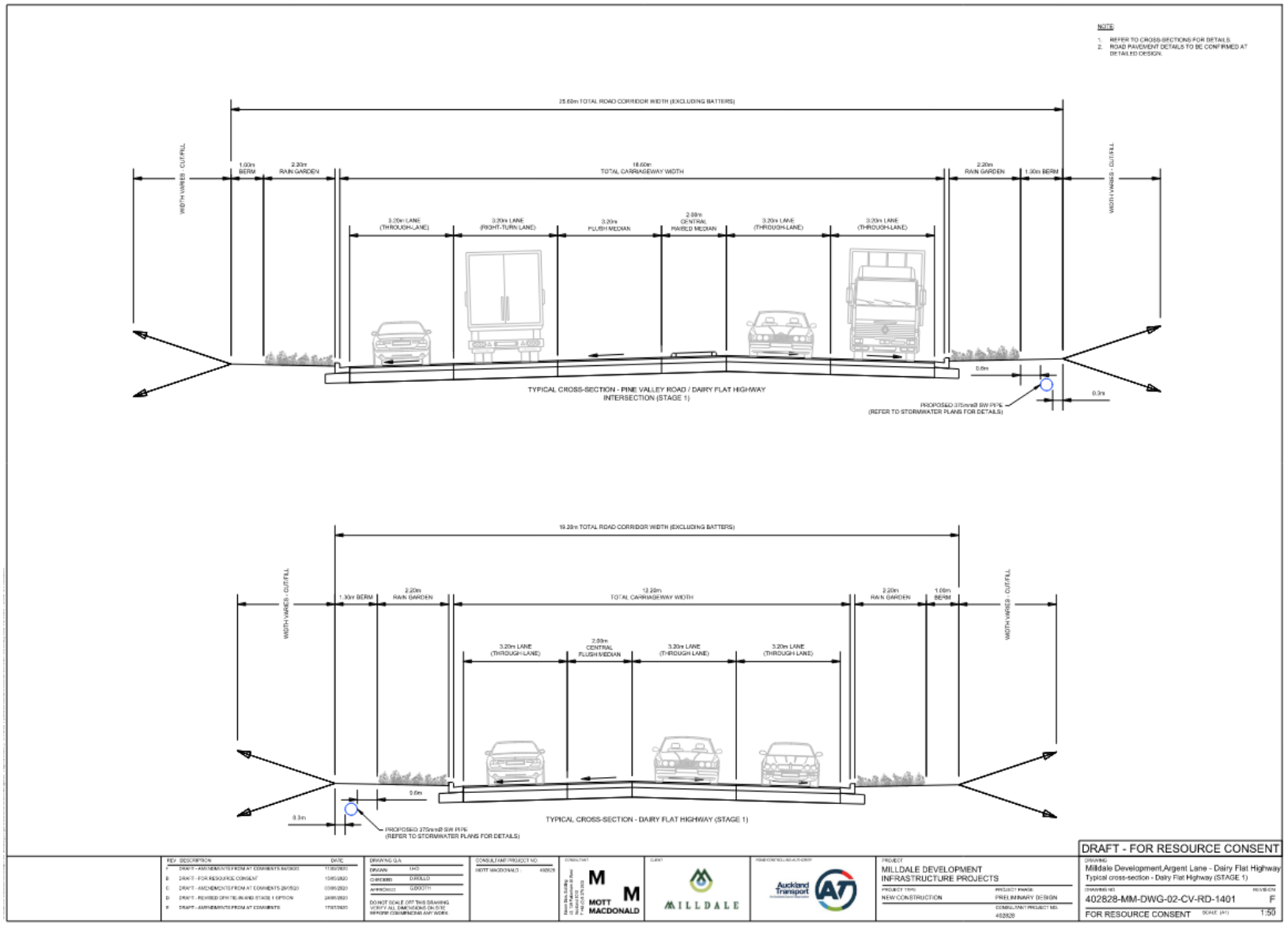
APPENDIX B SUPPLEMENTARY DRAWINGS

B1 Diversion of Pine Valley Road to connect with Old Pine Valley Road (supplied by Mott MacDonald 15 September 2020)



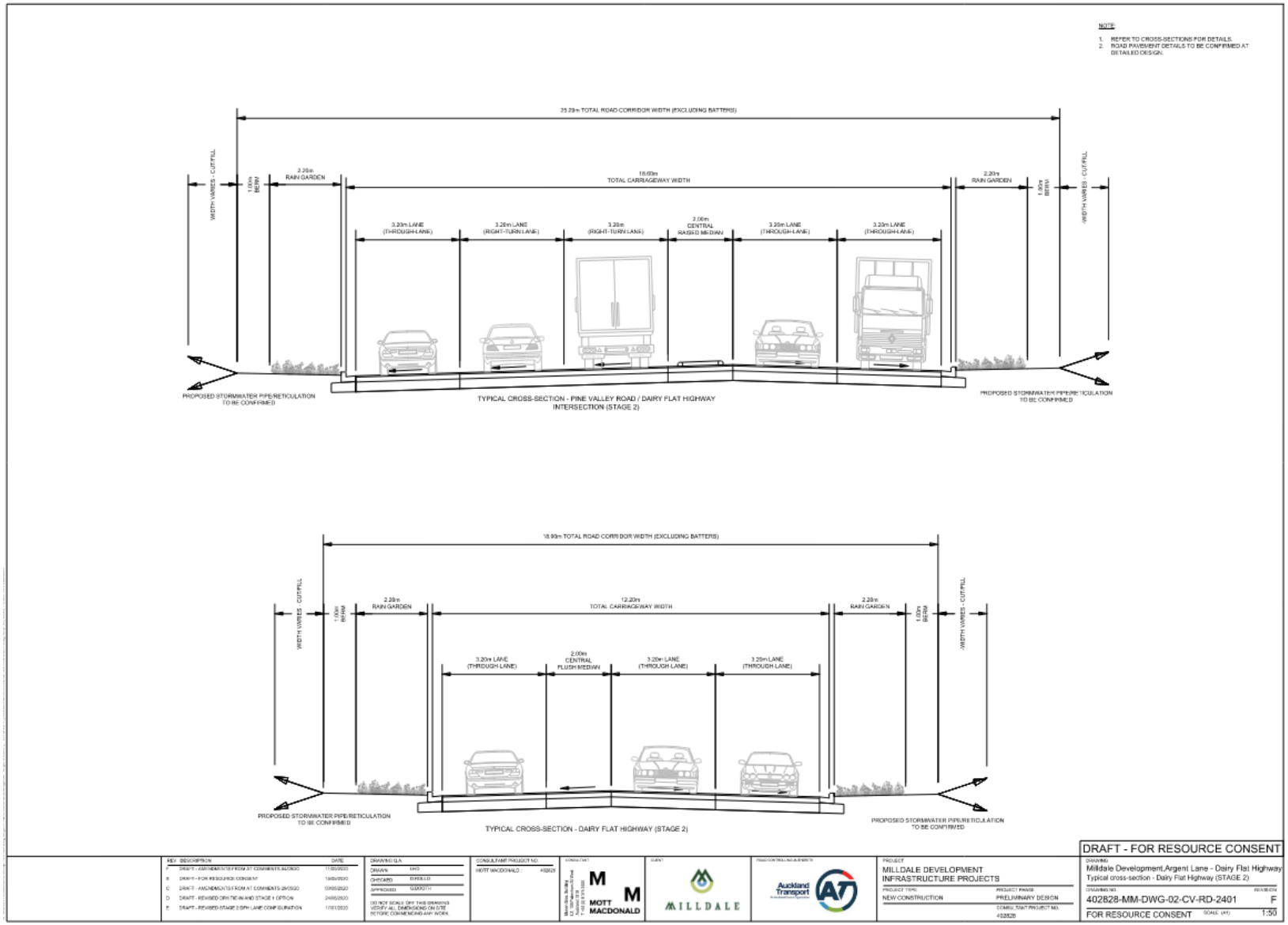
This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

B2 Stage 1 design of Pine Valley Road and Dairy Flat Highway (supplied by Mott MacDonald 15 September 2019)



This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

B3 Stage 2 design of Pine Valley Road and Dairy Flat Highway (supplied by Mott MacDonald 15 September 2019)



This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited