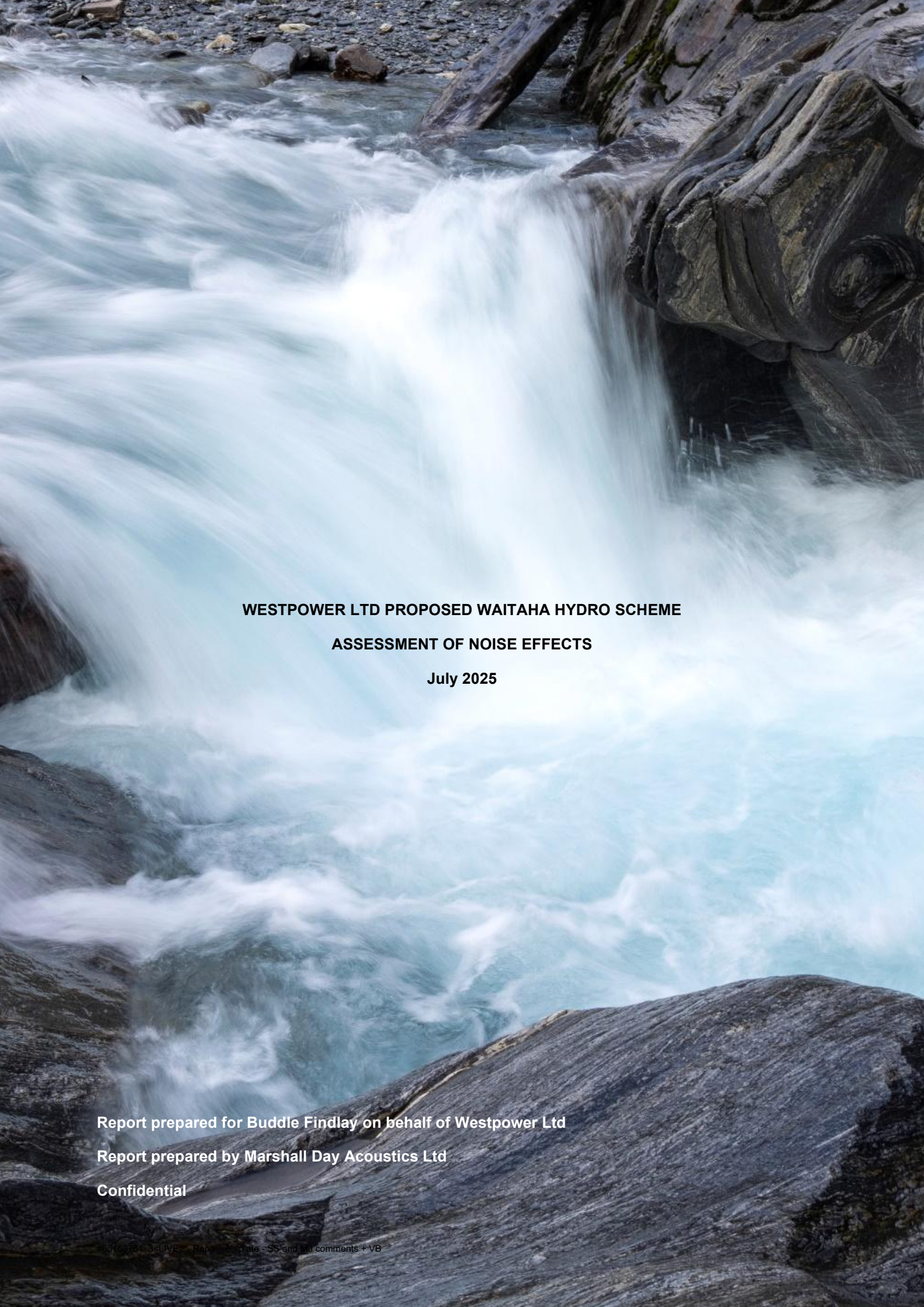

WESTPOWER LTD PROPOSED WAITAHA HYDRO SCHEME

ASSESSMENT OF NOISE EFFECTS

July 2025

Report prepared for Buddle Findlay on behalf of Westpower Ltd

Report prepared by Marshall Day Acoustics Ltd

Confidential

Project: **WESTPOWER PROPOSED WAITAHA HYDRO SCHEME**

Prepared for: **Buddle Findlay on behalf of Westpower Ltd**

Attention: [redacted]

Report No.: **Rp 001 R06 20240063**

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Cover image: Aaron Staples

Statement confirming compliance with the Environment Court's Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023

As an expert witness or peer reviewer, I have read, and I am familiar with the Environment Court's Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023.

I have prepared my, or provided input into, an assessment of effects for the Waitaha Hydro Scheme in compliance with the Code of Conduct and will continue to comply with it in this Fast-track Approvals Act process. In particular:

- my overriding duty is to assist the decision-maker impartially on matters within my expertise;
- unless I state otherwise, my 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; and
- I have not, and will not behave as, an advocate for the Applicants.

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1 INTRODUCTION

1.1 Westpower Ltd (**Westpower**) proposes a run-of-the-river hydro-electric power scheme (**Scheme**) on the Waitaha River, approximately 60 km south of Hokitika[1] on the West Coast of the South Island, New Zealand.

1.2 The proposed Headworks include a low weir and intake structure situated at the top of Morgan Gorge that will divert water into a tunnel and pressurised desander. A pressurised tunnel will convey the diverted water down to a Power Station below Morgan Gorge. Having passed through the turbines the diverted water will be returned via a tailrace, and discharging to the Waitaha mainstem in the vicinity of the confluence with Alpha Creek. The Scheme will divert up to a proposed maximum of 23 m^3/s (cumecs) whilst maintaining a minimum residual flow of 3.5 cumecs immediately downstream of the intake. Construction access to the Headworks above Morgan Gorge will initially be via helicopter and/or foot and then via the access tunnel (once it is completed), while an access road and transmission line corridor will be required from Anderson Road to the Power Station Site to enable a connection to the existing network. As part of this work, the existing transmission corridor, extending from State Highway 6 to the southern part of Waitaha Road will also be upgraded. A short access road will provide temporary construction access between the access tunnel portal and Construction Staging Area 1. Emergency sirens will be installed at the Headworks and Power Station to warn people about a sudden change in water flow in the event of emergency Power Station outages and the operation of the 10 cumec bypass valve.

1.3 Details of the project design including the proposed construction methodology and Scheme operations as it relates to noise is set out in **Appendix A.** This information, as well as a description of the **Project Site** is set out in the **Project Overview Report** and **Project Description**.

1.4 Marshall Day Acoustics has been commissioned by Westpower to assess the potential noise effects of the Scheme. The qualifications and experience of the report author relevant to this Scheme are set out in **Appendix B**.

1.5 This report (**Noise Report**) considers noise generation during the construction and operational phases of the Scheme. It provides an assessment of the potential noise effects that may be experienced by nearby residents, recreational users and wildlife and how (if necessary) these effects are proposed to be avoided, mitigated or remedied.

2 EXISTING ENVIRONMENT

Ambient Noise Levels

2.1 Existing ambient noise levels around the Waitaha River vary significantly. Near the river, noise levels can be 75 dB L_{Aeq} or more. However, noise levels can be as low as 35 dB L_{Aeq} in locations far away from the river without direct line of sight under fine, calm conditions.

2.2 On 6 August 2024, a site visit to the Waitaha Valley was undertaken to perform ambient daytime noise measurements at various locations along the Waitaha River. Further details of the measurements, such as equipment and calibration information, are provided in **Appendix C**.

[1] Measured using local roads and tracks to the Power Station.

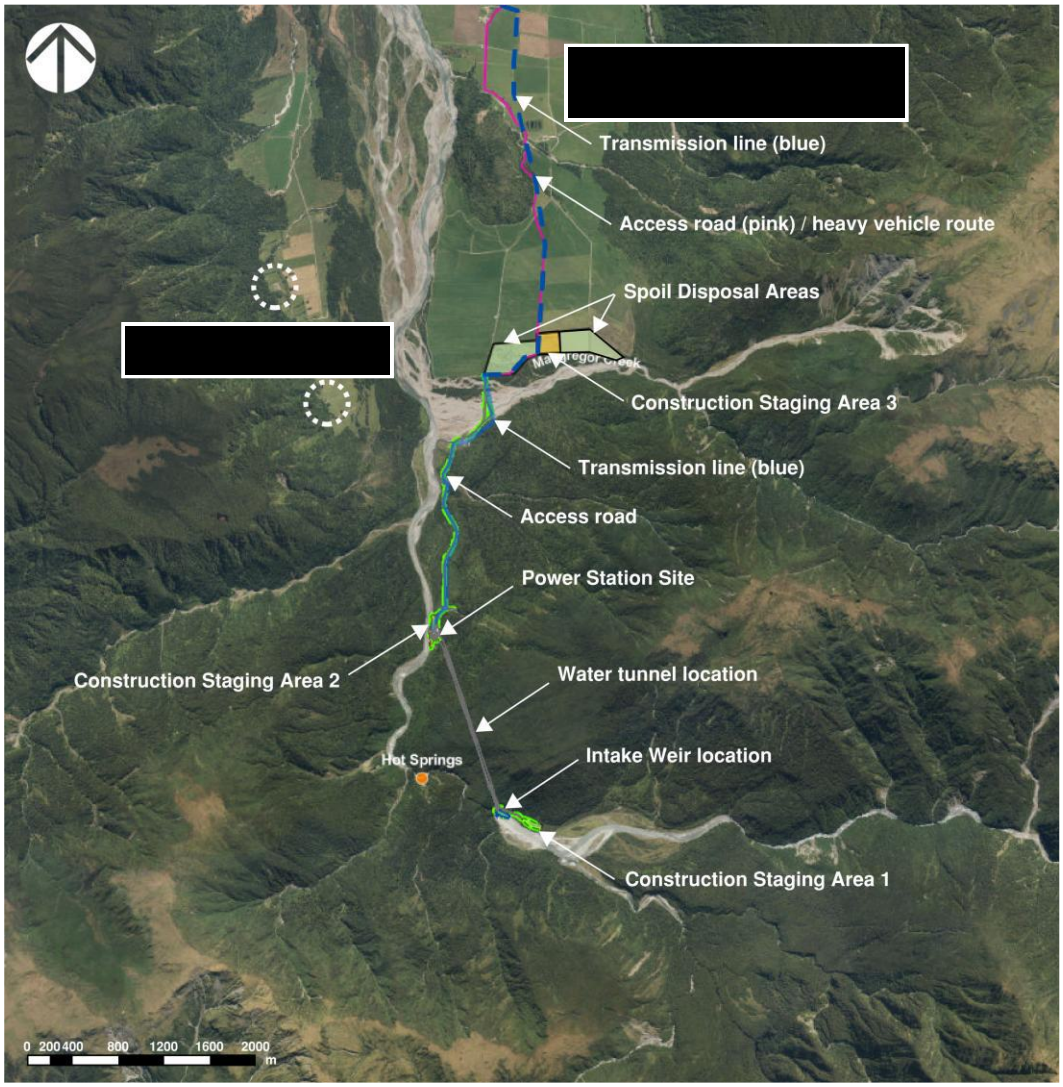
2.3 The Waitaha River flow was relatively low during our visit – estimated by Westpower to be around 6.5-7 cumecs. For reference, the median flow is around 18 cumecs[2]. Weather conditions were fine with light winds, which meant our ambient noise measurements represent typical "quietest day" noise levels. During wet or windy conditions, or when river flow rates are greater, ambient noise levels will be significantly higher.

2.4 Close to the river (i.e. within 10 metres), noise levels were measured around 65-75 dB L_{Aeq}. A few hundred metres back from the river without direct line of sight to the river, we measured noise levels around 35-40 dB L_{Aeq}.

Nearest Dwellings

2.5 The nearest dwellings to the proposed Scheme are between approximately two to four kilometres away from the proposed Power Station Site and are indicated in **Figure 1**. A number of other dwellings are situated further north up the Waitaha Valley. However, these dwellings are at such a distance from the Scheme that any potential noise effects would only be associated with helicopter and vehicle movements to and from the site.

Figure 1: Proposed Scheme and locality (base map provided by Westpower)



[2] Waitaha Hydro Project – Downstream Flow Modelling Report prepared by AusHydro, dated 7 May 2025

3 NOISE EFFECTS ASSESSMENT

3.1 The potential noise effects of both the construction and operational phases of the Scheme are considered below. Potential noise effects are discussed in terms of residents of nearby dwellings, recreational users and wildlife. Because the potential for adverse noise effects is greatest during the construction phase, this is the main focus of the noise assessment.

3.2 New Zealand Standard NZS 6803:1999 "*Acoustics - Construction Noise"* is the appropriate standard for assessing construction noise in New Zealand and this is referred to in both the Operative Westland District Plan and the Proposed Te Tai o Poutini District Plan. Further details of relevant noise assessment criteria used to inform this effects assessment is provided in **Appendix D**.

Dwellings

Construction of Access Road

3.3 The only dwellings that will be exposed to notable noise from the construction of the access road are those located on the farm property at [redacted] (refer to **Figure 1**).

3.4 Provided that the recommended noise limits set out in NZS 6803:1999 are achieved at [redacted] during construction of the access roads, noise effects at these dwellings will be reasonable. This is expected to be achieved provided that the construction of the access roads in close proximity to these dwellings is only carried out during the daytime hours, as specified in the Standard (0730-1800 hours).

3.5 All other dwellings are over one kilometre away from the nearest access road and the noise effects arising from road construction at these dwellings will be reasonable.

Construction of Scheme

3.6 The location of the proposed Scheme is such that construction noise sources will generally be over four kilometres away from the nearest dwellings. At this distance, noise from the majority of construction activities will be negligible. The most significant construction noise sources are discussed below.

Helicopter Movements

3.7 Helicopters will be used to assist with constructing parts of the Headworks. Hughes 500 helicopters (similar to those typically used at Franz Josef Glacier) will be used to transport personnel, equipment and materials from the Power Station Site or Construction Staging Area 3 on the northern side of Macgregor Creek to the Headworks construction site. Up to eight movements per day are anticipated (i.e. two return trips at the start of the day and two at the end of the day) between these sites over a period of up to 24 months. This period allows for days on which the river levels are too high for construction activities and or conditions are unsuitable for flying.

3.8 For the majority of concrete pouring at the Headworks, concrete will be batched at the Construction Staging Area 3 and then transported by concrete trucks though the access tunnel to the Headworks. Prior to completion of the access tunnel however, helicopter access to the Headworks will be required for preparatory works which need to occur during low flows, and helicopters may also be required for small amounts of concrete pouring. There will be 4 – 6 months needed for this

work, but this will be subject to low flows so could be happening over a couple of seasons if flows remain high. During peak construction of the Headworks, there may be up to 30 helicopter movements between Construction Staging Area 3 and the Headworks in one day.

3.9 In addition, helicopters will be required to construct the transmission lines between the access road and the Power Station. This involves a helicopter hovering for up to two hours per day as it pulls conductors along approximately 2 km sections of the line. The work is anticipated to take a week or so, but may be spread over a couple of weeks depending on construction sequencing and weather.

3.10 Predicted noise level contour maps for the range of anticipated helicopter activities is provided in **Appendix E**.

3.11 If the helicopters are stored on site, the noise effects will generally be limited to the nearest dwellings [redacted]

3.12 In the event that helicopters are flown to and from the Scheme Project Site each day rather than stored on site overnight, helicopter noise received at dwellings close to the flight path has the potential to be more noticeable. To ensure noise from helicopters accessing the Project Site is controlled as far as practicable, helicopters should be flown in accordance with noise abatement techniques such as The Helicopter Association International's 'Fly Neighborly' programme. Helicopter activity should also be managed such that noise emissions achieve the appropriate limits contained in New Zealand Standard NZS 6807:1994 "*Noise Management and Land Use Planning for Helicopter Landing Areas"*. Our calculations indicate that this will be achievable (refer to **Appendix E**). These recommendations along with other helicopter noise management considerations are included in the draft Construction Noise Management Plan (**CNMP**). It is also noted that kayakers and recreational users currently utilise helicopters to access the area at times, and as such, the sound of helicopters will not be unfamiliar to others in the environment.

3.13 Provided that the recommendations provided in the draft CNMP are adhered to, helicopter noise emissions will be below the recommended noise limit provided in NZS 6807:1994 at all dwellings. It is therefore considered that any potential noise effects from helicopter activity will be reasonable at nearby dwellings.

Vehicle Movements on Waitaha Road

3.14 As previously stated, construction traffic on Waitaha Road will vary considerably, depending on the construction activity occurring at the time. During the busiest periods of construction, there are anticipated to be up to an additional 40 light vehicle movements and 12 heavy vehicle movements per day. Residents on Waitaha Road will experience a noticeable increase in traffic, although traffic noise levels are predicted to be around 45-50 dB $L_{Aeq(1hr)}$ during the day at the dwellings closest Waitaha Road, which is within acceptable guidelines. Construction traffic noise effects will therefore be reasonable.

3.15 In order to further mitigate construction traffic noise effects, it is recommended that heavy vehicles only use Waitaha Road during daytime hours (7am to 10pm Monday to Friday and 8am to 8pm on weekends and public holidays) as far as practicable. Only a small number of vehicle movements will be required at night during the tunnelling stage of construction (approximately 11 movements for each shift change).

3.16 Most heavy vehicle movements will occur within the Scheme footprint – between the Power Station/tunnel portal exit location and the Construction Staging Area 3/Spoil Disposal Areas.

Blasting

3.17 Blasting will be required during tunnel excavation and construction of the Headworks structures. Because the operative and proposed District Plans do not provide a permitted activity standard for blasting noise, this noise assessment is based on the limits from Australian Standard AS 2187.2-2006 *"Explosives-Storage and use, Part 2: Use of explosives"* (specifically Appendix J), which is considered best-practice in New Zealand. Based on previous projects involving blasting, a buffer distance of 500 metres is considered sufficient to ensure the maximum airblast overpressure is below the recommended limits provided in AS 2187.2-2006. All dwellings are significantly further away from the Scheme than this and therefore it is expected that noise from blasting to be well below acceptable limits at all dwellings and therefore reasonable. Notwithstanding this, it is recommended that residents within five kilometres of any blasting work are informed prior to blasting to minimise any potential adverse reactions.

Operational Noise

3.18 The separation distances from the nearest dwellings to the Scheme is such that operational noise will easily comply with both the Operative and Proposed District Plan noise limits.

3.19 The only noticeable noise associated with the Scheme once it enters the operational phase will be staff vehicle movements on the local road network, infrequent helicopter movements and occasional emergency sirens. It is understood that the Scheme could result in an additional four light vehicle movements per day on Waitaha Road during the first year of operation. However, the number of vehicle movements is expected to drop back to approximately two per week after the first year. There will be occasions when greater numbers of vehicle movements are required for maintenance purposes. However, this is expected to occur infrequently and is therefore not expected to result in any adverse noise effects.

3.20 Any helicopter movements would be very rare, and would be managed to comply with the relevant noise limits contained in NZS 6807:1994 "Noise management and land use planning for helicopter landing areas".

3.21 The emergency sirens proposed at the Headworks and Power Station are highly directional and sufficiently far away from the dwellings that siren sounds are unlikely to be audible to residents. The directional sirens have been modelled to minimise effects for people and wildlife (refer to **Appendix F** for calculated noise levels).

3.22 Based on the above, it is considered that the operation of the Scheme will result in negligible noise effects at nearby dwellings.

Recreational Users

3.23 The Rob Greenaway & Associates (2025) Waitaha Hydro Scheme: Assessment of Environmental Effects – Recreation (**Recreation Report**) found that the Waitaha study area receives low use from kayakers, trampers and hunters. The primary recreational value of the area is its high-quality whitewater and the wider area's remoteness.

3.24 From an acoustic perspective, the whitewater characteristics of the area result in a relatively high level of ambient noise. Although the river flow within the abstraction reach will reduce under the Scheme, noise from the river and associated rapids will still provide useful masking of construction and operational noise from the Scheme and reduce the potential for adverse noise effects to arise.

3.25 Based on the relatively high ambient noise levels, even the noisiest construction activities (such as piling) are predicted to be inaudible beyond a distance of approximately two kilometres. Noise from general construction activities, which will be temporary in nature, is not expected to be intrusive to water based recreational activity beyond a distance of two to three hundred metres.

Walking and Tramping Tracks

3.26 A walking track currently passes close by the Scheme. It is understood that, where possible this track will be rerouted away from construction areas for health and safety reasons. At its closest, parts of the track could be approximately 100 metres from construction areas. As a result, construction noise will be clearly audible on parts of the walking track during construction, but will be transitory as trampers move through the area.

3.27 It is recommended that the walking track be temporarily closed during blasting, such that a 500 metre buffer is maintained between the track and the blasting activity. As blasting typically only occurs over short periods of several minutes at a time, it is anticipated that trampers would not be significantly inconvenienced by the temporary closure. Mitigation measures have been included in the draft CNMP but could alternatively be incorporated into a Health and Safety Management Plan.

Nearby Tramping Hut

3.28 A trampers' hut is located on Kiwi Flat, approximately one kilometre from the Headworks. Considering the separation distance involved, and the hut's proximity to the river which results in a high level of background noise, it is anticipated that any potential noise effects will be reasonable, provided that construction activities are managed in accordance with NZS 6803:1999 and comply with the recommended noise limits contained in that Standard.

Helicopter Movements

3.29 To minimise noise effects, helicopters should be flown in accordance with noise abatement techniques such as The Helicopter Association International's 'Fly Neighborly' programme to mitigate noise effects as far as practicable. Helicopters are the main form of transport when kayakers are accessing the Waitaha River runs above Morgan Gorge. Hunters and trampers may also use helicopters to fly in and/or out of Kiwi Flat and the surrounding area. Although helicopter noise levels will be relatively high for short periods, the likelihood of exposure, and therefore adverse effect, is low, given the duration of helicopter noise and the relatively small number of individuals that use the walking track. Predicted noise level contour maps for the range of anticipated helicopter activities is provided in **Appendix E**.

Operational Noise

3.30 Once operational, the Scheme will be largely inaudible over river noise. The only noticeable noise to recreational users is on occasions when emergency sirens operate to warn them about a sudden change in water flow in the event of emergency shutdown, which is when the bypass valve will be operating. Refer to **Appendix F** for predicted siren noise levels.

3.31 Overall, any potential noise effects are considered to be minimal for recreational users including those using the walking tracks.

Wildlife and Livestock

3.32 In general, the various project wildlife experts are relied upon to assess the impacts of noise on wildlife. Predicted noise levels have however been provided – both in terms of daytime averages and maximums – for wildlife experts to assess the noise effects on individual species.

3.33 Notwithstanding this, a literature review of the potential noise effects on livestock and wildlife has been conducted and some general discussion of the available research knowledge in **Appendix G**.

3.34 In general, once livestock become habituated to noise, especially when it is steady and associated with clearly non-threatening activity, they generally demonstrate little adverse response. This is particularly true with cattle, horses, sheep and other livestock.

3.35 Recommended buffer distances for livestock have been included in the draft CNMP to ensure animals are not exposed to construction noise above acceptable limits. Once operational, the noise from the Scheme will have a negligible effect on livestock.

4 RECOMMENDED EFFECTS MANAGEMENT

4.1 The following measures are recommended to ensure that the effects of noise from the construction and operation of Scheme are reasonable.

a) The preparation of a CNMP (noting that a draft CNMP has been prepared and attached to this application) prior to the commencement of the construction of the Scheme to address, as a minimum, the following:

i) The consent conditions that relate to noise

ii) Noise sources and potential impacts

iii) Methods to be used for noise control

iv) Managing noise from blasting

v) Managing noise from helicopter activity

vi) Training of operators and contractors

vii) Contingency plans (in the event that noise limits are exceeded)

viii) Complaints and reporting procedures

b) The activities are to be undertaken in accordance with the provisions of the CNMP.

c) Noise from construction activities, excluding blasting and helicopter movements, must comply with the long term duration standards in NZS 6803:1999 *"Acoustics – Construction Noise*".

d) Air overpressure from blasting (including any implosive jointing of transmission line cables) must comply with the following limits set out in Australian Standard AS 2187-2006 *"Explosives – Storage and Use: Use of Explosives"* when measured at any dwelling:

i) A maximum airblast overpressure of 115 dB Lpeak
The level of 115 dB Lpeak may be exceeded on up to 5% of the total number of blasts

over a period of 12 months. However, the level should not exceed 120 dB L_{peak} at any time.

e) Helicopter movements during construction and operation must be managed so that noise emissions achieve the relevant noise limits contained in NZS 6807:1994 "*Noise management and land use planning for helicopter landing areas*":

i) 50 dB L_{dn} (day-night average) and 70 dB L_{AFmax} (between 10 pm and 7 am) at the notional boundary of any rural dwelling,

and flown in accordance with noise abatement techniques provided in The Helicopter Association International's 'Fly Neighborly' programme.

f) Noise from operation of the Scheme must comply with the following noise limits at any point within the notional boundary of any sensitive activity within any site receiving noise:

i)	7am to 10pm Monday to Friday 8am to 8pm weekends and public holidays	55 $L_{Aeq\ (15\ min)}$
ii)	10pm to 7am Monday to Friday 8pm to 8am weekends and public holidays	45 $L_{Aeq\ (15\ min)}$
iii)	10pm to 7am all days	75 dB L_{AFmax}

g) Emergency sirens must only be located near the Headworks and Power Station and shall be designed and directed in a way to ensure they are audible in areas where staff and recreational users need to be alerted of sudden river level changes, but no louder than necessary to limit potential noise exposure to wildlife.

Table 2 - Environmental effects of noise associated with each phase of the Scheme (construction and operational), the suggested approaches to manage these effects, and effects after management measures have been applied.

Scheme phase	Environmental effects (positive and adverse effects)	Assessment of effects	Recommended effects management	Residual effects post mitigation
Construction effects	Impacts on residents – construction of access road	Potentially significant	CNMP Compliance with noise and guidelines Limit road construction activities to 0730-1800 hours.	Reasonable, including compliance with construction standards
	Impact on residents – helicopters	Significant, but temporary	CNMP Compliance with helicopter flying guidelines	Reasonable, including compliance with standards
	Impacts on residents – construction traffic	Reasonable	Limitations on heavy vehicle use	Reasonable
	Impacts on residents - blasting	Significant, but temporary	Notify residents within five kilometres of any blasting work	Reasonable
	Impacts on walking and tramping track - helicopters	Significant, but temporary	Compliance with helicopter flying guidelines	Moderate but temporary
	Impacts on walking and tramping track - blasting	Significant, but temporary	Walking track be temporarily closed during blasting	Low
	Impacts on Kiwi Hut	Significant, but temporary	When the hut is occupied, it is recommended that construction activities are managed in accordance with NZS 6803:1999 and comply with the recommended noise limits contained in that Standard	Reasonable, including compliance with standards

	Impacts on recreationalists - helicopters	Significant, but temporary	Compliance with helicopter flying guidelines	Moderate but temporary
	Impacts on livestock	Potentially significant	Buffer distances for livestock	Reasonable
Operational effects	Impacts on residents	Low	Compliance with helicopter flying guidelines	Low
	Impacts on recreationalists	Potentially significant during sirens	Ensure siren is no louder than necessary to alert staff and recreationists in the vicinity of the Headworks and Power Station of sudden changes to water flow, when the bypass valve will be operating	Reasonable
	Impacts on livestock	Negligible	Nil	Negligible

5 CONCLUSION

5.1 Marshall Day Acoustics has assessed the noise effects that may arise from the construction and operation of the proposed Scheme. As the Scheme is situated in a conservation area, potential noise effects have been considered for residents and recreational users, and data has been provided to enable technical specialists to assess the effects on wildlife.

5.2 During construction, the potential noise effects on residents of nearby dwellings will be reasonable, provided that the recommendations in this report are adopted. On site construction activities will be managed to comply with the requirements of NZS 6803:1999 "*Acoustics - Construction Noise*" in line with best practice. Construction traffic on Waitaha Road and helicopter movements will be appropriately managed to ensure noise effects are reasonable through the implementation of the CNMP.

5.3 Noise from helicopter movements and certain construction activities such as blasting may cause a significant but temporary adverse effect on some recreational users. However, several noise mitigation and management measures are recommended to be incorporated into the CNMP to minimise any adverse noise effects on recreational users as far as practicable so that the impact of noise is reasonable. This includes flying helicopters in accordance with noise abatement techniques such as The Helicopter Association International's 'Fly Neighborly' programme and temporarily closing nearby walking tracks during blasting (in conjunction with the Department of Conservation).

5.4 Impulsive construction activities, such as blasting, are likely to startle animals and birds in close proximity to the construction sites. Recommended buffer distances for livestock have been included in the draft CNMP to ensure animals are not exposed to construction noise above acceptable limits.

5.5 Once construction is complete, noise emissions from the operation of the Scheme will be low in comparison to the relatively high levels of ambient noise produced from water flowing down the Waitaha River. Operational noise emissions from the Scheme will comfortably comply with the District Plan noise limits. It is therefore anticipated that any operational noise effects on residents of nearby dwellings, recreational users and wildlife will be minimal.

APPENDIX A - CONSTRUCTION METHODOLOGY (PROVIDED BY WESTPOWER)

Construction of the Scheme is anticipated to take at least 3-4 years. This will take place in four key stages as outlined in **Table 1** below.

Table 1: Proposed construction stages

Stage	Description	Estimated period from start
1	Access road and transmission line from Waitaha Road to Power Station Site. Staging Areas 2 and 3. Bridge across Granite Creek.	1-10 months
2	Tunnels and subsurface structures. Early works at the intake. Construction Staging Area 1 and the access track from the access portal to Construction Staging Area 1. Short access track from access portal at the intake to the river.	7-27 months
3	Remaining water tunnel and desander excavations completed. Construction of the intake channel and weir. Construction of Power Station, switchyard and tailrace. Construction of the remaining section of the transmission line from Westpower's Waitaha Substation near SH6 to Macgregor Creek. Rebuild of Waitaha Substation.	28-33 months
4	Equipment installation and commissioning in Power Station, switchyard and intake.	32-37 months

There will be some overlap between stages.

Detailed construction methodology for the Scheme is yet to be confirmed at this stage of the project; however, based on experience of similar hydro-electric projects, the most significant sources of construction noise will be from blasting activities. Helicopter movements to transport people and materials to the Project Site will also be significant.

The construction of the Scheme will generate additional traffic on Waitaha Road. The number of vehicle movements per day will vary considerably, depending on the construction activity occurring at the time. It is understood that up to 40 light vehicle movements (equivalent to 20 light vehicles) and 12 heavy vehicle movements (equivalent to 6 heavy vehicles) per day are anticipated on Waitaha Road during the busiest periods of construction. Vehicle movements will generally occur during daytime hours only (0700 2100 hours). However, a small number of light vehicle movements will occur at night during tunnelling.

Helicopters will be used to construct parts of the Headworks. Hughes 500 (or similar) helicopters will be used to transport personnel, equipment and materials from the Power Station Site or Construction Staging Area 3 on the northern side of Macgregor Creek to the Headworks Site. It is anticipated that there could typically be up to eight movements per day (i.e. two return trips at the start and end of the day) between these sites over a period of up to 24 months. This period allows for days on which the river levels are too high for construction activities and or conditions are unsuitable for flying.

During peak construction of the intake, there may be up to 30 movements per day between the Power Station Site / Construction Staging Area 3 and Headworks in one day. The proposed flight path for the periods of intense helicopter movements is in the order of two kilometres away from the nearest dwellings.

Helicopter movements would generally only occur within the daytime hours stipulated in the District Plan (0700-2100 hours Monday to Friday, and 0700-1800 hours on Saturdays). However, occasional helicopter movements on Sundays may also occur. Furthermore, helicopter movements will, for safety reasons, only occur during daylight hours and will therefore vary depending on the season.

APPENDIX B – AARON STAPLES QUALIFICATIONS AND EXPERIENCE

Aaron Staples is a Senior Acoustic Engineer based in Marshall Day Acoustics' Auckland office. He joined Marshall Day Acoustics in 2010 after completing a Bachelor of Engineering (Mechanical) at the University of Canterbury.

His specialties include environmental noise, industrial noise control design, resource consent applications, building sound insulation design, mechanical ventilation noise control, room acoustics, and vibration assessment. Aaron is also an experienced expert witness, having presented evidence at numerous hearings for resource consent applications.

Expertise

- Environmental noise
- Industrial noise control design
- Building acoustics
- Room acoustics
- Vibration assessment

Qualifications & Memberships

- Bachelor of Engineering (Hons), Mechanical, University of Canterbury
- Member of the Acoustical Society of New Zealand (MASNZ)
- Member of the Resource Management Law Association (RMLA)

Publications

- Benefits of Developing a Detailed Noise Model for a Large Industrial Site (2016)

APPENDIX C – NOISE SURVEY DETAILS

The key details of the noise survey are as follows:

Date:	6 August 2024, 9:00 am – 5:15 pm
Personnel:	Aaron Staples, Marshall Day Acoustics
Weather:	Temperature range 3-12°C, initially clear sky, then cloud cover increasing to 80% over the course of the day, calm conditions
Instrumentation:	Brüel & Kjær Type 2250 analyser, serial 3031061, calibration due 20/08/2025 Norsonic Nor1256 calibrator, serial 125626196, calibration due 24/04/2025
Calibration:	Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements. Observed change less than 0.1 dB.

APPENDIX D – NOISE ASSESSMENT CRITERIA

Operative Westland District Plan Noise Rules

Under the Operative District Plan (**ODP**), the site and surrounding land is zoned Rural. The ODP noise rules for permitted activities in this zone are as follows:

> *Noise*
> *(all activities except forestry, and agricultural activities)*
>
> | | |
> |---|---|
> | *0700 – 2100 hrs Mon – Fri*
0700 – 1800 hrs Saturday | *55 dB L_{A10} at any point within the notional boundary of a residential activity.* |
> | *All other times including public holidays* | *45 dB L_{A10} at any point within the notional boundary of a residential activity.* |
>
> *All measurements are to be taken and assessed in accordance with the NZ Standards 6801:1991 "Measurement of Sound" and 6802:1991 "Assessment of Environmental Sound" and amendments thereto.*

Although the Scheme is not a permitted activity, operational noise will be broadband[3] in nature, therefore the permitted activity noise rules are considered to be appropriate for assessing the effects of this application.

The ODP is going to be replaced with a new District Plan that will cover the entire West Coast region, called the Te Tai o Poutini District Plan (**TTPP**). The TTPP contains new noise rules discussed below.

Proposed Te Tai o Poutini District Plan Noise Rules

The Te Tai o Poutini Plan (**TTPP**) is proposed to replace the Buller, Grey and Westland District Plans. This plan has recently been notified and hearings are not yet complete. While it has no legal weight in terms of this noise assessment (i.e. there are no noise rules with immediate legal effect), it does indicate the anticipated noise environment for the area in the future.

It is noted that any future plan will have to give effect to the National Planning Standards, which requires noise to be assessed in line with current best practice and, in particular, New Zealand Standard NZS 6802:2008 “Acoustics - Environmental Noise". (The ODP refers to the 1991 version of this Standard.) This will necessitate adoption of the L_{Aeq} assessment parameter, rather than the L_{A10} limit currently used in the ODP.

Under the TTPP, the project area and surrounding land are proposed to be rezoned Open Space Zone. The nearest dwellings would remain General Rural Zone.

The TTPP provides the following noise limits for these zones:

Times	**Noise limit at any point within the notional boundary of any sensitive activity within any site receiving noise**
7am to 10pm Monday to Friday 8am to 8pm weekends and public holidays	55 $L_{Aeq\ (15\ min)}$
10pm to 7am Monday to Friday 8pm to 8am weekends and public holidays	45 dB $L_{Aeq\ (15\ min)}$
10pm to 7am all days	75 dB L_{AFmax}

[3] Broadband means sound at all frequencies, similar to the sound of the sea.

The TTPP noise limits are consistent with the ODP's limits for the rural and settlement areas, although the hours of application and noise metrics differ.

The proposed noise limits are common in rural areas and represent a slightly modernised version of the existing rules.

The TTPP also states that noise from any construction work activity must be measured and assessed in accordance with the requirements of New Zealand Standard NZS6803:1999 "*Acoustics – Construction noise"*. Relevant criteria from this Standard are provided below.

New Zealand NZS 6803:1999 Construction Noise Standard

NZS 6803:1999 "*Acoustics – Construction Noise"* allows construction noise levels during daytime to be somewhat higher than for permanent noise sources on the basis that the effects are of relatively short duration, whilst maintaining appropriate amenity at night to permit sleep.

This Standard includes a table of recommended noise limits, depending on the duration of noise as follows:

- "Short-term" means construction work at any one location for up to 14 calendar days;
- "Typical duration" means construction work at any one location for more than 14 calendar days but less than 20 weeks; and
- "Long-term" means construction work at any one location with a duration exceeding 20 weeks.

"Residential zones and dwellings in rural areas:

Table 1: *Recommended* upper limits for construction noise received in residential zones and dwellings in rural areas (Table 2 from NZS 6803:1999)

Time of week	Time period	Duration of work					
		Typical duration (dBA)		Short-term duration (dBA)		Long-term duration (dBA)	
		L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85
	1800-2000	70	85	75	90	65	80
	2000-0630	45	75	45	75	45	75
Saturdays	0630-0730	45	75	45	75	45	75
	0730-1800	75	90	80	95	70	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75
Sundays and public holidays	0630-0730	45	75	45	75	45	75
	0730-1800	55	85	55	85	55	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75

Note that the level of protection provided during night-time activity under this Standard is consistent with that provided for non-construction sources in the Operative and Proposed District Plans.

Although the construction of the Scheme will exceed 20 weeks, the effects of noise at any one residential property may not. Noise levels at dwellings will vary depending on the type of construction work being undertaken and its proximity. However, for the purposes of this noise assessment, it has been assumed that all dwellings will potentially be affected for more than 20 weeks, and have therefore applied the most stringent (long-term) limits.

NZS 6803:1999 also places an onus on contractors to adopt the best practicable option to minimise noise during construction.

Blasting

The above construction noise criteria are not applicable for blasting. NZS 6803:1999 specifies that noise from the use of explosives is a special case and should conform with the provisions of documents such as Australian Standard AS 2187.2-2006 *"Explosives-Storage and use, Part 2: Use of explosives"*. This Standard (specifically Appendix J) specifies the following noise criteria when measured close to a dwelling:

- A maximum airblast overpressure of 115 dB L_{peak}
  The level of 115 dB L_{peak} may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dB L_{peak} at any time.

New Zealand NZS 6807:1994 Helicopter Landing Area Noise Management Standard

As helicopters will be used at times during the construction and operation of the Scheme, it is necessary to consider relevant helicopter noise assessment criteria. NZS 6802 is inappropriate for assessing helicopter noise as it is outside the scope of the standard.

NZS 6807:1994 *"Noise management and land use planning for helicopter landing areas"* provides guidance on acceptable limits of helicopter noise exposure around heliports for the protection of community health and amenity.

The philosophy behind NZS 6807:1994 is to provide guidance on helicopter landing areas that are used more than 10 times per month or where noise levels will be above 90 dB L_{AFmax} during the day or 70 dB L_{AFmax} during the night within any residential zone or within the notional boundary of any rural dwelling. The Standard states that day and night-time hours shall be defined by the territorial authority, which in this case is 0700-2100 hours Monday to Friday and 0700-1800 hours on Saturdays.

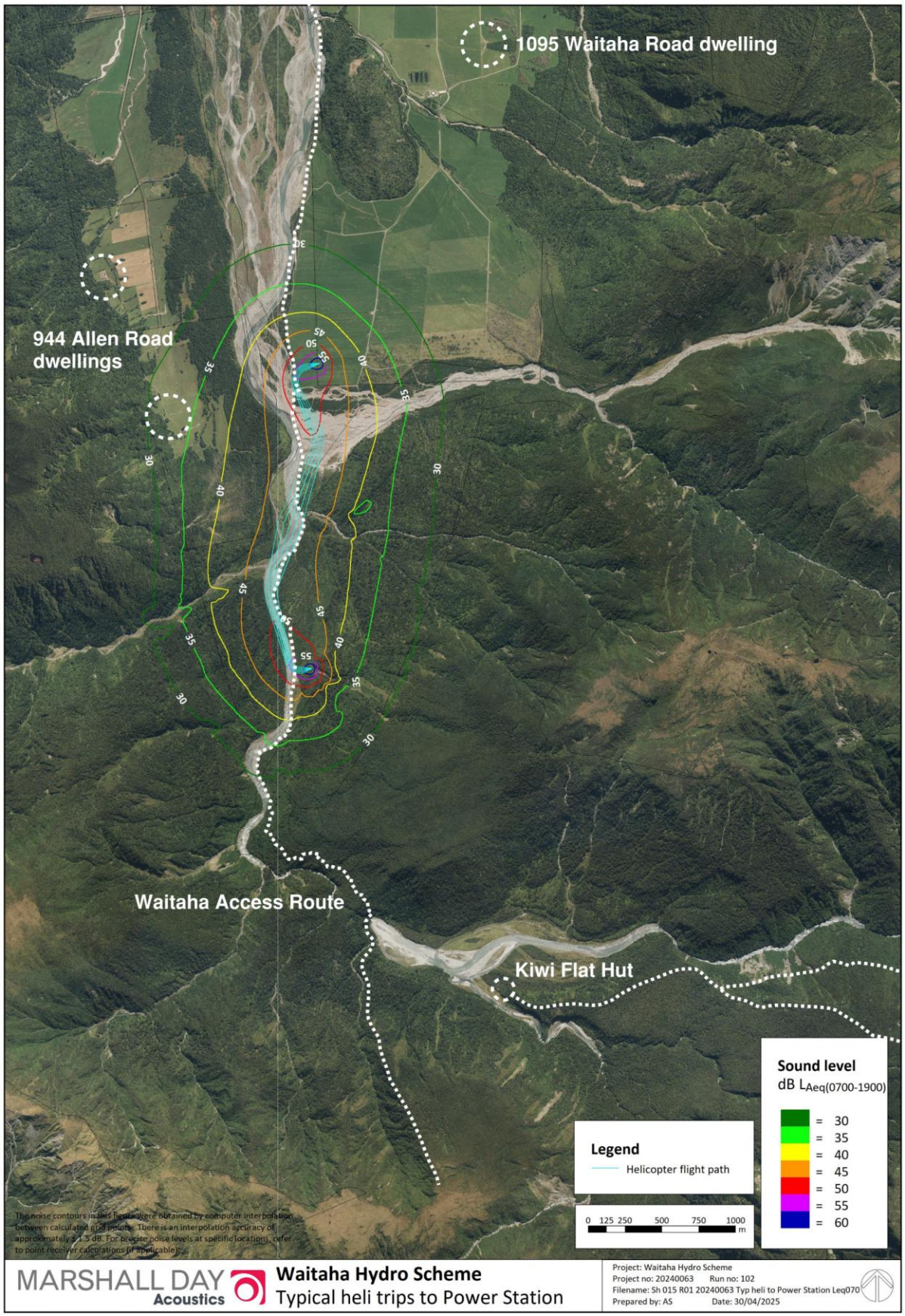
For this project, the relevant recommended noise limit for acceptability provided by the Standard is 50 dB L_{Adn} at the notional boundary of any rural dwelling.

Traffic on Public Roads

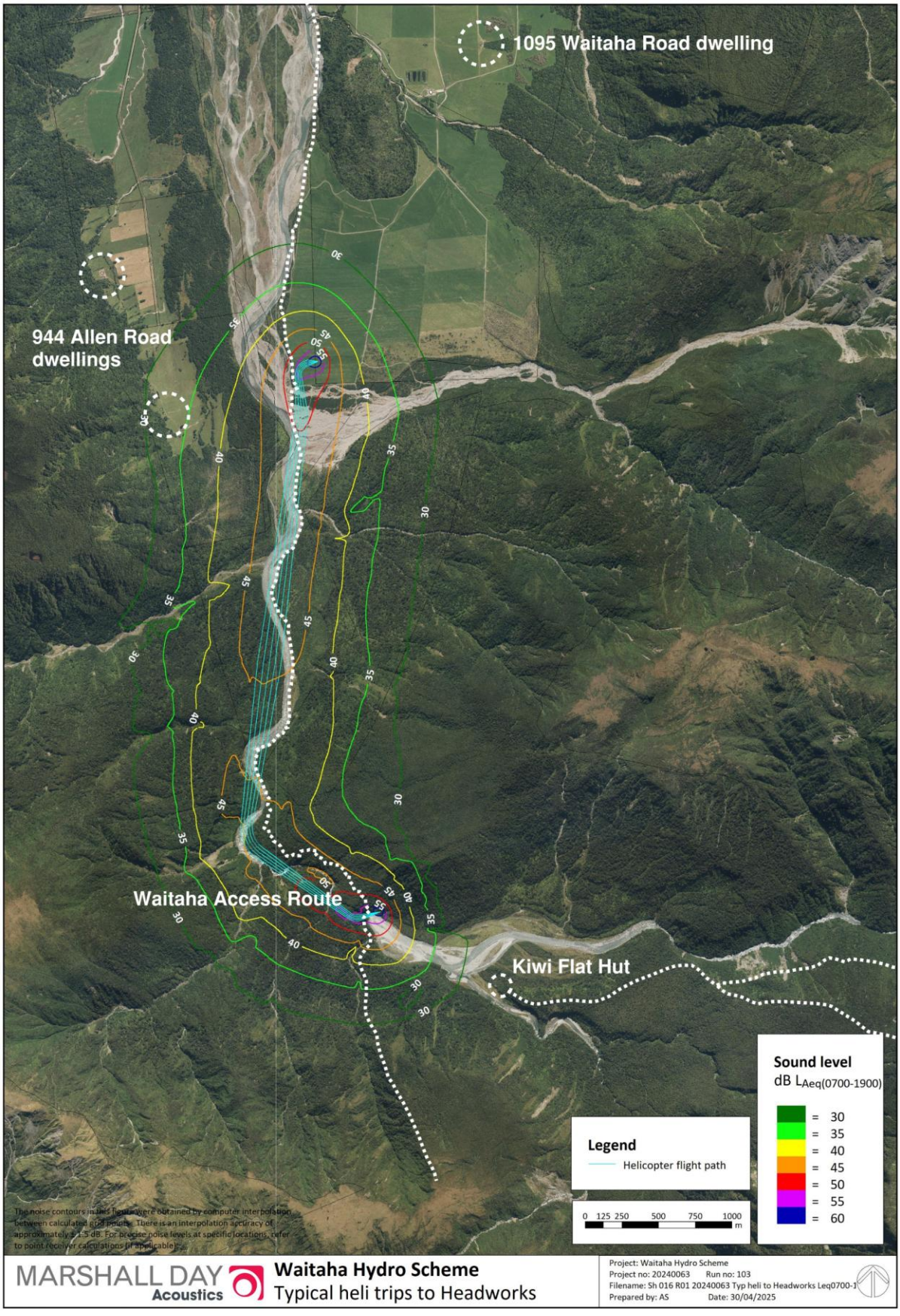
Noise from traffic using public roads is exempt from assessment under the ODP noise rules and neither is it appropriate to use NZS 6803:1999. However, where a proposed activity will result in a significant increase in traffic it is good practice to assess the potential noise effects.

APPENDIX E – PREDICTED HELICOPTER MOVEMENT NOISE LEVELS

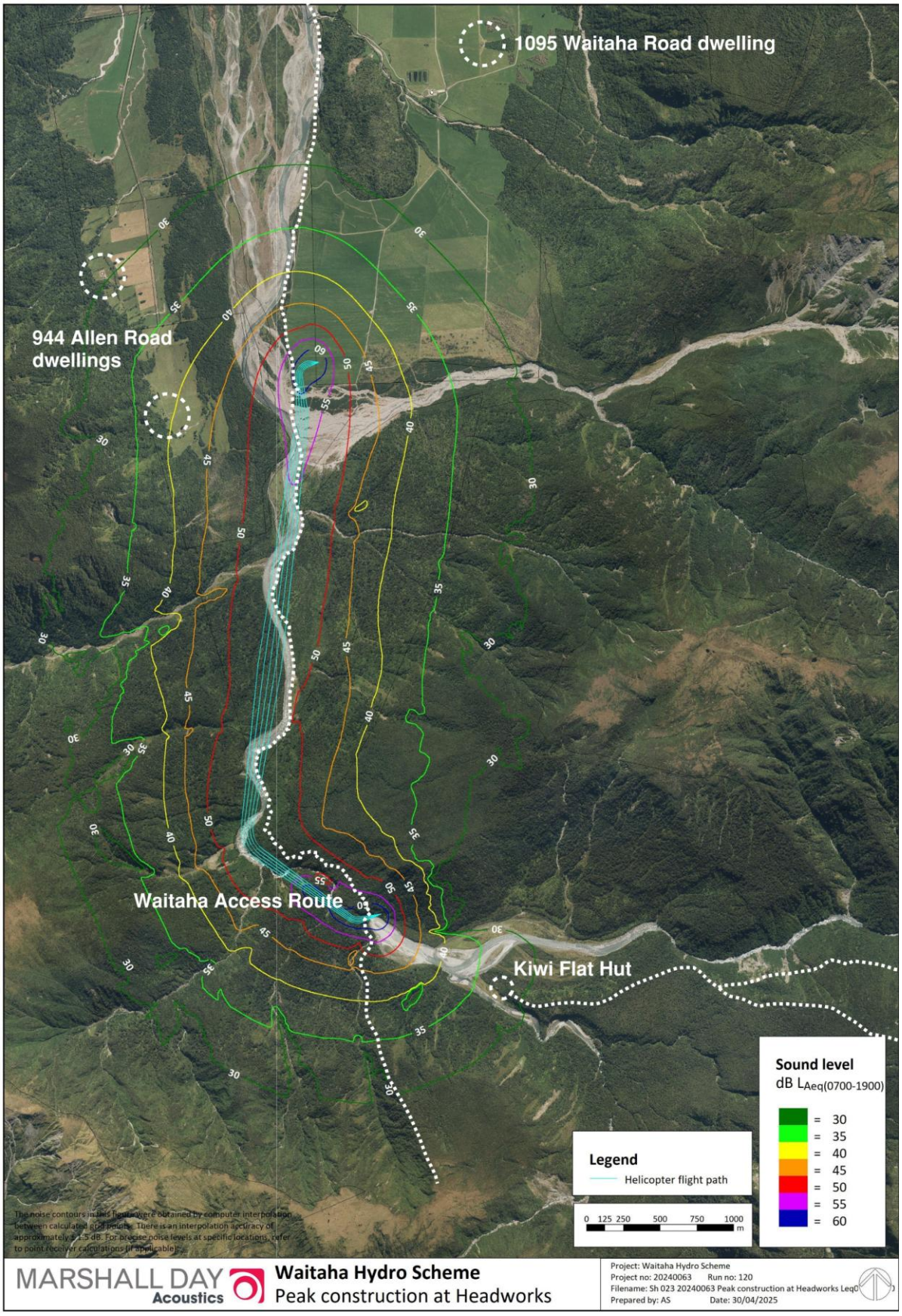
Construction – Typical trips to Power Station (average over day)



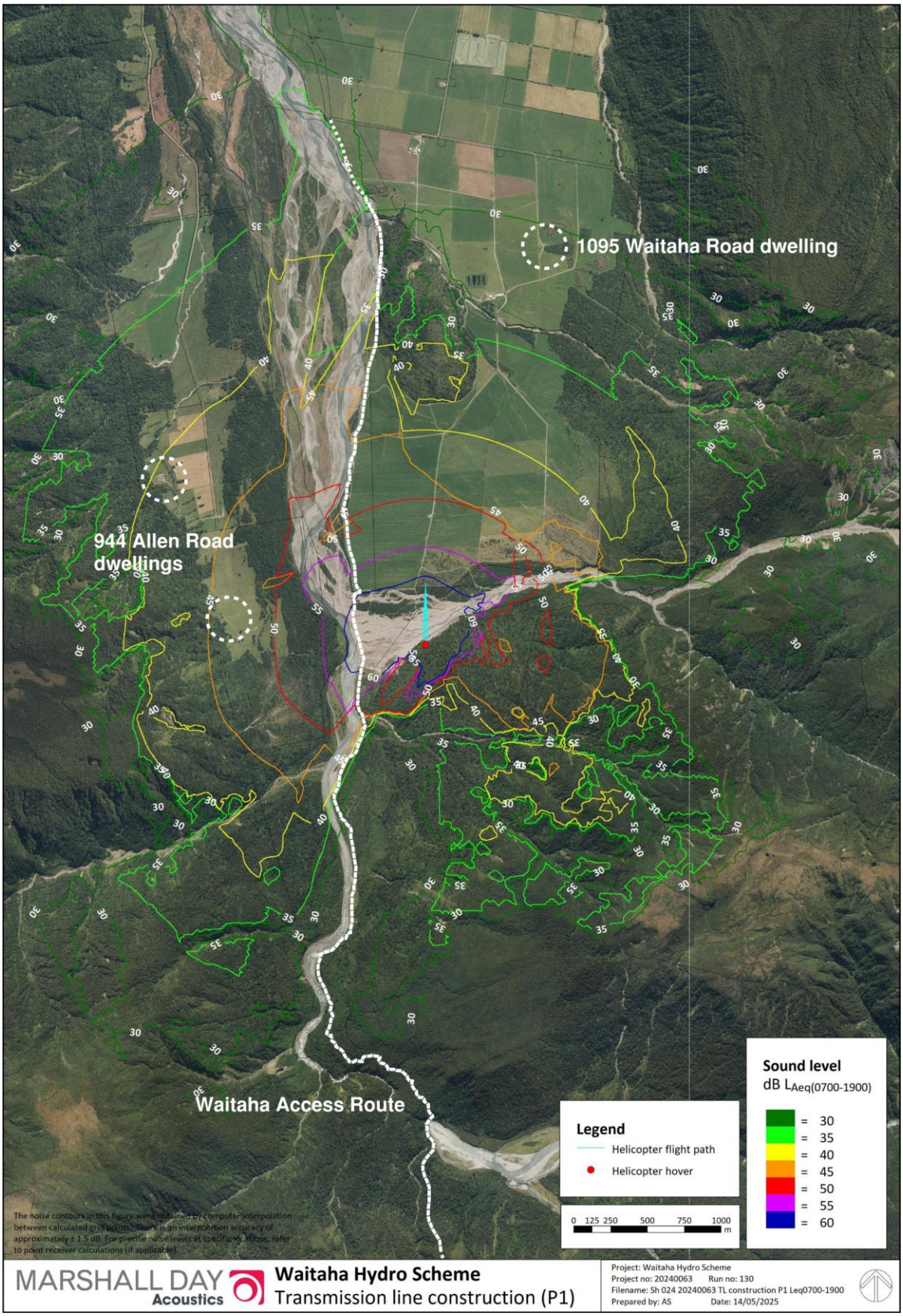
Construction – Typical trips to Headworks (average over day)



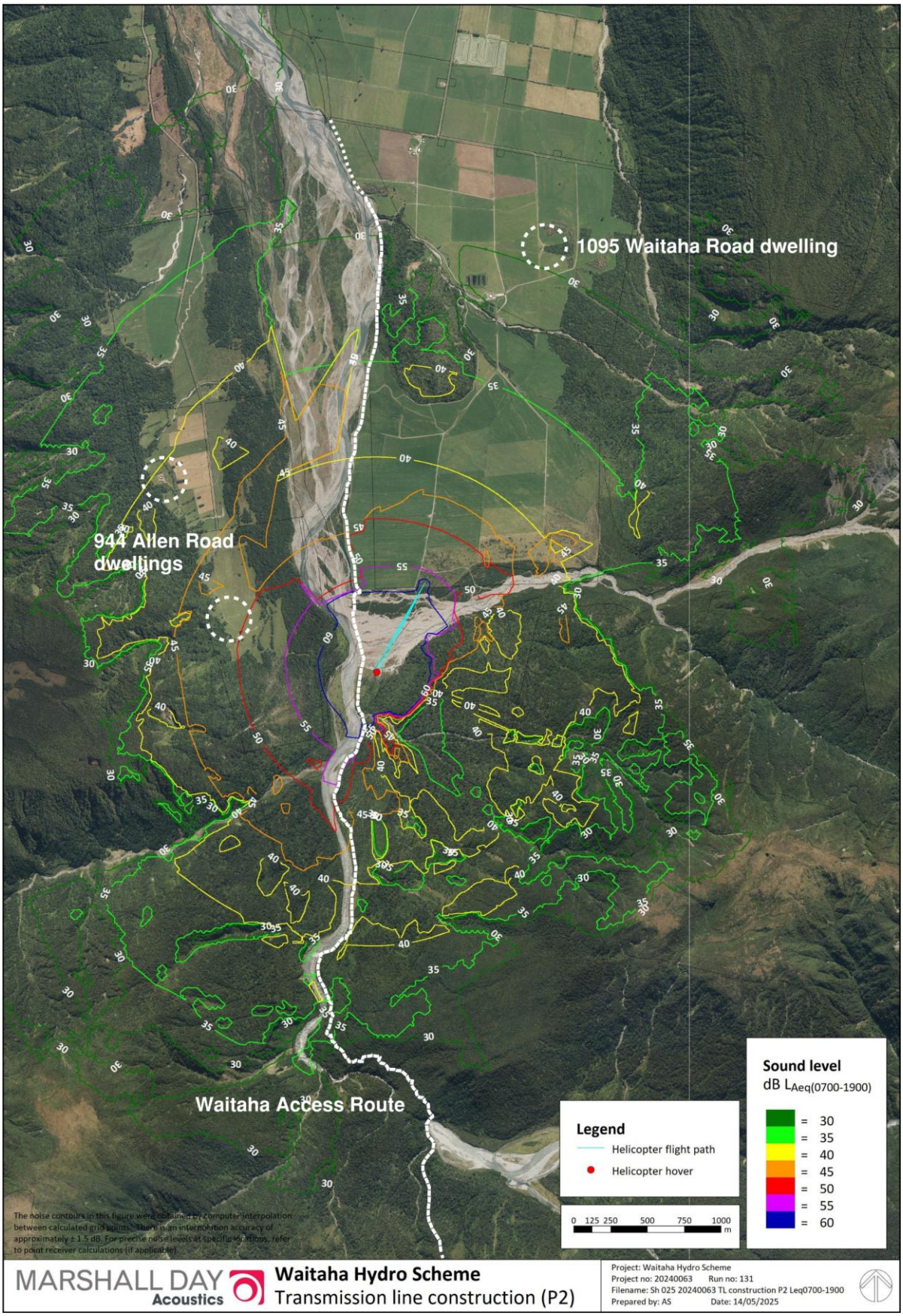
Construction – Peak activity at Headworks (average over day)



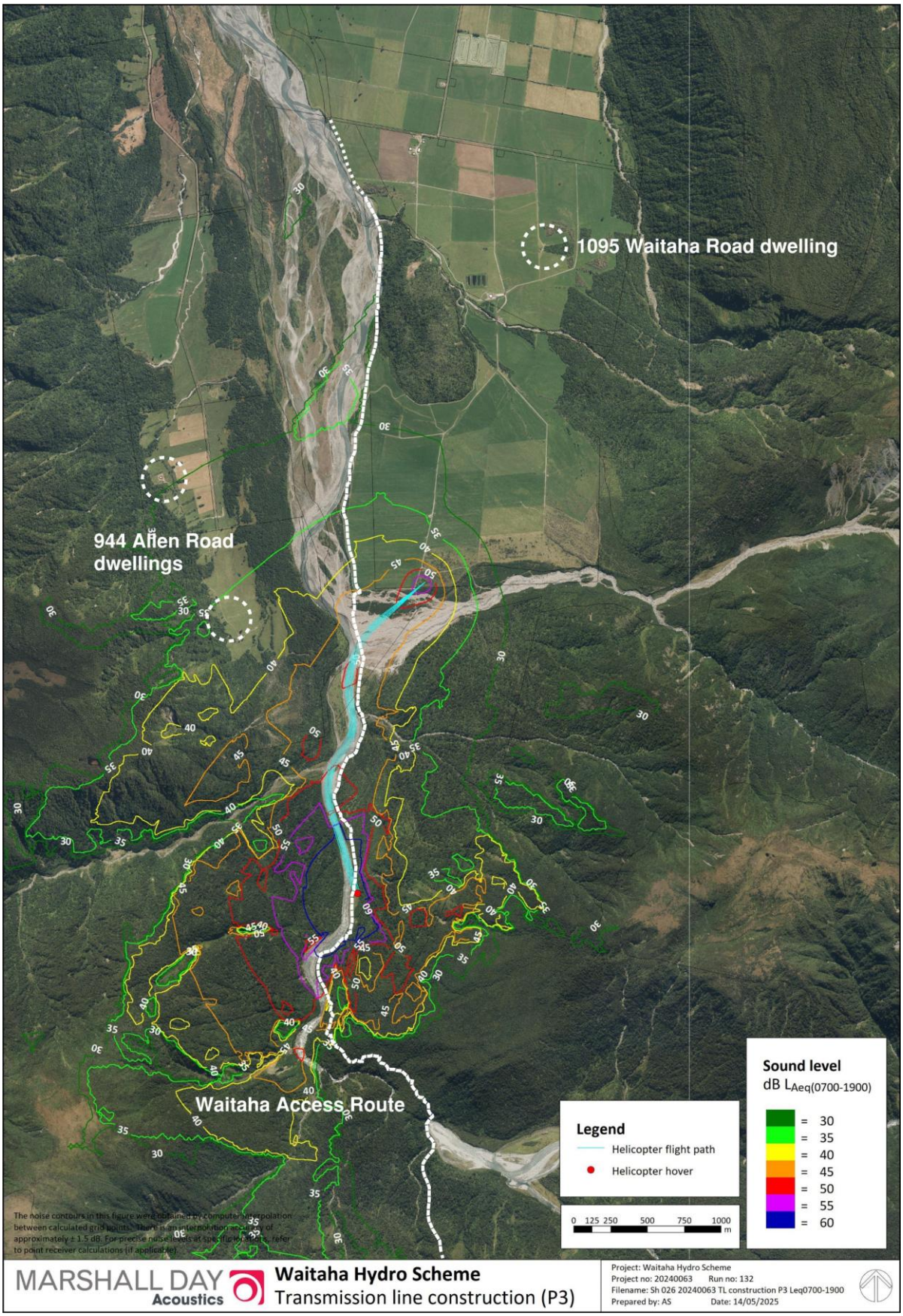
Construction – Transmission line construction position 1 (average over day)



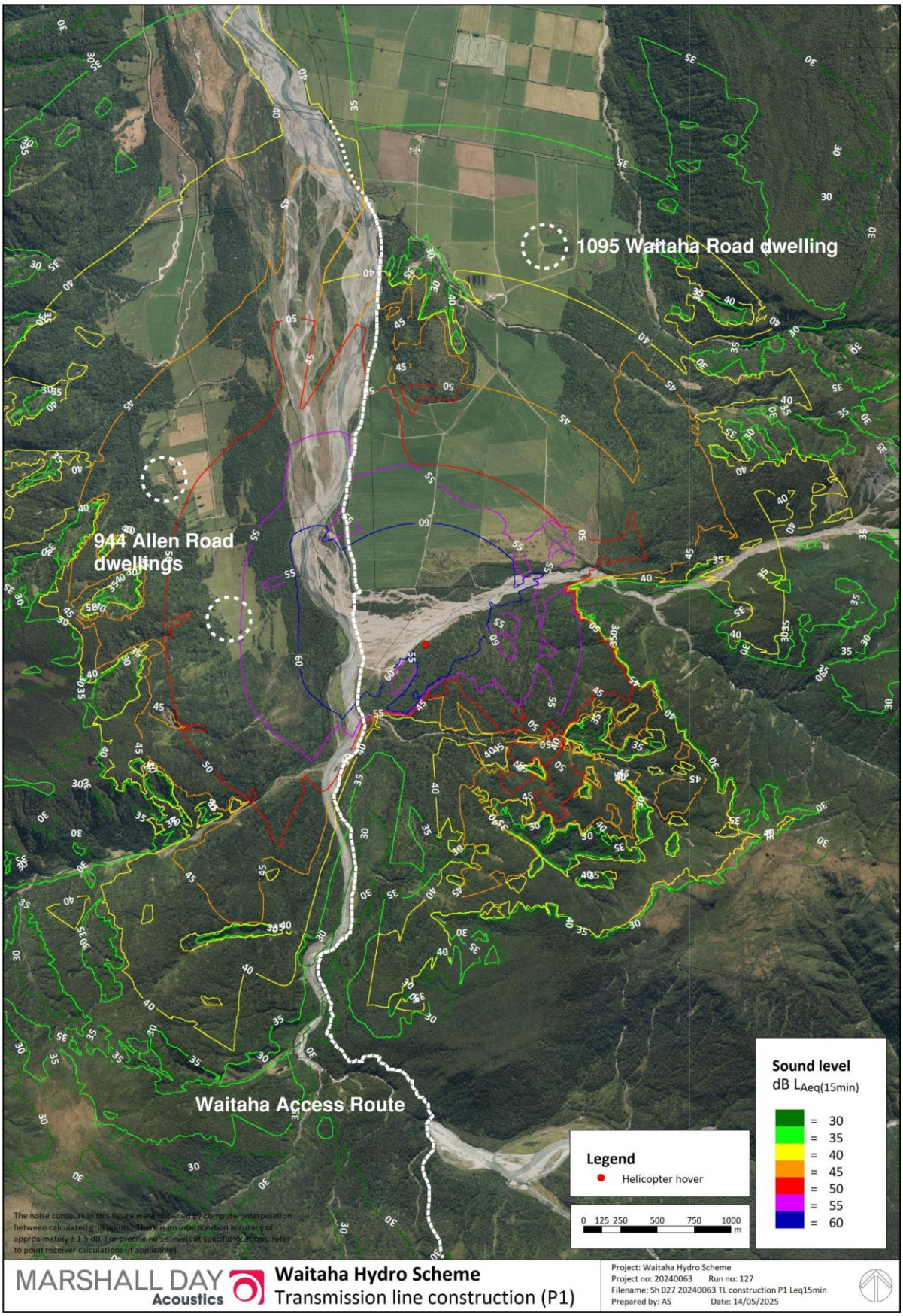
Construction – Transmission line construction position 2 (average over day)



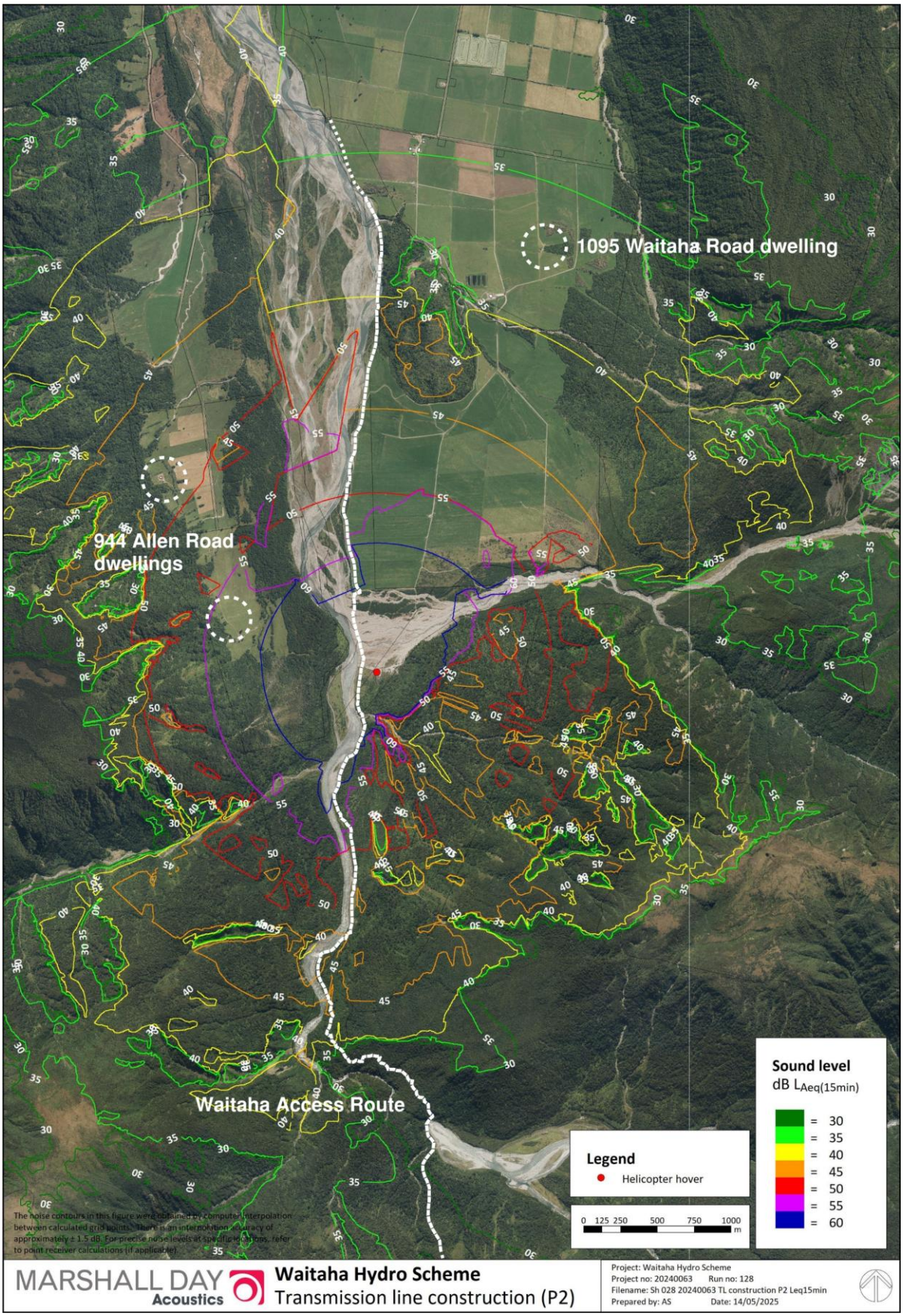
Construction – Transmission line construction position 3 (average over day)



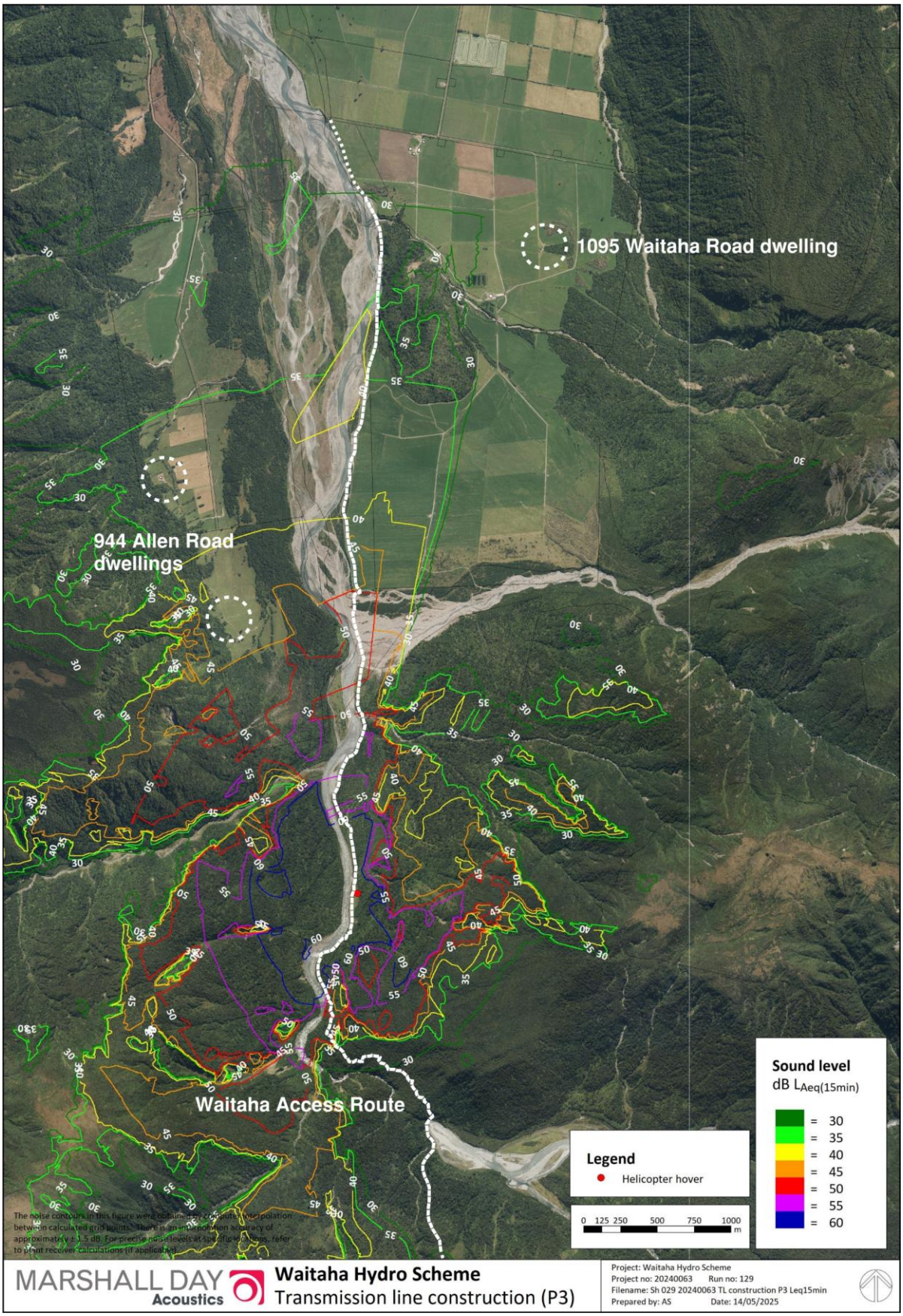
Construction – Transmission line construction position 1 (average noise level during hover)



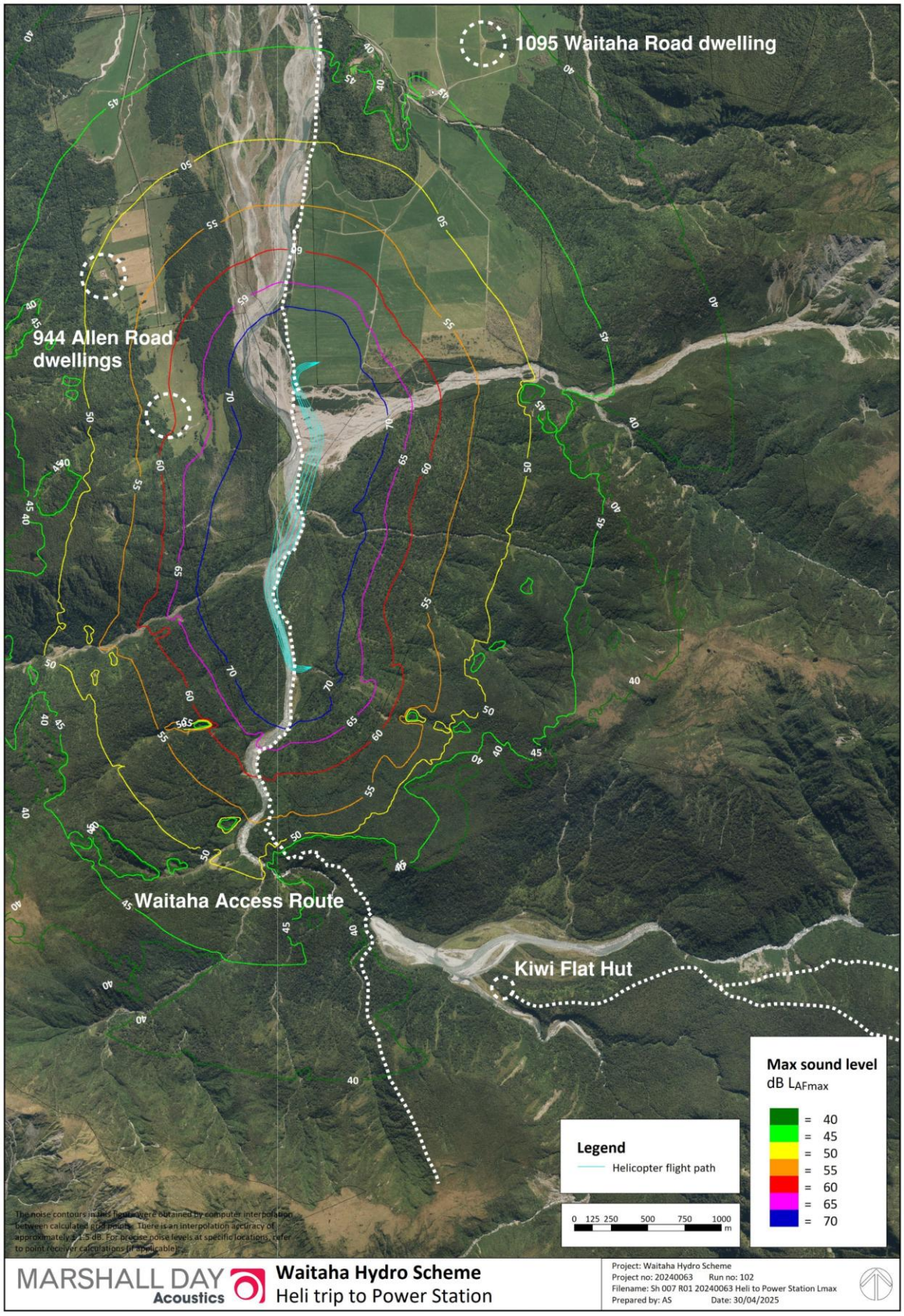
Construction – Transmission line construction position 2 (average noise level during hover)



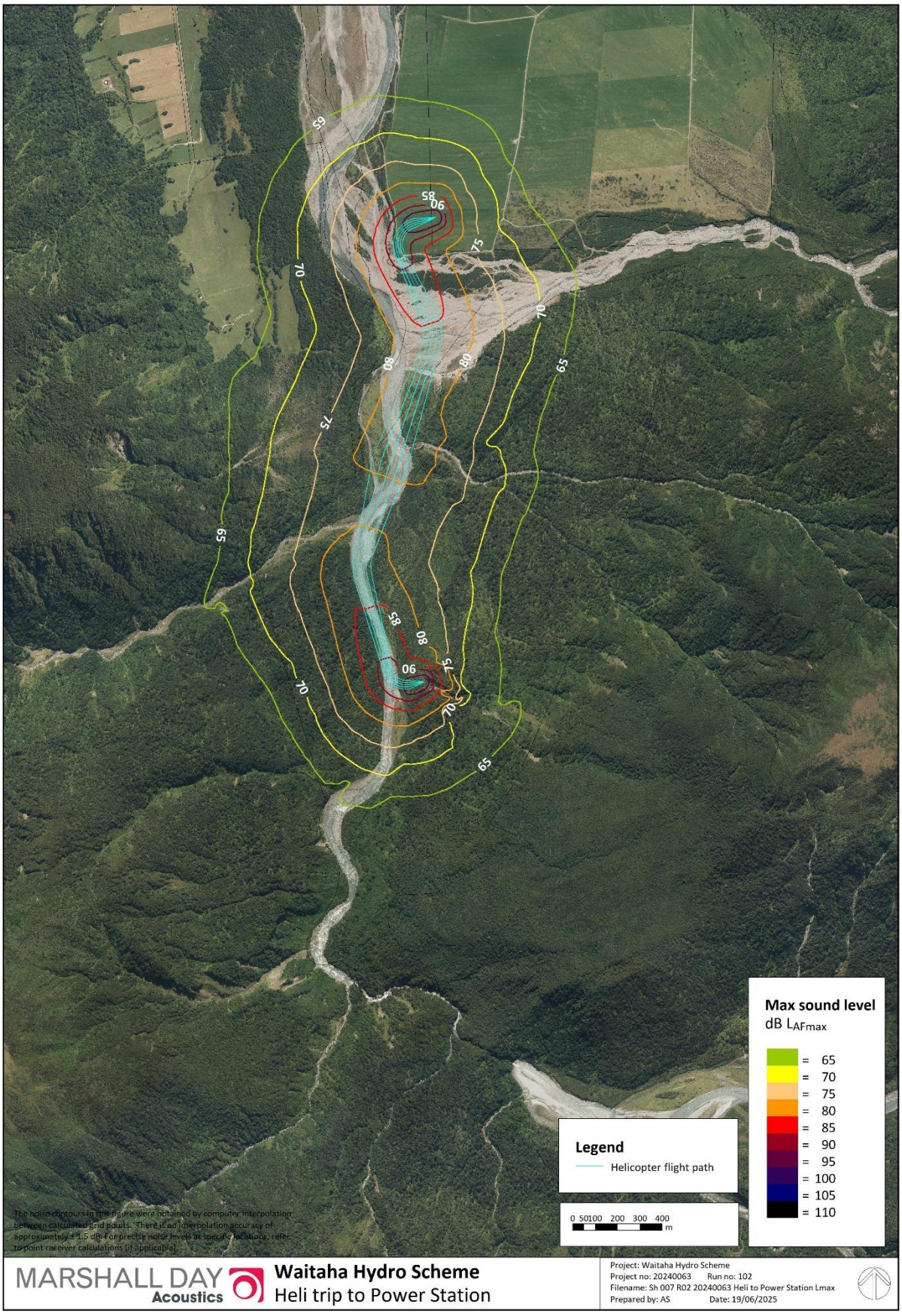
Construction – Transmission line construction position 3 (average noise level during hover)



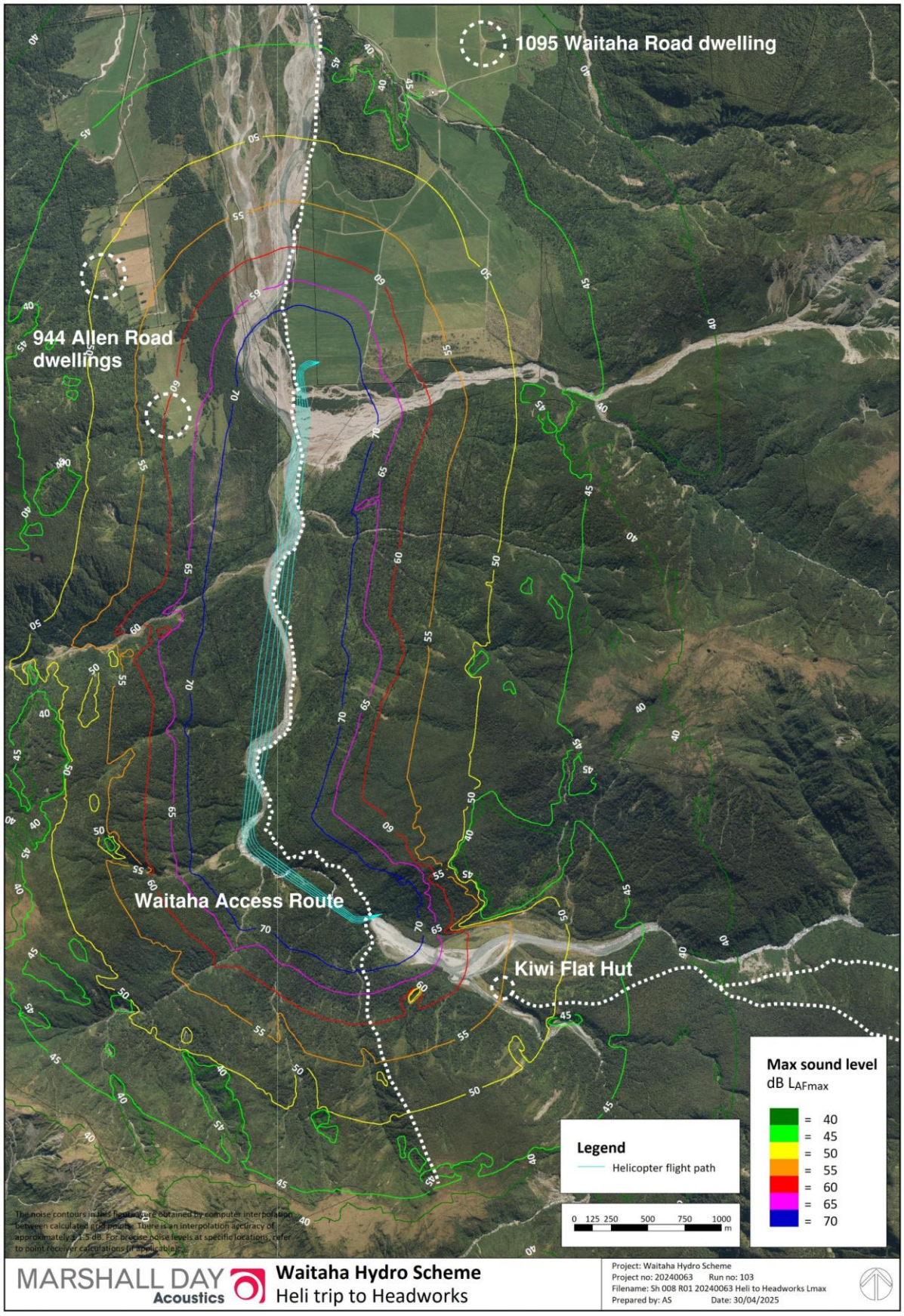
Maximum noise level during typical trip to Power Station



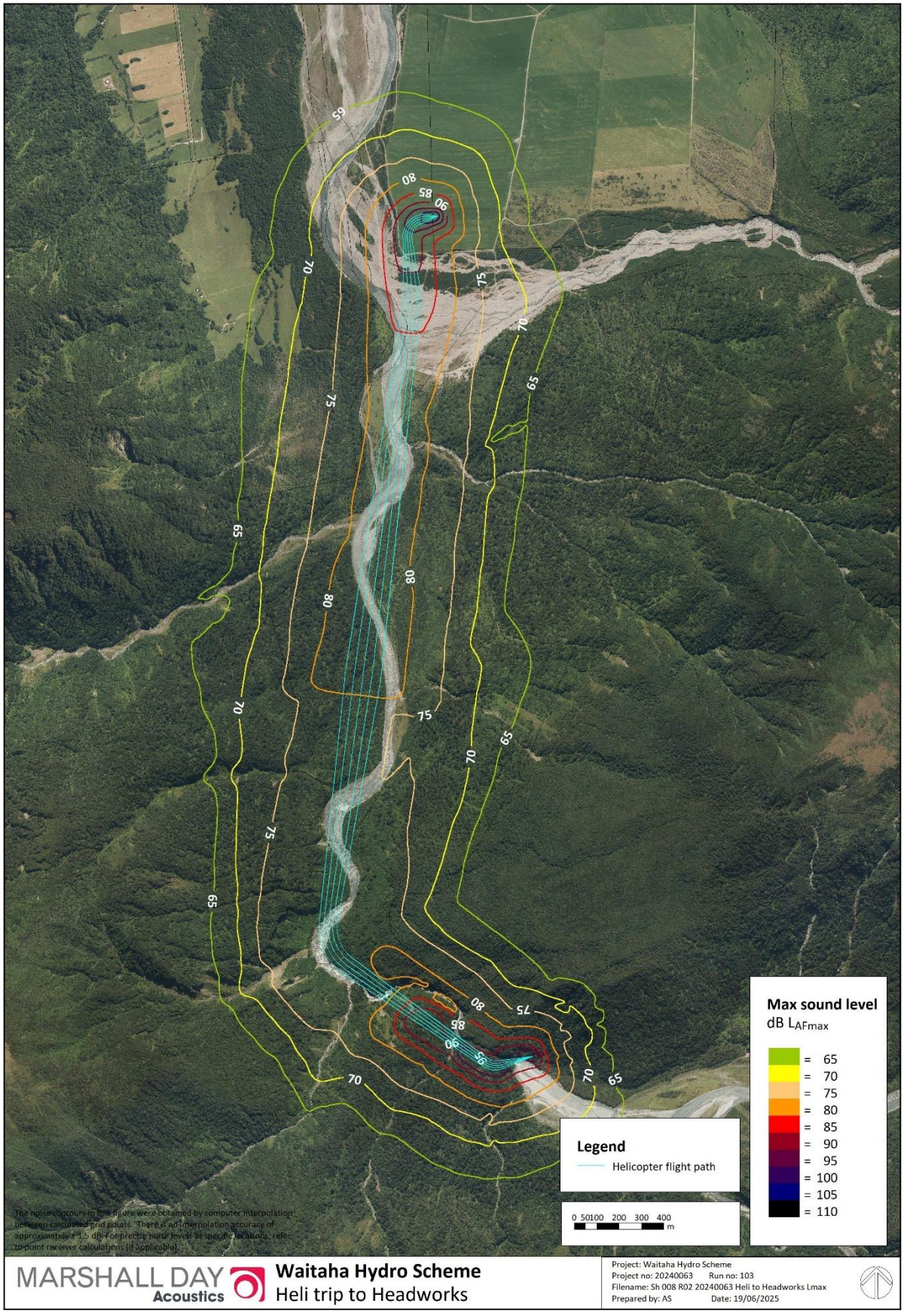
Maximum noise level during typical trip to Power Station (closer to arrival/take off zones)



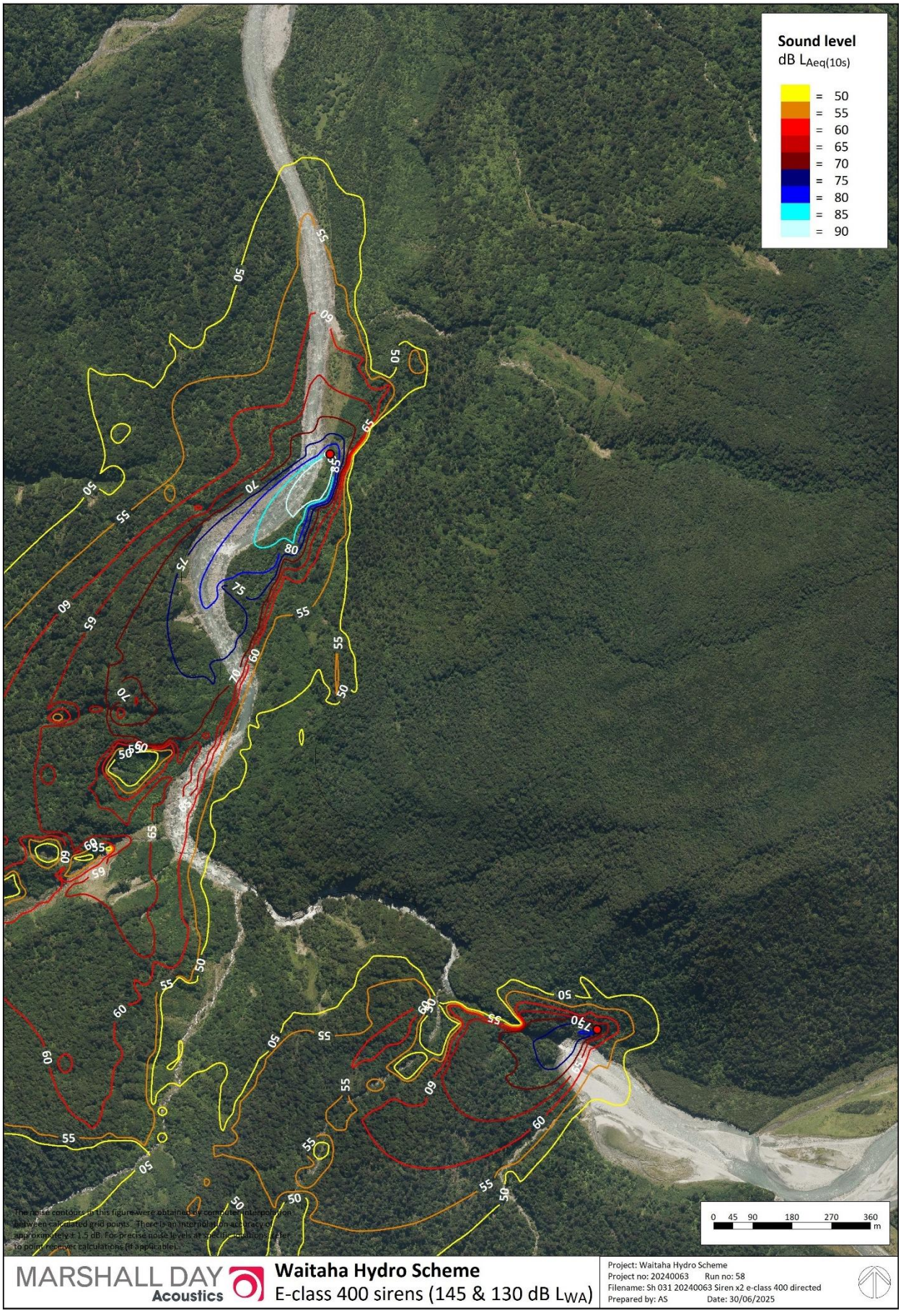
Maximum noise level during typical trip to Headworks



Maximum noise level during typical trip to Headworks (closer to arrival/take off zones)



APPENDIX F – EMERGENCY SIREN NOISE LEVELS



APPENDIX G – SUMMARY OF LITERATURE REVIEW ON NOISE IMPACTS ON ANIMALS

Introduction

The Effect of Noise on Wildlife: A Literature Review by A.L. Radle (1998) concludes “most researchers agree that noise can affect an animal’s physiology and behaviour”. However, a study by Warren et al (2006) points out that there is a “surprising dearth of research on the behavioural responses of animals to altered acoustic environments”. One aspect of noise effects on animals which has been documented reasonably well is that noise has the greatest effect on wildlife which rely heavily on auditory signals for survival.

Livestock

Cattle

The Memphis State University (1971) found that noise has little impact on livestock, and that there are no long term effects on either milk or meat production. The US Environmental Protection Agency reported in the same year that large livestock generally adapt well to consistent noise. Later research by Beyer (1983) supported the Memphis State University studies finding that during low-altitude flights over livestock, milk production and pregnancies of cows and heifers were not affected. Manci et al (1988) reports on studies which show that livestock are not affected by “normal” levels of noise—below about 80-90 dBA.

Our experience, and the report by Manci et al (1988), suggests that the only possible causes of disturbance for animals will be impulsive type noises such as blasting and pile driving. To ensure that any such effects of these activities are minimised, we recommend that noise levels are reduced to the criteria suggested for human exposure.

Horses

A case study by Huybregts from Marshall Day Acoustics observes that horses in stables exposed to $L_{Aeq,15min}$ of 54-70 dB generally show little response to music noise unless the noise is particularly impulsive. A noise criterion of 65 dB L_{Aeq} is recommended by Huybregts (2008). Le Blanc et al (1991) found that birth success of pregnant mares was not affected by F-14 jet aircraft noise. While the ‘fright-flight’ reaction was initially observed, the mares did adapt to the noise.

Race horses are known for being high-strung. However, Marshall Day Acoustics have observed horses grazing in paddocks directly under the main approach path of the Christchurch International Airport where noise levels are in excess of 90 dB (L_{Amax}) during an aircraft flyover. Although these horses are arguably “used to” the noise, there was generally little recognition by them of an aircraft passing, let alone any sign of disturbance. This tends to support the conclusions by Le Blanc et al (1991).

From the above information, we recommend a noise level criteria suggested for human exposure.

Birds

In some respects, birds show that they are more adaptable to noise than humans. As an example, most bird scaring guns need to operate at random time intervals to avoid having birds perching on them between blasts. This is supported by a study by Pater et al (1999) on the response of woodpeckers to military training noise events such as artillery, small arms, helicopters and manoeuvre noise. The woodpeckers were observed to successfully adjust to these events.

The studies reported by Manci et al (1988) show that noise at levels around the human exposure criteria is extremely unlikely to cause startle or similar effects in birds, with blasting and pile driving the only likely causes of disturbance.

In 1995 and 1997, Marshall Day Associates studied the impact of noise on birds for the Avalon Air Shows at Avalon Airport near Geelong, Victoria. These studies found that the impact of noise on birds consisted primarily with the startle response following the initial transient signal, but a habituation to noise developed after continuous exposure to steady levels of noise.

The Avalon study indicated that for fixed wind aircraft and helicopters the chance of a response resulting in bird flight is rapidly increased when the maximum noise level exceeds 80 dBA. There was a 100% chance of flight when Lmax exceeded 90 dBA. Below 80 dBA there is a reduced chance of flight and with some degree of disturbance, such as looking or a break in feeding pattern, evident with noise levels as low as 60 dBA.

Dooling and Popper (2007) note that physical damage to birds' ears occur for single blasts of 140 dBA and 125 dBA for multiple blasts (both assumed to be L_{AFmax}, sound level descriptor not provided in study). The study also notes that birds' ears can suffer physical damage at continuous (>72 hours) exposure to noise above 110 dBA.

Fish

Fish do startle in response to low-flying aircraft noise. However, they have been found to adapt to the sound of over flights (Gladwin, et al. 1988). EPCB guidelines state the threshold for behavioural response in fish is 120 dB ref 1 µPa. Other research has recommended a sound pressure level limit of 150 dB ref 1 µPa to ensure 'no harm' to fish (Hastings 1990).

Reptiles

Researchers have summarised a few studies of reptile response to noise (Duflour 1980 and Manci, et al. 1988) under laboratory conditions. Following exposure to 95 dB for several minutes, these reptiles experienced at least temporary threshold shifts or hearing loss.

Summary

Once animals become habituated to noise, especially when it is steady and associated with clearly non-threatening activity, they suffer very little adverse response.

It is therefore considered that noise levels up to 60 dBA do not result in negative or adverse response to impacted animals or livestock. Noise levels up to 80 dBA generate startle responses in birds and animals, and noise levels in excess of 90 dBA may cause negative impact. The response of birds, animals and livestock to noise will also depend on the character and duration of the sound and observations suggest that steady broad band noise will create less negative response than transient, intermittent, tonal sounds.

Loud, impulsive sounds such as blasting can damage birds' ears if exposed to multiple events above 125 dBA.

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