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6.7 Noise and Vibration

6.7.1 Introduction

The potential for impacts from noise to cause pollution is recognised in IFC PS 3 and EBRD PR 3, in that all Project related activities should be subject to pollution prevention and control. In addition, PS 2 and PR 2 that relate to Labour and Working Conditions require that noise is controlled in the workplace. This Chapter considers the potential impacts on environmental and social aspects of the Project affected community and surrounding area. The requirements for noise control at work have not been specifically addressed in this Chapter, but have been assessed by reference to specific policies and management requirements in Chapter 8. Therefore, specific occupational health and safety criteria that apply to the workers within the Project affected area, including the worker accommodation camp are not considered in this assessment or the Air Quality, Noise and Vibration Management Plan (AQNVMP, Appendix 8.14).

The methodology adopted in this Chapter follows that set out in Sections 6.1 to 6.3 and the sensitivity of receptors and magnitude of the potential noise impacts have been derived from the relevant guidance prepared by IFC and WHO.

6.7.2 Project Activities Related to Noise and Vibration

Ambient noise levels will increase with commencement of construction and will continue throughout the operation of the Project, and will decline and cease post-closure. Site noise will originate from construction activities to develop the mine and related infrastructure. Operational noise will result from open pit mining, mobile plant including the transport of materials to the crushing plant and waste rock to the BRSF, ore transport to the ADR facility and HLF facility operations, and noise from air overpressure resulting from blasting. Ground vibrations with the potential to damage structures may also result from blasting to extract rock within the open pit and certain other Project specific activities. Specific noise and vibration generating activities for each of these categories are considered in this Section.

Primary receptors for construction-related noise and vibration increases include Lydian employees, and residents and structures in the communities nearest to the mining operations, including: Gndevaz, Saravan, Saralanj, Jermuk (which includes the village of Kechut) and Gorayk. In addition, herders staying in temporary seasonal herder camps, for example Ughedzor and temporary summer grazing camps in closer proximity to the Project, have the potential to be disturbed as a consequence of noise and ground vibration.

The potential impacts on mammals (including livestock) and birds that contribute to the natural habitat have been assessed in terms of disturbance in Sections 6.11 and 6.20.

6.7.3 Noise and Vibration Significance Criteria

The significance of an environmental impact for noise and vibration is determined by the interaction of magnitude of change in ambient noise level and sensitivity of the receptor. The methodology for determining the magnitude of impact and sensitivity of the receptor with regard to noise and vibration is shown in Table 6.7.1 and Table 6.7.2.

Table 6.7.1: Methodology for Determining Sensitivity

Sensitivity	Methodology
Minor	The location is tolerant of change without detriment to its character, is of low or local importance. e.g. an industrial development
Medium	The location has moderate capacity to absorb change without significantly altering its present character, or is of high importance. e.g. a residential dwelling
High	The location has little ability to absorb change without fundamentally altering its present character, or is of national importance. e.g. a hospital
Very High	The location is of the highest sensitivity to changes in noise and vibration, or is of international importance.

Table 6.7.2: Methodology for Determining Magnitude of Noise Impact

Impact	Change compared with baseline or difference in predicted level compared to guideline level
Negligible	No discernible change in the baseline environmental conditions, within margins of error of measurement.
Low	Impact resulting in a discernible change in baseline environmental conditions with undesirable/desirable conditions that can be tolerated
Moderate	Impact resulting in a discernible change in baseline environmental conditions predicted either to cause relevant objectives or guidance levels to be marginally exceeded or to result in undesirable/desirable consequences on the receiving environment.
High	Impact resulting in a substantial change in baseline environmental conditions predicted either to cause relevant objectives or guidance levels to be exceeded or to result in undesirable/desirable consequences on the receiving environment which cannot be tolerated.

For the purposes of this noise and vibration assessment, the level of significance for noise and vibration effects will be ultimately determined by using the magnitude criteria detailed in Table 6.7.2 above, together with the sensitivity of the receptor, as detailed above, using the significance matrix detailed in Table 6.1.3.

6.7.4 Construction Activities Generating Noise and Vibrations

Construction activities at the open pits, BRSF, HLF, ADR plant, related support infrastructure and access roads can have temporary and local effects through an increase in the ambient noise climate, together with the impacts from blasting (air over pressure and ground vibration) for employees and residents of the surrounding communities. Construction operations will take place over a two year period, resulting in the potential for increased noise levels. Site preparation activities such as removal of topsoil overburden to form stockpiles, grading, excavation, and pouring of foundations are generally the noisiest construction operations, and typically result from the use of mobile plant workings in an open site. Concrete batch plants will be required at the mine and aggregate will be extracted within the project affected area and imported to the site in heavy good vehicles, from surrounding quarries, where it cannot be sourced from borrow pits. Other operations such as building construction, fit out of control equipment, laboratories are generally less noisy operations.

Drilling and blasting in the HLF area and crusher area will occur, starting Q3 2016 and continuing for 18 months. Blasting in borrow pit quarries will take place for the duration of the construction period. Blasting will occur during daylight hours only up to 3 times a week. Within the open pit, the blasting will be scheduled to maintain the mining programme and will also be restricted to daylight hours. Ground vibrations associated with rock extraction to establish the open pits at Artavasdes, Tigranes are only expected to be detected by mine operatives working within and adjacent to these working areas.

6.7.5 Operations Activities Generating Noise and Vibrations

During operations, potential impacts that are likely to affect the ambient noise level will result from operations that include: drilling and blasting, product extraction and stockpiling, crushing, conveying, hauling, stacking, and loading activities together with ground vibrations and air over pressure associated with rock extraction within the open pit. Mining and processing will occur 24 hours a day, for approximately 350 days per year, resulting in the potential for increased noise levels during the day and night time periods. Blasting activities which include drill and blast preparation works will take place continuously; however, blasting will be restricted to daylight hours only and will be scheduled to maintain the mining programme. Ground vibrations associated with rock extraction within the open pits (Artavasdes, Tigranes and Erato) are only expected to be detected by mine operatives working within and adjacent to these working areas.

New haul roads will be constructed between the open pit and the crushing plant, run of mine

(ROM) stockpile, BRSF and HLF. Haul trucks with a carrying capacity of 190 tonnes will transport the ore from the open pit to the primary crushers, and transport waste rock to the BRSF. A fleet of up to 19 Cat 789D haul trucks will be needed to maintain annual production of 10Mtpa ore to the process plant. Haulage will be split between the crushing plant, BRSF and internal movements within the open pit. Transport of crushed rock to the HLF discharge structure will be via a closed conveyor, driven by electric motors and is essentially a quiet operation. 30/39t haul trucks will then be used to distribute rock onto the HLF. Haul truck reversing alarms/beepers can be a significant additional source of noise, particularly at night. The prediction methodology employed in this assessment incorporates the frequent use of reversing alarms. Lydian will investigate the optimal technology to be used for reversing alarms on haul trucks, to balance the requirement of occupational health and safety, for workers deployed on the HLF and to minimise/remove the audibility of alarms within the nearest community of Gndevaz.

Mobile equipment operations are predicted to increase the ambient noise levels in the area, including input from light vehicle operations noise, delivery trucks and heavy equipment operations noise and vibrations resulting from supply truck traffic on public roads. Supply truck traffic along public roads will be restricted to day-time hours for safety reasons. On public roads, project related traffic movements will be of low number and therefore have a negligible impact on receptors. This potential noise and vibration source has therefore not been considered further within this assessment.

6.7.6 Potential Noise Impacts

Potential impacts of noise and vibration have been modelled by using the predicted maximum levels during the construction and operational phases, to produce conservative “worst-case” assessments.

The following assumptions have been made through the noise modelling process to ensure “worst-case” assessments are maintained:

- During the construction phase each item of plant is modelled to include activity at the nearest operating location to the noise sensitive receptors;
- Two operational scenarios have been considered. The first represents the period of potentially highest impact associated with maximum ore production and highest numbers of operating plant and machinery – this will occur in year 3. The second operational scenario considered was chosen to represent the potential impact at the nearest settlement of Gndevaz associated with HLF activities when its operation is at

an advanced height – this will occur in year 8;

- A receptor location (domestic dwelling) in the south of Gndevaz (i.e. the closest to the Project area) was modelled to represent noise levels at the settlement. In reality, noise levels will be lower at properties further into the settlement; and
- During the operational phases, the crusher plant and ADR facility will be operated within enclosures; however, no noise attenuation from the buildings has been assumed within the model.

Construction Noise Sources

The primary noise sources, quantities, and sound power levels used in the assessment are shown in Table 6.7.3.

Table 6.7.3: Primary Source Sound Power Levels

Source	Quantity of Sources	Sound Power Level L_W(dB)
Cat 6018 Excavator	2	113
Cat D10 Track dozer	3	123
Cat 824G Wheel dozer	1	111
Cat 16M Motor grader	1	111
Haul Truck	3	116
Water truck	1	116
Cat 992G Wheel loader	1	116
Cat 336 backhoe	1	106

Operational Noise and Vibration Sources

The primary noise sources, quantities, and sound power levels used in the assessment are shown in Table 6.7.4.

Table 6.7.4: Primary Source Sound Power Levels

Source	Quantity of Sources Year 3	Quantity of Sources Year 8	Sound Power Level L_W(dB)
Cat 6240 Drill	4	4	118
Cat 5150 Drill	1	1	118
Cat 6050 Excavator	2	2	123
Cat 789D 190t Haul truck	56 trips/hr	54 trips/hr	121
Man 30t Haul truck	81 trips/hr	80 trips/hr	108
Cat D10 Track dozer	2	2	121
Cat 966 Loader	2	1	111
Cat 16M Motor Grader	2	2	114
Belaz Water truck	2	2	116
Cat 994 Highlift loader	1	1	117
Cat 824G Tyre Dozer	2	2	111
Primary Crush plant	1	1	104

Table 6.7.4: Primary Source Sound Power Levels			
Source	**Quantity of Sources Year 3**	**Quantity of Sources Year 8**	**Sound Power Level L_W(dB)**
Secondary Crush plant	2	2	104
Overland conveyor	1	1	75
Overland conveyor drive motors	2	2	95
ADR facility area	1	1	100

The nearest noise, air overpressure, and vibration receptors to the Project are in the town of Jermuk, which is situated approximately 7 km from the nearest part of the Project's infrastructure. There are four rural communities in proximity to the Project, namely: Kechut (a rural community associated with the town of Jermuk), Saravan (including Saralanj and Ughedzor) and Gndevaz all located within Vayots Dzor Marz, and Gorayk, which is located in Syunik Marz. Gndevaz is the community closest to the footprint of the Project's infrastructure, with the HLF approximately 1 km south and east from the boundary of the village. There is also a resident currently living in accommodation near to the livestock and dairy farm located between Gndevaz and the Project area, however, the resident has agreed to sell the property to the Project sponsor and will be relocating prior to commencement of construction. This location will become a Primary Monitoring Station to allow long term compliance noise monitoring. Within the Project affected communities, the sensitive receptors are residential properties and therefore the sensitivity of all the receptors is medium (see Table 6.7.1).

The main factor affecting point-source noise transmittal is distance between noise source and receptor. For all receptors the distance identified is significant in terms of attenuating specific noise sources. For the noise prediction carried out using ISO9613-2:1996[1], accuracy is defined as ±3dB for distances up to 1km. Estimates of accuracy for distances greater than 1km are less certain. However, the predicted noise levels tend to equal, or be less than, those of the baseline conditions. In the majority of cases there is generally little or no change in absolute noise levels. It should be noted that all of the Project affected communities are greater than 1km from the main noise sources within the Project. Seasonal herder camps and biological receptors may be within 1km of these main Project noise source emissions, and the potential for disturbance has been considered in Sections 6.16 and 6.11 respectively.

Air and ground adsorption also influence noise transmittal, as can seasonal climatic/atmospheric changes; however, for the Project noise transmission has been

[1] Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation, ISO9613-2:1996

calculated over a rocky surface, with short vegetation, as this is representative of worse case conditions which occur during the summer. The distance between noise source and receptor remains the key pathway of interest; likewise, distance between source and receptor is the primary pathway of interest for potential air overpressure and vibration impacts. The noise models have been based on the assumption that noise, air overpressure, and vibration that emanates from the Project would remain relatively consistent throughout the year.

6.7.7 Noise Prediction Methodology

To accurately model the land surrounding the operation, an AutoCAD drawing was produced, which included the layout of the proposed mining operations and land contour data, to define natural barrier attenuation between the source of noise and receptors.

Calculations were carried out using the computer modelling software SoundPLAN Version 7.1. The computer modelling methodology conforms to the calculation procedures set out in ISO9613-1:1993 and ISO9613-2:19961 (acoustic measurement standard procedures). ISO9613-2:19961 outlines many attenuation factors that can be used in noise propagation calculations, including but not limited to geometrical divergence, atmospheric absorption, ground effect, and screening. The following assumptions were made in the prediction of site noise at each of the identified receptors:

- Geometrical divergence accounts for the hemi-spherical spreading of noise in the free-field from a point source situated near the ground surface - geometrical divergence is the most important factor in the attenuation of noise, as its main component is distance;
- Atmospheric absorption is the attenuation of noise as a result of the atmosphere. Noise propagation through the atmosphere depends on two factors: temperature and relative humidity. In all cases as stated previously no specific additional attenuation was used in the predictions;
- Attenuation due to ground effect is mainly the result of the ground surface interfering with the sound propagating directly from source to receiver. Given that the land between the Project and the noise-sensitive receptors is predominantly covered by rock and earth, the ground factor has been set at a conservative 0.25 in accordance with the guidance given in Section 7.3.1 of ISO9613-2:19961. This is considered to be worse case as during winter, snow cover would provide additional attenuation; and
- Attenuation due to screening is a result of noise being reflected or absorbed by barriers during propagation from the source to the receiver. In this calculation process, barriers will be land contours encountered along the noise propagation path,

as determined by the ground model used in the predictions.

In addition to the above, the calculation parameters of the acoustic model have been set to include the meteorological correction, Cmet, which is used to calculate the equivalent continuous long term sound pressure level, as set out in Clause 8 of ISO9613-2:1996[1.]

6.7.8 Blasting Prediction Methodology

Calculation Process

Air overpressure from blasting has been calculated using the following equation as shown in AS2187:2-2006[2] and outlined below:

$$P = K_a \left(\frac{R}{Q^{1/3}} \right)^{\alpha}$$

Where: P is pressure in kPa, Q is the explosives charge mass in kg, R is the distance from the charge in m, K_a is the site constant and α is the site exponent. The calculated pressure is converted into the linear Sound Pressure Level using a reference pressure of 20mPa.

Vibration from blasting has been calculated using the following equation as outlined in AS2187:2-2006[2]:

$$V = 1140 \left(\frac{R}{Q^{1/2}} \right)^{-1.6}$$

Where: V is ground vibration as vector peak particle velocity in mm/s, R is the distance from the charge in m; Q is the explosives charge mass in kg, with K_g and B constants related to site and rock properties for estimation purposes.

Assumptions

Air overpressure and vibration from blasting have been calculated on the basis that the Maximum Instantaneous Charge (MIC - the amount of explosives fired at the same moment in time) is 161kg. It has also been assumed that the charges will be confined in blast holes.

6.7.9 Construction Prediction

The activities associated with the earthworks and construction phase of each of the proposed developments will have the potential to generate noise and create an impact on the surrounding area.

[2] Blast and Vibration Impact Assessment, Appendix J of AS2187.2-2006

Noise level limits for the Project have been defined for daytime (07:00-22:00) when the main noise emitting operations during the construction phase of the Project will be undertaken and night-time (22:00-07:00) periods[3,4]. The construction of the mine will operate on a 24/7 shift pattern and therefore, appropriate noise conditions for night-time period have also been determined. The noise level likely to be generated in the nearby communities during the construction phase and any predicted increase in levels, i.e. the ambient noise level plus construction noise, are compared to the daytime limit value in Table 6.7.5.

Table 6.7.5: Construction Assessment Daytime Noise Impact

Community	Predicted Site Noise Level, L_{Aeq} (dB)	Daytime Noise Criterion, L_{Aeq} (dB)	Difference
Saralanj	28	45	-17
Ughedzor	20	45	-25
Saravan	31	45	-14
Gorayk	10	45	-35
Gndevaz	39	45	-6
Kechut	25	45	-20
Jermuk	15	45	-30

It can be seen that the worst case predicted noise level from construction operations meets the Armenian Order No. 138 for daytime noise level criterion by at least 6dB (see Table 2.14).

The IFC EHS Guidelines also include a criterion stating that noise impacts should not result in an increase in background levels of more than 3dB at the nearest off-site receptor locations (see Table 2.14). Table 6.7.6 identifies the contribution of predicted site noise levels compared to pre-existing baseline (or background levels).

Table 6.7.6: Construction Assessment Daytime Noise Impact

Community	Predicted Site Noise Level, L_{Aeq} (dB)	Measured Baseline Noise Level L_{Aeq} (dB)	Predicted Absolute Noise Level, L_{Aeq} (dB)	Increase over Baseline
Saralanj	28	49	49	0
Ughedzor	20	46	46	0
Saravan	31	48	48	0
Gorayk	10	47	47	0
Gndevaz	39	40	43	+3
Kechut	25	43	43	0
Jermuk	15	50	50	0

[3] IFC EHS Guidelines (www.ifc.org/ehsguidelines)
[4] Republic of Armenia, Noise Order No. 138, 2002

It can be seen that the worst case predicted noise level from construction operations will cause up to +3db in the monitored baseline levels, and is therefore in compliance with the IFC Guidelines. It should be noted that these predictions represent a "worst-case" scenario and that for the majority of the construction phase, the noise impact at sensitive receptors would be less.

The night-time noise levels arising from Project operations during construction have been assessed in Table 6.7.7 to Table 6.7.8.

6.7.7: Night-Time Noise Impact Assessment – Construction Phase			
Village	**Predicted Site Noise Level LAeq (dB)**	**Night Time Noise Criterion LAeq (dB)**	**Difference**
Saralanj	27	45	-18
Ughedzor	19	45	-26
Saravan	26	45	-19
Gorayk	11	45	-34
Gndevaz	33	45	-12
Kechut	26	45	-19
Jermuk	16	45	-29

The analysis demonstrates that the worst case predicted noise level from construction activities meets the IFC night-time noise level criterion (see Table 2.14) by at least 12dB. Table 6.7.8 identifies the contribution of predicted site noise levels compared to pre-existing baseline (or background levels).

6.7.8: Night-Time Noise Impact Assessment – Construction Phase				
Community	**Predicted Site Noise Level, LAeq (dB)**	**Measured Baseline Noise Level LAeq (dB)**	**Predicted Absolute Noise Level, LAeq (dB)**	**Increase over Baseline**
Saralanj	27	43	43	0
Ughedzor	19	47	47	0
Saravan	26	40	40	0
Gorayk	11	38	38	0
Gndevaz	33	38	39	+1
Kechut	26	36	36	0
Jermuk	16	42	42	0

It can be seen that the worst case predicted noise level from Project will increase baseline

levels by no more than 1dB in compliance with the IFC Guidelines at night (see Table 2.14).

When comparing the predicted ambient noise levels from the construction phase with the IFC Guidelines, the magnitude of the noise impact of construction phase is considered to be Minor or Negligible at all potentially affected communities and therefore not significant.

The nearest affected community is Gndevaz (which is at least 1km from major Project infrastructure), whilst workers will be in close proximity to each noise and vibration source. Standard noise mitigation and best practices will be adopted from the Occupational Health and Safety Plan (OHSP, Appendix 8.7) to protect workers. Appropriate mitigation measures will be required to ensure that residual impact on workers is safe and minimised in accordance with international best practice.

Seasonal herder camps and the grazing of animals will occur in closer proximity to the Project, including the known seasonal herder camp to the northeast and east of the proposed barren rock storage facility. If such camps occur outside of the proposed restricted area around the Project area, the magnitude of the noise impact of construction phase will be below IFC EHS Guidelines[5] and is therefore considered to be Minor and not significant. It is not proposed to fence off the restricted area so awareness will be raised through communication with the herders.

The potential noise and vibration impact upon ecological receptors is considered in Section 6.11 Biodiversity.

The output from the noise prediction model, showing noise emission from the Project construction phase during the daytime is in Figure 6.7.1. It should be noted that the unshaded parts of the map represent areas where the predicted site noise level is less than L_{Aeq}45dB[6].

[5] Ibid. 3

[6] Ibid 4

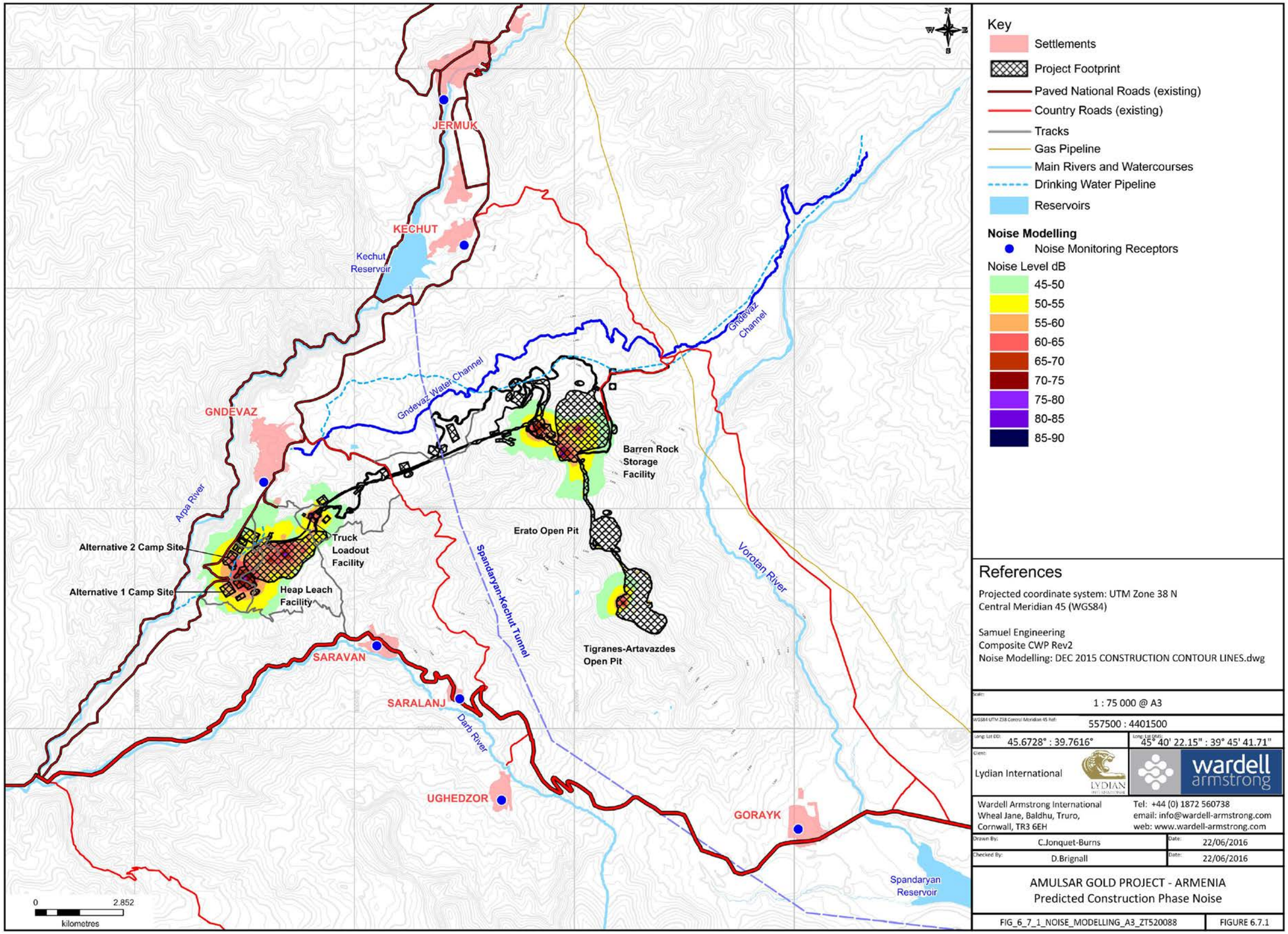

Figure 6.7.1: Predicted Construction Phase Noise

6.7.10 Operational Prediction

The changes in noise levels at each of the existing receptors considered have been assessed by comparing the noise levels predicted for the operational phase of the project with the absolute noise level limits, which should not be exceeded during daytime (07:00-22:00) and night-time (22:00-07:00) periods[7], see also Table 2.14) The predicted day time noise values in the nearby communities for years 3 and 8 are compared to these values in Table 6.7.9 to Table 6.7.12.

Table 6.7.9: Daytime Noise Impact Assessment – Year 3

Community	Predicted Site Noise Level, L_{Aeq} (dB)	Daytime Noise Criterion, L_{Aeq} (dB)	Difference
Saralanj	34	45	-11
Ughedzor	32	45	-13
Saravan	31	45	-14
Gorayk	24	45	-21
Gndevaz	36	45	-9
Kechut	31	45	-14
Jermuk	22	45	-23

It can be seen that the worst case predicted noise level from Project operations in year 3 meets the Armenian Noise Order criterion by at least 9dB[8].

The IFC EHS Guidelines[9] also include a criterion stating that noise impacts should not result in an increase in background levels of more than 3dB at the nearest off-site receptor locations (see Table 2.14). Table 6.7.10 identifies the contribution of predicted site noise levels compared to pre-existing baseline (or background levels).

Table 6.7.10: Daytime Noise Impact Assessment – Year 3

Community	Predicted Site Noise Level, L_{Aeq} (dB)	Measured Baseline Noise Level L_{Aeq} (dB)	Predicted Absolute Noise Level, L_{Aeq} (dB)	Increase over Baseline
Saralanj	34	49	49	0
Ughedzor	32	46	46	0
Saravan	31	48	48	0
Gorayk	24	47	47	0

[7] Ibid. 3&4
[8] Ibid 4
[9] Ibid. 3

Table 6.7.10: Daytime Noise Impact Assessment – Year 3				
Community	**Predicted Site Noise Level, L_{Aeq} (dB)**	**Measured Baseline Noise Level L_{Aeq} (dB)**	**Predicted Absolute Noise Level, L_{Aeq} (dB)**	**Increase over Baseline**
Gndevaz	36	40	42	+2
Kechut	31	43	43	0
Jermuk	22	50	50	0

It can be seen that the worst case predicted noise level from Project operations in year 4 will not increase baseline levels by more than 2dB in compliance with the IFC Guidelines[10].

When comparing the predicted ambient noise levels from the daytime mining operations with the IFC Guidelines[11], the magnitude of the noise impact of daytime phase is considered to be Low in Gndevaz and Negligible in all other potentially affected communities.

Table 6.7.11: Daytime Noise Impact Assessment – Year 8			
Community	**Predicted Site Noise Level, L_{Aeq} (dB)**	**Daytime Noise Criterion, L_{Aeq} (dB)**	**Difference**
Saralanj	34	45	-11
Ughedzor	32	45	-13
Saravan	33	45	-12
Gorayk	24	45	-21
Gndevaz	34	45	-11
Kechut	28	45	-17
Jermuk	19	45	-26

It can be seen that the worst case predicted noise level from Project operations in year 8 meets the Armenian Noise Order criterion (in Table 2.14) by at least 11dB[12].

The IFC EHS Guidelines,[13] states that noise impacts should not result in an increase in background levels of more than 3dB at the nearest off-site receptor locations (see Table 2.14). Table 6.7.12 identifies the contribution of predicted site noise levels compared to pre-existing baseline (or background levels).

[10] Ibid. 3
[11] Ibid. 3
[12] Ibid 4
[13] Ibid. 3

Table 6.7.12: Daytime Noise Impact Assessment – Year 8				
Community	**Predicted Site Noise Level, L_{Aeq} (dB)**	**Measured Baseline Noise Level L_{Aeq} (dB)**	**Predicted Absolute Noise Level, L_{Aeq} (dB)**	**Increase over Baseline**
Saralanj	34	49	49	0
Ughedzor	32	46	46	0
Saravan	33	48	48	0
Gorayk	24	47	47	0
Gndevaz	34	40	41	+1
Kechut	28	43	43	0
Jermuk	19	50	50	0

It can be seen that the worst case predicted noise level from Project operations in year 8 will not increase baseline levels by more than 1dB in compliance with the IFC Guidelines[14]. The nearest community is at least 1km from major Project facilities, whilst workers will be in close proximity to each noise and vibration source. Standard noise mitigation and best practices will be adopted from the OHSP (Appendix 8.7) to protect workers. With appropriate mitigation measures applied, the magnitude of the residual impact and the significance of the effect is Negligible at all Project affected communities with the exception of Gndevaz, which is Minor.

Seasonal herder camps and the grazing of animals has been noted to take place to the northeast and east of the proposed waste dump facility. If such camps occur outside of the proposed restricted area around the project site, the magnitude of the noise impact of operational phase will be below IFC EHS Guidelines[15] and is therefore considered to be Negligible, with the exception of Gndevaz, which is Minor.

The potential noise and vibration impacts upon ecological receptors is considered in Section 6.11 Biodiversity.

The output from the noise prediction model, showing noise emission from Project operations during year 4 for both daytime and night time periods, is shown in Figure 6.7.2. Predicted noise emission associated with Project operations during year 8 is shown in Figure 6.7.3. It should be noted that the unshaded parts of the map represents areas where the predicted site noise level is less than L_{Aeq}45dB (in compliance with IFC and Armenian Noise Order noise criteria[16]).

[14] Ibid. 3
[15] Ibid. 3
[16] Ibid. 4

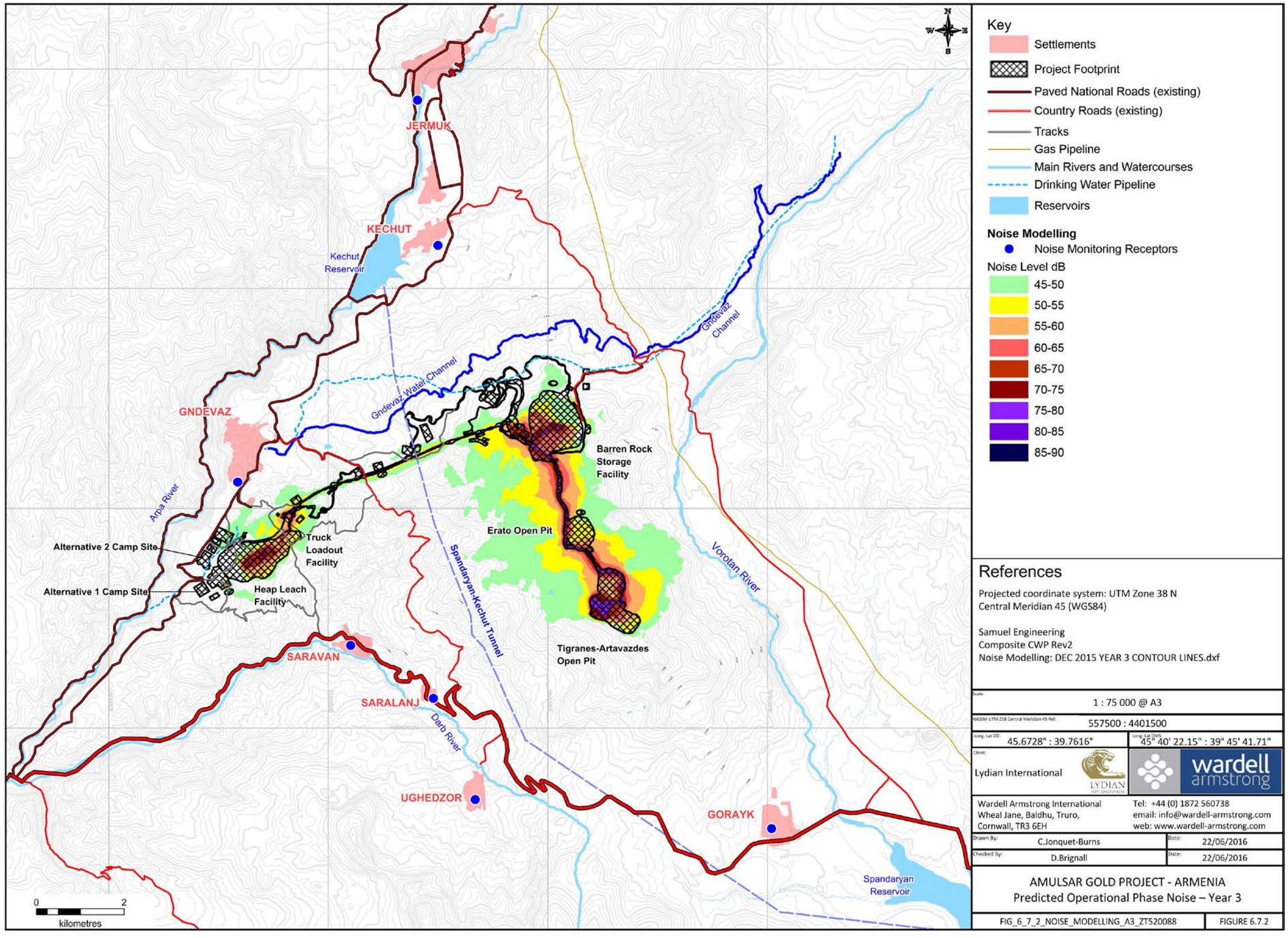

Figure 6.7.2: Predicted Operational Phase Noise Year 3

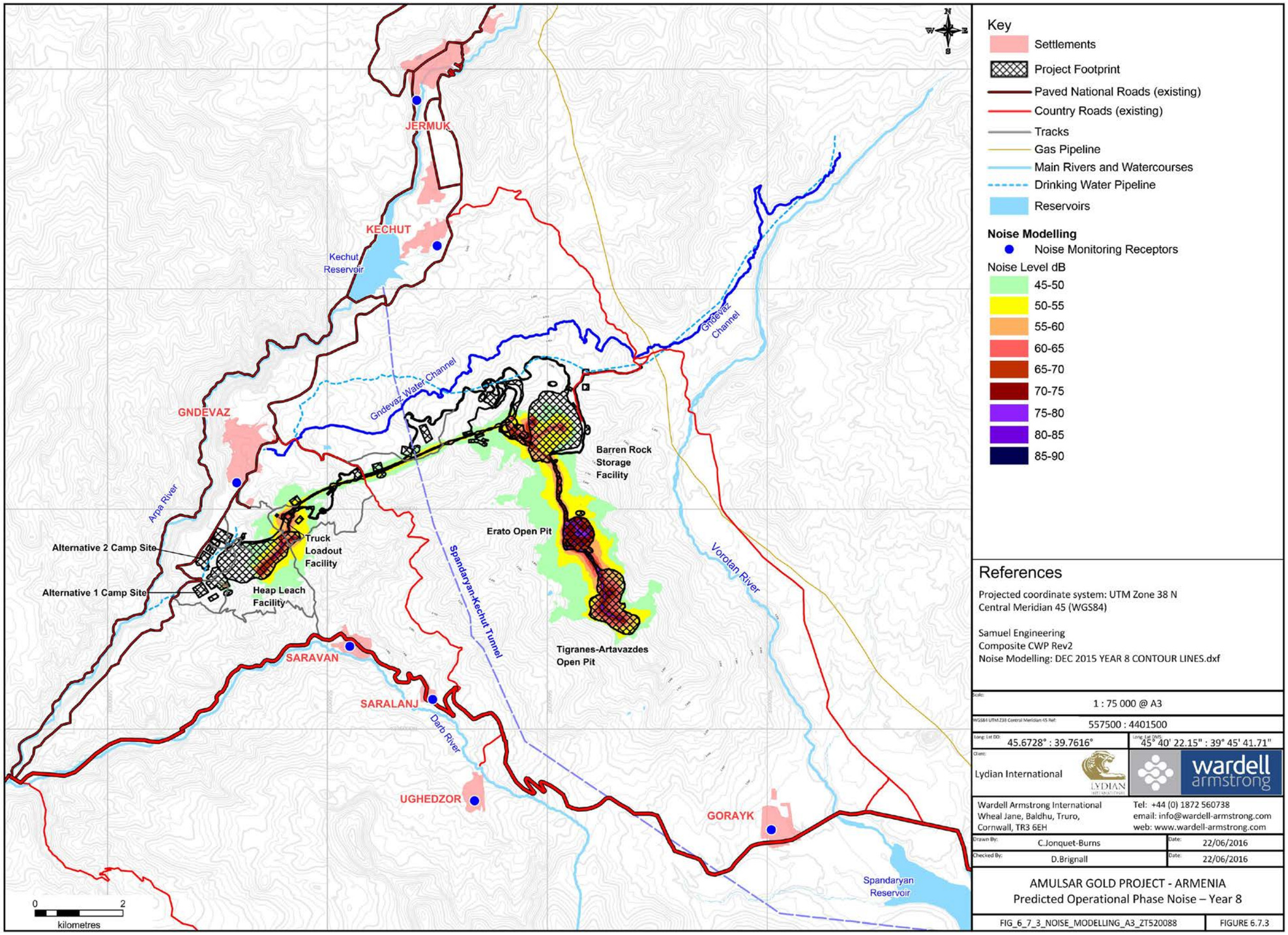

Figure 6.7.3: Predicted Operational Phase Noise – Year 8

The night-time noise levels arising from Project operations in years 4 and 8 have been assessed in Table 6.7.13 to Table 6.7.16.

Table 6.7.13: Night-Time Noise Impact Assessment – Year 3			
Village	**Predicted Site Noise Level LAeq (dB)**	**Night Time Noise Criterion LAeq (dB)**	**Difference**
Saralanj	34	45	-11
Ughedzor	32	45	-13
Saravan	31	45	-14
Gorayk	24	45	-21
Gndevaz	36	45	-9
Kechut	31	45	-14
Jermuk	22	45	-23

The analysis demonstrates that the worst case predicted noise level from Project operations in year 3 meets the IFC night-time noise level criterion (see Table 2.14) by at least 9dB. Table 6.7.14 identifies the contribution of predicted site noise levels compared to pre-existing baseline (or background levels).

Table 6.7.14: Night-Time Noise Impact Assessment – Year 3				
Community	**Predicted Site Noise Level, LAeq (dB)**	**Measured Baseline Noise Level LAeq (dB)**	**Predicted Absolute Noise Level, LAeq (dB)**	**Increase over Baseline**
Saralanj	34	43	44	+1
Ughedzor	32	47	47	0
Saravan	31	40	41	+1
Gorayk	24	38	38	0
Gndevaz	36	38	40	+2
Kechut	31	36	37	+1
Jermuk	22	42	42	0

It can be seen that the worst case predicted noise level from Project operations in year 3 will increase baseline levels by no more than 2dB in compliance with the IFC Guidelines at night (see Table 2.14).

Table 6.7.15: Night-Time Noise Impact Assessment – Year 8			
Village	**Predicted Site Noise Level LAeq (dB)**	**Night Time Noise Criterion LAeq (dB)**	**Difference**
Saralanj	34	45	-11
Ughedzor	32	45	-13
Saravan	33	45	-12
Gorayk	24	45	-21
Gndevaz	34	45	-11
Kechut	28	45	-17
Jermuk	19	45	-26

The analysis in Table 6.7.15 demonstrates that the worst case predicted noise level from Project operations in year 8 meets the IFC night-time noise level criterion by at least 11dB. Table 6.7.16 identifies the contribution of predicted site noise levels at year 8 of operations compared to pre-existing baseline (or background levels).

Table 6.7.16: Night-time Noise Impact Assessment – Year 8				
Community	**Predicted Site Noise Level, LAeq (dB)**	**Measured Baseline Noise Level LAeq (dB)**	**Predicted Absolute Noise Level, LAeq (dB)**	**Increase over Baseline**
Saralanj	34	43	44	+1
Ughedzor	32	47	47	0
Saravan	33	40	41	+1
Gorayk	24	38	38	0
Gndevaz	34	38	40	+2
Kechut	28	36	37	+1
Jermuk	19	42	42	0

It can be seen that the worst case predicted noise level from Project operations in year 8 will increase baseline levels by no more than 2dB in compliance with the IFC Guidelines[17] at night (see also Table 2.14).

When comparing the predicted ambient noise levels from the night-time mining operations with the IFC Guidelines[18], the magnitude of the noise impact of the night-time phase is considered to be Low at Gndevaz. At all other affected communities the magnitude of the noise impact is negligible. The significance of the effect is Minor at Gndevaz and Negligible at all other affected communities.

[17] Ibid. 3
[18] Ibid. 3

The nearest community is at least 1km from the major project facilities, whilst workers will be in close proximity to each noise and vibration source. Standard noise mitigation and best practices will be adopted from the OHSP (Appendix 8.7) to protect workers. With appropriate mitigation measures applied, the significance of the residual effect is Negligible at Saralanj, Ughedzor, Saravan, Gorayk, Kechut and Jermuk. The significance of the residual effect is Minor at Gndevaz.

Seasonal herder camps and the grazing of animals has been noted to take place to the northeast and east of the proposed BRSF. If such camps occur outside of the proposed restricted area around the project site, the magnitude of the noise impact of operational phase will be below IFC EHS Guidelines[19] and is therefore considered to be Negligible.

Potential noise and vibration impacts upon ecological receptors is considered in Section 6.11 Biodiversity.

6.7.11 Blasting Noise and Vibration Prediction

Air Overpressure

The predicted air overpressure from blasting during the operational phase within the open pits at receptors in each community, based on the assumptions outlined in Section 6.7.8, is shown in Table 6.7.17.

Table 6.7.17: Predicted Air Overpressure Level

Community		Operational Phase Air Overpressure Level (dBL)
Saralanj		109
Ughedzor		108
Saravan		104
Gorayk		109
Gndevaz		99
Kechut		98
Jermuk		94

The predicted air overpressure levels at the nearest villages indicate that all blasts undertaken at the Project will be audible, but only for a very short period after each blast (less than one second). The predicted levels in Table 6.7.17 are all less than the compliance targets set out in Section 2.4.4. In the construction phase, blasting may take place during HLF preparation

[19] Ibid.3

and in borrow pit quarries for short periods during the daytime only. The blasting methodology will be designed to ensure the target criterion of 115dB are met.

Vibration

The predicted ground vibration from blasting during the operational phase within the open pits at receptors in each community, based on the assumptions outlined in Section 6.7.8, can be seen below in Table 6.7.18.

Table 6.7.18: Predicted Vibration Level

Community		Operational Phase Vibration Level (mms^{-1})
Saralanj		0.09
Ughedzor		0.08
Saravan		0.05
Gorayk		0.09
Gndevaz		0.02
Kechut		0.02
Jermuk		0.01

The predicted vibration levels at the nearest villages indicate that all blasts undertaken at the Project will not be perceptible. In the construction phase, blasting may take place during HLF preparation and in borrow pit quarries for short periods during the daytime only. The blasting methodology will be designed to ensure the target vibration criterion of $5mms^{-1}$ are met.

6.7.12 Blasting Impact Assessment

Potential impacts related to blasting were assessed for air overpressure (this is a transient airborne pressure wave generated during blasting) and vibrations.

Air Overpressure

Air overpressure predictions were carried out in accordance with AS2187-2:2006[20]. To consider the worst case prediction, the guidance states that in unfavorable meteorological conditions, it is common for air overpressure levels to be increased by up to 20dBL due to the combined effects of an increase with altitude of temperature (an inversion) and/or wind velocity (windshear). Taking account of meteorological conditions, combined with blast design for open pit mining, the air overpressure impact assessment results are presented in Table 6.7.19.

[20] Ibid. 2

Table 6.7.19: Air Overpressure Impact Assessment			
Community	**Predicted Air Overpressure Level (dBL)**	**Air Overpressure Criterion (dBL)**	**Difference**
Saralanj	109	115	-6
Ughedzor	108		-7
Saravan	104		-11
Gorayk	109		-6
Gndevaz	99		-16
Kechut	98		-17
Jermuk	94		-21

Air overpressure criteria will be met at all affected communities by at least 6dBL. Air overpressure at any of the community receptors should not exceed 115dBL for 95% of blasts in any calendar year, extending to a maximum limit of 120dBL for the remaining 5% of blasts.

When comparing the predicted air overpressure levels from the blasting operations with AS2187-2:2006[21], the magnitude of air overpressure impact is considered to be Negligible and not significant.

Standard mitigation and best practices will be adopted from the OHSP (Appendix 8.7) to protect workers. With appropriate mitigation measures applied, the magnitude of the residual impact is considered Low, these will be identified in the OHSP (see Appendix 8.7).

Vibration

Vibration predictions were carried out in accordance with AS2187-2:2006[22], which states that the use of a site constant of K_g = 1,140, and a site exponent of B = 1.6, will provide an estimate of vibration levels in 'average' conditions. In practice, due to variations in ground conditions and other factors, the resulting ground vibration levels can vary from two-fifths to four times that estimated. The vibration impact assessment results for blasting are presented in Table 6.7.20.

Table 6.7.20: Vibration Impact Assessment			
Community	**Predicted vibration level (mms^{-1})**	**Vibration criterion (mms^{-1})**	**Difference**
Saralanj	0.09	5	-4.91
Ughedzor	0.08		-4.92

[21] Ibid. 2
[22] Ibid. 2

Table 6.7.20: Vibration Impact Assessment			
Community	**Predicted vibration level (mms^{-1})**	**Vibration criterion (mms^{-1})**	**Difference**
Saravan	0.05		-4.95
Gorayk	0.09		-4.91
Gndevaz	0.02		-4.98
Kechut	0.02		-4.98
Jermuk	0.01		-4.99

Vibration criteria will be met at all nearby communities by at least 4.91mms^{-1}.

Ground vibration at any of the community receptors should not exceed a Peak Particle Velocity (PPV) of 5mms^{-1} for 95% of blasts in any calendar year, extending to a maximum PPV of 10mms^{-1} for the remaining 5% of blasts.

The predicted vibration levels at the nearest villages indicate that all blasts undertaken at the Project will not be perceptible. Therefore, when comparing the predicted vibration levels from the blasting operations with AS2187-2:2006[2], the magnitude of impact is considered to be Negligible and not significant.

There is considered to be no potential for blasting activities to impact upon Jermuk spring waters used for bottling, as a study into groundwater sources in the region (see Section 4.8 and Appendix 4.9.1) shows that the source of groundwater which feeds Jermuk Spring is not connected with Amulsar Mountain.

Standard mitigation and best practices will be adopted from the OHSP (Appendix 8.7) to protect workers. With appropriate mitigation measures applied, the magnitude of the residual impact is considered Low and therefore not significant.

6.7.13 Mitigation Measures for Noise and Vibration Impacts

Noise

General mitigation measures applicable to all noise sources which will be implemented to address identified impacts for the design life of the Project are summarized as follows (see also Air Quality, Noise and Vibration Management Plan (AQNVMP, Appendix 8.14)):

Design Mitigation

- Incorporate designed mitigation measures prior to start up, including housing for crushing plant (which should be in place before tests on crushing plant are

commenced). Soil mounds constructed adjacent to haul roads should be located to provide additional attenuation between the haul trucks and the nearest community;

- Construct closed conveyor from crushing plant to HLF, test and prepare for operational use following commissioning of the crushers, as the use of the conveyor for transportation of crushed rock is a significant noise abatement measure, compared to use of dump trucks on haul routes; and
- During detailed construction design, consider the use of noise barriers, baffles, or enclosures to provide abatement for noisy equipment such as generators, compressor, pumps, gearboxes; and maintain an adequate distance between the stationary noise sources from nearby communities.

Operational Plant Mitigation

- All mobile plant should undergo regular inspection and maintenance; to ensure that they have designed mufflers are perform to an adequate standard and that worn parts are replaced;
- Schedule noisy construction activities, so that when new activities commence, local communities can be made aware of the activity in advance, through existing stakeholder engagement mechanisms;
- Where practical, noisy construction related activity should be undertaken during the "normal working" daytime period; and
- Maintain the surface of haul roads in good condition and impose a speed limit.

During operations, the following noise abatement best practice measures will be implemented:

- Workers will be trained in noise abatement best practices, including avoiding unnecessary revving of engines and switching off equipment when it is not required;
- Haul routes will be well maintained and where steep gradients are required operatives will be trained to minimize engine noise through avoiding unnecessary revving, etc.;
- Drop height for materials will be minimised;
- Vehicle and plant start-ups will be sequenced to avoid simultaneous noise bursts;
- All vehicles will be fitted with reversing alarms that take account of use and area of activity within the footprint of the Project, such that the requirements for occupational health and safety and environmental noise control are achieved;
- Provide an air inlet silencer and exhaust silencers for stationary combustion engines and other units (for example generators);

- Perform regular inspection and maintenance of material handling vehicles and equipment to ensure that they have quality mufflers installed, worn parts are replaced, and lubricants are applied so that the design noise-output specifications continue to be met;
- When plant equipment has to be replaced, the selected plant will have a sound power level equal to or less than the plant that it is replacing;
- Blast design will include face profiling and explosive packing to maintain high level of environmental performance for each blast;
- Lydian employees and contractors involved in mining and blasting operations will be issued and will wear appropriate hearing protection in high-noise areas. Such areas will be designated by signage in the appropriate language, and employees and contractors will be trained in hearing protection procedures;
- Consultation will be held with herders to ensure they are aware of the presence of the restricted access zone around the BRSF to minimise their noise exposure;
- The static plant located in the crusher and ADR facility processing areas will be housed within a building, and breakout points in the facade of these buildings (i.e. doors, windows etc.) will be minimised, as well as minimising the reverberant noise inside the buildings, which will be controlled through sound absorptive material;
- Complaints related to noise or vibrations related to mining and blasting activities will be monitored through the stakeholder engagement activities and the Project's complaints and grievance process, including the use of drop boxes to encourage comments on performance;
- Noise monitoring will be undertaken in accordance with the AQNVMP (Appendix 8.14) and following any complaints from within the affected community receptors and
- All measured data will be logged and maintained as a record for the site ESMS, which should be available on request and published annually for the duration of the Project.

The following general measures will be implemented to minimize transportation-related noise impacts associated with the Project:

- Enforce speed limits in relation to road conditions and location of sensitive receptors such as local communities;
- Maintain access road surfaces in good repair to reduce tire noise; and
- Ensure continuous traffic flow to avoid prolonged idling.

Blasting

To minimise the impact of the perception of blasting on nearby residents, community engagement publicity will include providing information to the residents in affected communities identifying when blasts are likely to occur (periods during each working day); how long each blasting schedule will last; and how frequently the blasting will take place. The public engagement will commence prior to the construction phase in order to identify where blasting will take place for construction, the periods when these activities will take place over and a schedule of blast frequency and times for each of the activities.

A safe blast radius will be maintained around blasting. All blasts will have an exclusion (or evacuation) zone established prior to firing of the shot. The size of the exclusion zone shall be such that all fly rock and associated debris is contained within the zone, as well as consideration on impacts of blast environmental limits on humans and where required, animals. The size of the exclusion zone is directly related to the blasting activity and the surrounding environment. A 500m restricted area will be established around the pits.

Prior to the start of construction activities, the Project will conduct a crack and damage survey of structures within the defined potential area of influence of blasting and heavy equipment traffic vibrations, to document baseline structural conditions for sensitive receptors. This survey to be conducted by Lydian and independent surveyors commencing in spring 2015. During the early stages of operation, it is good practice to monitor both ground vibration and air overpressure at the nearest sensitive receptors to ensure compliance with the air overpressure and vibration criteria outlined in this assessment. A record of the crack and damage survey and monitoring programme results, together with blast design and mine plan geometry at the time will be maintained. This information will identify suitable monitoring locations and programmes in the event of a complaint at any stage of the operational life of the mine. Should the measured data indicate that the criteria are not being met, the blasting design will be modified to ensure compliance.

All air overpressure and vibration monitoring will be carried out in accordance with the relevant guidance and the AQMVMP (see Appendix 8.14).

6.7.14 Monitoring and Management

The approach to the management of site noise and blasting vibration has been considered in Table 6.7.21.

<table>
<tr><th colspan="4">Table 6.7.21: Noise and Vibration Management Plan</th></tr>
<tr><td colspan="4">Noise</td></tr>
<tr><td>Monitoring approach</td><td>Baseline</td><td colspan="2">A developing programme of ambient noise monitoring commenced in 2012 in order to establish baseline conditions at key locations within the Project licence area and at local settlements (see Chapter 4).</td></tr>
<tr><td>Level 3 SSPs</td><td colspan="3">The noise assessment detailed in the ESIA will be underpinned by a monitoring plan that will provide specific guidance on monitoring locations and procedures during the construction, operational and closure phases. The level 3 plan will include the following:
• Suitable Monitoring Equipment – Type 1 Cirrus noise meters with environmental monitoring kits will be used for noise monitoring and suitable maintenance requirements and non-conformance procedures will be identified. Chain of custody documentation.
• Noise Monitoring Procedures - The SSP will define the monitoring requirements and periods for the use of the equipment, which will be directed towards areas of the operation where the effectiveness of mitigation measures can be determined. The procedure will ensure that representative data is collected and suitable records retained throughout the duration of the Project and will include details of:
- suitable monitoring locations;
- duration of monitoring to be undertaken at each location for each identified stage of works;
- recording of all required noise data including noise level (L_{Aeq}), date, time, weather conditions and any other relevant information;
- guideline noise levels; and
- action to be undertaken in the event that guideline noise levels are exceeded at identified receptors.
• Vibration monitoring procedures – The SSP will define the vibration monitoring requirements and periods for use of the equipment.
• Complaints Procedure –The procedure will detail actions to be undertaken in the event that noise specific complaints are received by the operator either directly or through the dedicated liaison mechanisms implemented as part of the project</td></tr>
<tr><td colspan="2">Monitoring strategy</td><td>Equipment</td><td>Procedure</td></tr>
<tr><td colspan="2">Noise</td><td>Two type 1 Cirrus noise meters with environmental monitoring kits will be retained on site and maintained throughout the duration of the Project.</td><td>Noise monitoring will be undertaken at locations considered representative of sensitive receptors closest to the Project periodically through each stage of the proposed Project. Additional monitoring will be undertaken in response to noise complaints at suitable locations.</td></tr>
<tr><td colspan="2">Vibration</td><td>Vibration meters of a suitable standard and level of maintenance will be used as required.</td><td>Vibration monitoring will be undertaken in response to vibration complaints at suitable locations.</td></tr>
<tr><td colspan="4">Note: Noise and vibration have been combined into a single Air Quality, Noise and Vibration Management Plan (see Appendix 8.14)</td></tr>
</table>

The monitoring programme commencing during construction will be augmented with the introduction of a Primary Monitoring Station (PMS) for noise, vibration and air quality located to the west of the livestock and dairy farm, adjacent to the apartment block that has been

acquired by the Project sponsor. Noise levels have been predicted at the PMS, compliance with which will demonstrate compliance at the nearest community of Gndevaz. The monitoring location affords a power supply and therefore the ability to undertake long term noise monitoring. The monitoring location (see Figure 6.7.4), can be accessed from the H-42 and therefore will be included in the community participatory monitoring programme.

6.7.15 Residual Noise and Vibration Impacts

Standard noise mitigation and best practices will be adopted by the Project to protect workers and community receptors. With appropriate mitigation measures applied, the noise levels at each nearby community will be below guideline values. The residual impact is therefore considered minor in the short and long term for both, workers and community receptors.

During the early stages of operation, it is good practice to monitor both ground vibration and air overpressure at the nearest sensitive receptors to ensure compliance with the air overpressure and vibration criteria outlined in this assessment and this will be done in accordance with the AQNVMP (Appendix 8.14).

Noise and vibration impact upon ecological receptors is considered in Section 6.11 Biodiversity.

Additionally, the effectiveness of mitigated noise and vibration activities will be monitored via the Project's complaints and grievances mechanism. The summary of residual impacts has been defined in Table 6.7.22.

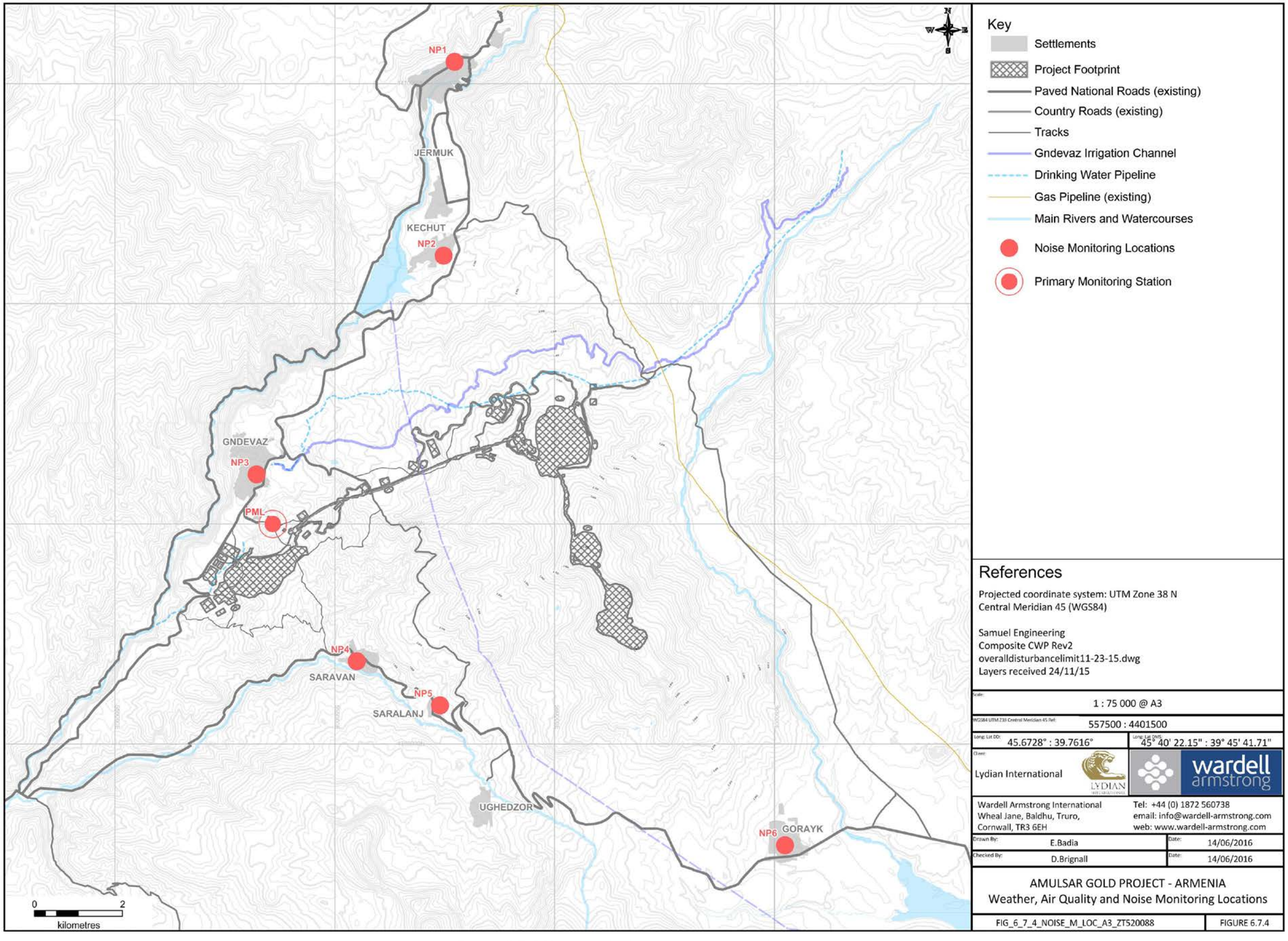

Figure 6.7.4 Noise and vibration monitoring locations

6.7.16 Conclusions

An impact assessment has been undertaken to assess the effects of construction, operation and closure of the Project with regard to noise and vibration sensitive receptors.

The potential impact magnitude of noise and vibration generated by the Project has been assessed at identified sensitive receptors and appropriate mitigation measures defined to ensure that significant noise and vibration impacts do not occur.

To reduce the potential for noise and vibration impacts both at existing receptor locations in the immediate vicinity of the site, and for employees working on the site, standard mitigation measures and best practices will be adopted by the Project to protect workers and community receptors. Additionally, the effectiveness of mitigated noise and vibration activities will be monitored via the Project's grievance mechanism.

With appropriate mitigation measures applied, the residual impact is considered minor to negligible in the short and long term for both workers and community receptors.

Table 6.7.22: Impact Summary - Noise and Vibration								
Impact	**Source**	**Primary Receptor (1)**	**Phase (2)**		**Significance(3)**		**Mitigation Measures**	**Management Plan**
			C	**O**	**ST**	**LT**		
Noise	Vehicle Traffic, Heavy Equipment, Mobile Equipment, Supply Traffic, Diesel Generators, Concrete Plant, General Construction Activities	R	X	X	MI	N to MI	• Perform regular maintenance and inspection of vehicles and mobile equipment, including mufflers. • Maintain speed limits for heavy equipment and general traffic on all roads, and maintain roads. • Install noise attenuation devices on construction equipment. • Position stationary noise sources away from residents.	Transport Plan (TP, Appendix 8.10)
							• Schedule high noise-generating activities to daytime and/or normal work hours. • Post signage in appropriate languages denoting areas of high noise where hearing protection is mandatory. • Position containers for use as temporary noise barriers when possible.	AQNVMP (Appendix 8.14)
							• Monitor noise-related complaints through the Complaints and Grievances Process. • Engage with herders to ensure they understand the importance of the restricted access zone around the BRSF to minimise their noise exposure	Stakeholder Engagement Plan (SEP, Appendix 8.6)

Table 6.7.22: Impact Summary - Noise and Vibration

Impact	Source	Primary Receptor (1)	Phase (2)		Significance(3)		Mitigation Measures	Management Plan
			C	O	ST	LT		
Noise	Vehicle Traffic, Heavy Equipment, Mobile Equipment, Supply Traffic, Diesel Generators, Concrete Plant, General Construction Activities	E	X	X	MI	N to MI	• Use personnel protective equipment where required and occupational medical monitoring.	Occupational Health and Safety Plan (Appendix 8.7)
	Topsoil / Soil Cover Stripping, Drilling, Blasting, Product Extraction and Stockpiling, Crushing, and Loading Activities	R	X	X	MI	N to MI	• Perform regular maintenance and inspection of equipment, including lubrication. • Perform regular maintenance and inspection of vehicles and mobile equipment, including mufflers. • Limit equipment on site - have only the necessary equipment on site. • Maintain speed limits for heavy equipment and general traffic on all roads, and maintain roads. • Use noise barriers, baffles, or enclosures when possible. • Post signage in appropriate languages denoting areas of high noise where hearing protection is mandatory.	AQNVMP (Appendix 8.14)
							• Monitor noise-related complaints through the Complaints and Grievances Process.	SEP (Appendix

Table 6.7.22: Impact Summary - Noise and Vibration

Impact	Source	Primary Receptor (1)	Phase (2)		Significance(3)		Mitigation Measures	Management Plan
			C	O	ST	LT		
								8.6)
Noise	Topsoil / Soil Cover Stripping, Drilling, Blasting, Product Extraction and Stockpiling, Crushing, and Loading Activities	E	X	X	MI	N to MI	• Use personnel protective equipment where required and occupational medical monitoring.	OHSP (Appendix 8.7)
	Mobile Equipment	R	X	X	N	N To MI	• Maintain speed limits for heavy equipment and general traffic on all roads, and maintain roads. • Perform regular maintenance and inspection of equipment, including lubrication. • Consider use of noise barriers, baffles, or enclosures if appropriate . • Post signage in appropriate languages denoting areas of high noise where hearing protection is mandatory.	AQNVMP (Appendix 8.14)
							• Monitor noise-related complaints through the Complaints and Grievances Process.	SEP (Appendix 8.6)
	Mobile Equipment	E	X	X	MI	MI	• Use personnel protective equipment where required and occupational medical monitoring.	OHSP (Appendix 8.

Table 6.7.22: Impact Summary - Noise and Vibration

Impact	Source	Primary Receptor (1)	Phase (2)		Significance(3)		Mitigation Measures	Management Plan
			C	O	ST	LT		
								7)
Noise	General Project Operations	R		X	N	N	• Enclose noise-generating equipment in a sound-insulated building. • Use exhaust silencers. • Perform regular maintenance and inspection of equipment. • Post signage in appropriate languages denoting areas of high noise where hearing protection is mandatory.	AQNVMP (Appendix 8.14)
							• Monitor noise-related complaints through the Complaints and Grievances Process.	SEP (Appendix 8.6)
	General Project Operations	E		X	MI	MI	• Use personnel protective equipment where required and occupational medical monitoring.	OHSP (Appendix 8. 7)
Vibrations	Vehicles, Heavy Equipment	E, R, B	X	X	N	N	• Enforce speed limits for heavy equipment and general traffic on all roads. • Schedule high vibration-generating activities to daytime hours.	AQNVMP (Appendix 8.14)
	General Project Operations	E, R, B		X	N	N	• Schedule high vibration-generating activities to daytime hours. • Perform regular maintenance and inspection of equipment.	AQNVMP (Appendix 8.14)
							• Monitor vibration-related complaints through the Complaints and Grievances Process.	SEP (Appendix 8.6)

Table 6.7.22: Impact Summary - Noise and Vibration								
Impact	**Source**	**Primary Receptor (1)**	**Phase (2)**		**Significance(3)**		**Mitigation Measures**	**Management Plan**
			C	**O**	**ST**	**LT**		
Notes: (1) Primary Receptors: R = residents, E = employees, B = buildings (2) Project Phase: C = Construction, O = Operations (3) Expected Significance Rankings: ST = short-term with mitigation, LT = long-term with mitigation, N = Negligible, MI = Minor, M = Moderate, MA = Major, NA = Not Acceptable								