

Submissions Report

Appendix E



North Star to NSW/Queensland Border

Environmental Impact Statement

APPENDIX

E

Construction Noise and Vibration Assessment Updates

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

Appendix E: Construction Noise and Vibration Assessment Updates

E.1 Updated sensitive receiver numbers

Table E.1 presents receiver numbers used in the CNVIA and the ONVIA. It also identifies the type of receivers close to the main alignment, borrow pits and access/haul routes.

TABLE E.1: RECEIVER ADDRESSES AND LAND USES

Original CNVIA receiver number	Final CNVIA and ONVIA receiver number ¹	Receiver land use
1	1	Shed
2	2	Residential
3	3	Residential
4	4	Shed
5	5	Residential
6	253850	Residential
7	253851	Residential
8	253852	Residential
9	253856	Residential
10	253855	Residential
11	253858	Residential
12	253864	Residential
13	253866	Residential
14	253868	Residential
15	253869	Residential
16	253871	Residential
17	253876	Residential
18	253880	Residential
19	253883	Residential
20	253886	Residential
21	253890	Residential
22	253888	Active Recreation
23	253894	Residential
24	253895	Commercial
25	253897	Commercial
26	253898	Commercial
27	253899	Residential
28	253904	Residential
29	253905	Residential
30	253915	Residential
31	253922	Residential
32	253919	Commercial
33	253920	Residential
34	253924	Residential
35	253926	Residential

Original CNVIA receiver number	Final CNVIA and ONVIA receiver number ¹	Receiver land use
36	253929	Residential
37	253936	Shed
38	253931	Residential
39	253934	Residential
40	253940	Industrial
41	253945	Residential
42	253947	Residential
43	253950	Shed
44	253951	Shed
45	253949	Residential
46	253948	Residential
47	253956	Residential
48	253958	Shed
49	253962	Residential
50	253960	Residential
51	253971	Residential
52	253973	School
53	253977	School
54	253978	School
55	253978	School
56	253978	School
57	253980	Residential
58	253981	Residential
59	253984	School
60	253986	Industrial
61	253988	Residential
62	253990	Residential
63	253992	Residential
64	253994	Industrial
65	254000	Industrial
66	253997	Residential
67	254001	Residential
68	254004	Industrial
69	254009	Industrial
70	254019	Industrial
71	254020	Industrial
72	254024	Shed
73	254026	Shed
74	254027	Residential
75	254029	Shed
76	254035	Shed
77	254037	Shed
78	254038	Shed

Original CNVIA receiver number	Final CNVIA and ONVIA receiver number ¹	Receiver land use
79	254042	Residential
80	80	Residential
81	81	Residential
82	82	Shed
83	83	Residential
84	84	Residential
85	85	Residential
86	86	Shed
87	87	Residential
88	254047	Shed
89	254048	Shed
90	90	Residential
91	254050	Residential
92	92	Residential
93	254056	Residential
94	254061	Shed
95	254064	Residential
96	254063	Residential
97	254070	Residential
98	98	Shed
99	254071	Residential
100	100	Residential
101	254072	Shed
102	254074	Shed
103	254075	Residential
104	254076	Shed
105	105	Residential
106	106	Residential
107	107	Residential
108	108	Residential
109	109	Residential
110	110	Residential
111	111	Residential
112	112	Residential
113	113	Residential
114	114	Shed
115	115	Residential
116	116	Residential
117	254088	Residential
118	254093	Shed
119	254096	Residential
120	254100	Residential
121	254103	Residential

Original CNVIA receiver number	Final CNVIA and ONVIA receiver number ¹	Receiver land use
122	122	Residential
123	123	Residential
124	124	Residential
125	125	Residential
126	126	Residential
127	127	Residential
128	128	Residential
129	129	Residential
130	130	Residential
131	131	Residential
132	132	Residential
133	133	Residential
134	134	Community Centre
135	135	Residential
136	136	Residential
137	137	Residential
138	138	Residential
139	139	Residential
140	140	Residential
141	141	Residential
142	142	Residential
143	143	Residential
144	144	School
145	145	Residential
146	146	Residential
147	147	Residential
148	148	Shed
149	149	Residential
150	150	Residential
151	151	Residential
152	152	Residential
153	153	Residential
154	154	Residential
155	155	Residential
156	156	Residential
157	157	Residential
158	158	Residential
159	159	Residential
160	160	Residential
161	161	Residential
162	162	Residential
163	163	Residential
164	164	Residential

Original CNVIA receiver number	Final CNVIA and ONVIA receiver number ¹	Receiver land use
165	165	Residential
166	166	Residential
167	167	Residential
168	168	Residential
169	169	Residential
170	170	Residential
171	171	Industrial
172	172	Residential
173	173	Residential
174	174	Residential
175	175	Residential
176	176	Residential
177	177	Residential
178	178	Residential
179	179	Residential
180	180	Residential
181	181	Residential
182	182	Residential
183	183	Residential
184	184	Residential
185	185	Residential
186	254105	Residential
187	254106	Residential
188	254130	Residential
189	254139	Residential

Table notes:

- Note that some receivers are only used in the CNVIA; this is generally due to their location being close to a borrow pit but distant from the main alignment.

TABLE E.2: RESIDENTIAL CONSTRUCTION NOISE MANAGEMENT LEVELS

NCA	Period	RBL L_{A90} dBA	Standard hours noise management levels, $L_{Aeq, 15min}$ dBA	Out of hours noise management levels, $L_{Aeq, 15min}$ dBA
1	Day	35 ¹	45	40
	Evening	32	-	37
	Night	30 ¹	-	35
2	Day	35 ¹	45	40
	Evening	30 ¹	-	35
	Night	30 ²	-	35
3	Day	35 ¹	45	40
	Evening	30 ¹	-	35
	Night	30 ¹	-	35
4	Day	35 ¹	45	40
	Evening	30 ¹	-	35
	Night	30	-	35

NCA	Period	RBL L_{A90} , dBA	Standard hours noise management levels, $L_{Aeq, 15min}$, dBA	Out of hours noise management levels, $L_{Aeq, 15min}$, dBA
5	Day	35 ¹	45	40
	Evening	31	-	36
	Night	30 ¹	-	35

Table notes:

1. In accordance with Noise Policy for Industry Table 2.1, a minimum RBL has been adopted where the measured RBL is less than 35 dBA during the day, 30 dBA in the evening or 30 dBA at night
2. The Noise Policy for Industry indicates that the community generally expects a greater control of noise during the evening and night as compared to the daytime; therefore, the rating background level used for the evening is set to no more than that for the daytime, and the night-time to no more than the daytime or evening.

TABLE E.3: PREDICTED CONSTRUCTION NOISE IMPACTS—OUT-OF-HOURS (NIGHT-TIME)

NCA	Noise management level, dBA	Maximum L _{Aeq} noise level, dBA	Number of receivers where the NML is exceeded			
			Number of properties where noise levels exceed NML—< 5 dBA	Number of properties where noise levels exceed NML—5 to 15 dBA	Number of properties where noise levels exceed NML—16 to 25 dBA	Number of properties exceeding NM—> 25 dBA
Site establishment and laydowns						
NCA1	35	59	1	33	9	0
NCA2	35	53	0	1	3	0
NCA3	35	49	3	2	0	0
NCA4	35	45	2	1	0	0
NCA5	35	43	3	0	0	0
Drainage works and earthworks						
NCA1	35	37	7	0	0	0
NCA2	35	78	0	1	2	1
NCA3	35	64	4	0	1	1
NCA4	35	75	1	0	0	1
NCA5	35	41	2	0	0	0
Bridge and road works						
NCA1	35	< 20	0	0	0	0
NCA2	35	69	0	2	0	1
NCA3	35	42	0	1	0	0
NCA4	35	29	0	0	0	0
NCA5	35	40	2	0	0	0
Track works						
NCA1	35	34	0	0	0	0
NCA2	35	75	0	3	0	1
NCA3	35	61	1	0	1	1
NCA4	35	72	0	0	0	1
NCA5	35	38	2	0	0	0

NCA	Noise management level, dBA	Maximum L _{Aeq} noise level, dBA	Number of receivers where the NML is exceeded			
			Number of properties where noise levels exceed NML—< 5 dBA	Number of properties where noise levels exceed NML—5 to 15 dBA	Number of properties where noise levels exceed NML—16 to 25 dBA	Number of properties exceeding NM—> 25 dBA
Testing commissioning and reinstatement						
NCA1	35	31	0	0	0	0
NCA2	35	72	1	2	0	1
NCA3	35	58	0	1	1	0
NCA4	35	69	0	0	0	1
NCA5	35	35	0	0	0	0

TABLE E.4: PREDICTED BORROW PIT NOISE IMPACTS—DAYTIME

ID	NCA	Noise management level, dBA	L _{Aeq} noise level, dBA
3	N/A	45	46
5	N/A	45	46
80	N/A	45	46
81	N/A	45	47
84	N/A	45	48
85	N/A	45	47
87	N/A	45	48
90	N/A	45	48
254050	NCA2	45	48
92	N/A	45	49
254056	NCA2	45	49
254070	NCA3	45	50
254071	NCA3	45	48
254075	NCA3	45	46
105	N/A	45	46
108	N/A	45	47
109	N/A	45	47
111	N/A	45	47

TABLE E.5: PREDICTED BORROW PIT NOISE IMPACTS—NIGHT-TIME

ID	NCA	Noise management level, dBA	L_{Aeq} noise level, dBA
2	N/A	35	41
3	N/A	35	46
5	N/A	35	46
80	N/A	35	46
81	N/A	35	47
83	N/A	35	42
84	N/A	35	48
85	N/A	35	47
87	N/A	35	48
90	N/A	35	48
254050	NCA2	35	48
92	N/A	35	49
254056	NCA2	35	49
254064	NCA3	35	42
254063	NCA3	35	43
254070	NCA3	35	50
254071	NCA3	35	48
100	N/A	35	42
254075	NCA3	35	46
105	N/A	35	46
106	N/A	35	44
107	N/A	35	44
108	N/A	35	47
109	N/A	35	47
110	N/A	35	44
111	N/A	35	47
112	N/A	35	44
113	N/A	35	45
115	N/A	35	43
116	N/A	35	45

TABLE E.6: PREDICTED BORROW PIT NOISE IMPACTS—SLEEP DISTURBANCE

ID	NCA	Sleep disturbance criteria	L _{A1,1min} noise level
2	N/A	45	46
3	N/A	45	51
5	N/A	45	51
80	N/A	45	51
81	N/A	45	52
83	N/A	45	47
84	N/A	45	53
85	N/A	45	52
87	N/A	45	53
90	N/A	45	53
254050	NCA2	45	53
92	N/A	45	54
254056	NCA2	45	54
254064	NCA3	45	47
254063	NCA3	45	48
254070	NCA3	45	55
254071	NCA3	45	53
100	N/A	45	47
254075	NCA3	45	51
105	N/A	45	51
106	N/A	45	49
107	N/A	45	49
108	N/A	45	52
109	N/A	45	52
110	N/A	45	49
111	N/A	45	52
112	N/A	45	49
113	N/A	45	50
115	N/A	45	48
116	N/A	45	50

TABLE E.7: INDICATIVE CONSTRUCTION PROGRAM

Construction stage	2021			2022			2023			2024		
Site establishment and laydowns												
Drainage works and earthworks												
Bridge and road works												
Track works												
Testing, commissioning and reinstatement												

TABLE E.8: TYPICAL SOUND POWER LEVELS OF CONSTRUCTION EQUIPMENT

Construction stage	Indicative Duration	Equipment	Sound power level, dBA
Site establishment Laydown areas (used intermittently)	6 months	Trucks	104 ¹
		Crane	98
		Concrete mixer	90
		Chainsaw	110
		Chipper	120 ²
		Grader	107
		40 t excavator	107
		Welding equipment ³	110
		Front end loader ³	103
		Water cart	109
		Total⁵	1224
Drainage works and earthworks	14 months	Jackhammer	113 ²
		Generator	93
		Crushing plant	117
		Boring machine	107
		Backhoe	95
		Dozer	107
		40 t excavator	107
		Trucks	104 ¹
		Scraper	107
		Water cart	109
		Front end loader	103
		Compactor	106
		Grader	107
		15 t roller	102
		Total⁵	120
Bridge works ³	20 months	40 t excavator	107
		Impact piling rig	119 ^{1,2}
		Concrete truck	108
		Concrete pump	106
		Drilling rig	111
		Boring machine	107
		Trucks	104 ¹
		Welding equipment	110
		Generator	93
		Crane	98
		Total⁵	120
Road works ³	8 months	30 t excavator	103
		Trucks	104 ¹
		Crane	98
		Concrete truck	108
		Concrete pump	106

Construction stage	Indicative Duration	Equipment	Sound power level, dBA
Road works³ [continued]	8 months [continued]	Generator	93
		Compactor	106
		Grader	107
		Seal spray rig	106
		15 t roller	102
		Water cart	109
		Line marking equipment	102
		Total⁵	116
Track works	8 months	Tamper	107 ²
		Regulator	107 ²
		40 t excavator	107
		Dump truck	100
		Water cart	109
		Trucks	104 ¹
		Dozer	107
		Dynamic track stabiliser	102
		Lighting rig	93
		15 t roller	102
		Skid steer loader	104
		Grader	107
		Front end loader	103
		Clip up machine	85
		Rail rake	94
		Welding equipment	110
		Ballast train	102
		Total⁵	117
Testing, commissioning and reinstatement	6 months	Grader	107
		30 t excavator	103
		Milling machine	108
		Water cart	109
		Trucks	104 ¹
		Generator	93
		Oxy torch	93
		Sprayer truck	106
		Total⁵	114

Table notes:

1. Equipment assumed to be in operation 50% of any 15-minute period
2. A +5 dBA correction has been added to take account of annoying characteristics
3. Equipment likely to be used in laydown areas only
4. Sound power level represents either site setup works or laydown area activities
5. The total level is the logarithmic sum of sound power levels of all equipment that has been assumed to be operating simultaneously
6. Bridge works and road works have been assessed as a single scenario to maintain consistency

TABLE E.9: MODELLED OPERATIONAL MECHANICAL PLANT SOUND POWER LEVELS

Plant type	Quantity	Overall sound power level, dBA	Octave band frequency—Hz, dB							
			63	125	250	500	1000	2000	4000	8000
Condenser unit	96	61	69	63	60	59	56	51	45	48
Generating set	1	101	99	101	99	100	96	93	89	84
Sewage treatment facility	1	89	94	91	84	85	80	86	73	68

TABLE E.10: NOISE AND VIBRATION MITIGATION MEASURES AND THEIR EFFECTIVENESS

Noise mitigation measures	Type of mitigation measures	Details	Predicted effectiveness
Equipment selections	Source	▶ Equipment selections would be reviewed with a preference for adopting quieter and non-vibratory plant items near sensitive receivers, where feasible and reasonable ▶ Appropriately sized equipment would be selected for the task, such as vibratory compactors and rock excavation equipment ▶ Earth moving equipment would be fitted with efficient sound reduction exhaust systems. Manufacturer' enclosure panels would be kept closed. ▶ Non-tonal reversing alarms would be used, taking into account the requirements of the Workplace Health and Safety legislation.	5–10 dB
Use and siting of plant	Source/Path	▶ Where possible, the duration of simultaneous operation of noise or vibration-intensive plant will be minimised. Plant and equipment used intermittently or no longer in use will be throttled or shut down. ▶ Noise-emitting plant and equipment will be orientated away from sensitive receivers where feasible and reasonable ▶ Construction plant, vehicles and machinery will be maintained and operated in accordance with manufacturer's instructions to minimise noise and vibration emissions ▶ Equipment would be regularly maintained to ensure it is in good working order.	5–10 dB
Shielding	Path	▶ Significant stationary noise sources would be enclosed or shielded.	5–10 dB
Worker training	Source	▶ Induction and training would be provided to relevant staff and sub-contractors outlining their responsibilities with regard to noise and vibration.	-
Construction hours	Source	▶ Noisy work would be scheduled to be undertaken during the standard hours as far as possible. Noisy activities that cannot be undertaken during standard construction hours are to be scheduled as early as possible during the evening and/or night-time periods. ▶ Deliveries would be carried out during standard construction hours where feasible and reasonable.	-
Community consultation	Receiver	▶ All residents affected by noise from the project that are expected to experience an exceedance of the construction NMLs should be consulted about the project prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works ▶ For out of hours works, additional consultation would take place.	-
At-receiver noise mitigation	Receiver	▶ Where properties have been identified for operational at-receiver noise mitigation, and these properties would be impacted by noise from construction works, consideration would be given to the early installation of treatments to provide noise mitigation during the construction of the project. This approach would assist in managing noise through all phases of the project.	5–10 dB

TABLE E.11: ADDITIONAL MITIGATION MEASURES MATRIX (TFNSW CNV STRATEGY)

Construction hours		Action level ¹ (mitigation measures) ²			
		0–10 dB(A) Noticeable	>10–20 dB(A) Clearly audible	>20–30 dB(A) Moderately intrusive	>30 dB(A) Highly intrusive
Standard	Weekday (7:00 am–6:00 pm)	-	-	PN, V	PN, V
	Saturday (8:00 am–1:00 pm)				
	Sunday/Public Holiday (Nil)				
Out-of-Hours Work Period 1	Weekday (6:00 pm–10:00 pm)	-	PN, RP ³ , DR ³	PN, V, SN, RO, RP ³ , DR ³	PN, V, SN, RO, RP ³ , DR ³
	Saturday (7:00 am–8:00 am) and (1:00 pm–10:00 pm)				
	Sunday/Public Holiday (8:00 am–6:00 pm)				
Out-of-Hours Work Period 2	Weekday (10:00 pm–7:00 am)	PN	PN, V, SN, RO ⁴ , RP ³ , DR ³	PN, V, SN, RO ⁴ , RP ³ , DR ³	PN, V, SN, RO ⁴ , RP ³ , DR ³ , AA
	Saturday (10:00 pm–8:00 am)				
	Sunday/Public Holiday (6:00 pm–7:00 am)				

Notes:

1. Action level is, the noise level ($L_{Aeq(15\text{ minutes})}$) above background (RBL) —qualitative assessment of noise levels.
2. The following abbreviations have been used (refer to Table E.12 for further details):
 PN: project notification
 V: Verification monitoring
 SN: Specific notification
 RP: Respite period
 DR: Duration reduction
 RO: project specific respite offer
 AA: Alternative accommodation.
3. Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (i.e. Saturday 6:00 am–7:00 am and 1:00 pm–6:00 pm, Sundays/Public Holidays 8:00 am–6:00 pm)
4. Respite offers during OOHW Period 2 are only applicable for evening periods (i.e. Sundays / Public Holidays 6pm–10pm) and may not be required if a respite offer has already been made for the immediately preceding OOHW Period 1.

TABLE E.12: DESCRIPTION OF ADDITIONAL MITIGATION MEASURES (TFNSW CNV STRATEGY)

Abbreviation	Mitigation measure	Explanation
PN	Periodic notification	A notification entitled 'Project Update', 'Construction Update' or 'Community Update', or similar, is produced and distributed to stakeholders via letterbox drop and distributed to the project postal and/or email mailing lists. The same information will be published on the ARTC website. Periodic notifications provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage, inform and provide project-specific messages. Advanced warning of potential disruptions can assist in reducing the impact on stakeholders. The approval conditions for projects specify requirements for notification to sensitive receivers where works may impact on them. Most projects distribute notifications on a monthly basis.
V	Verification	Verification monitoring of noise and/or vibration during construction may be conducted at the affected receiver or a nominated representative location. Monitoring can be in the form of either unattended logging or operator-attended surveys. The purpose of monitoring is to confirm that attended noise monitoring is to be undertaken as follows: ▶ Construction noise and vibration from the project is consistent with the predictions in the noise assessment ▶ Mitigation and management of construction noise and vibration is appropriate for receivers affected by the works. Where noise monitoring finds that the actual noise levels exceed those predicted in the noise assessment then immediate refinement of mitigation measures may be required.
SN	Specific notifications	Specific notifications are in the form of a personalised letter or phone call to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. Alternatively (or in addition to), communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities and provide an individual briefing: ▶ Letters may be letterbox dropped or hand distributed ▶ Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and their specific needs ▶ Individual briefings are used to inform stakeholders about the impacts of noisy activities and mitigation measures that would be implemented. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
RO	Respite offers	The purpose of a respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact. The offer could comprise pre-purchased tickets for activities, restaurants or similar.
AA	Alternative accommodation	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts. Alternative accommodation would be determined on a case-by-case basis and should provide a like-for-life replacement for permanent residents, including provisions for pets where reasonable and feasible.
RP	Respite period	OOHW during evening and night periods would be restricted so that receivers are impacted for no more than three consecutive evenings and no more than two consecutive nights in the same NCA in any one week, except where this is a Duration Reduction. A minimum respite period of four evenings/five nights must be implemented between periods of evening and/or night works. Strong justification must be provided where it is not feasible and reasonable to implement these period restrictions (e.g. to minimise impacts to rail operations).

Abbreviation	Mitigation measure	Explanation
DR	Duration reduction	Where Respite Periods are considered to be counterproductive to reducing noise and vibration impacts to the community it may be beneficial to increase the number of consecutive evenings and/or nights through Duration Reduction to minimise the duration of the activity. Impacted receivers must be consulted and evidence of community support for the Duration Reduction must be provided as justification for the Duration Reduction. A community engagement strategy must be agreed with and implemented in consultation with Project Community Engagement Representatives.

TABLE E.13: NUMBER OF PROPERTIES IMPACTED BY CONSTRUCTION NOISE

NCA	Noise management level, dBA	Maximum LAeq noise level, dBA	Number of receivers where NML is exceeded			Number of highly noise affected receivers
			Number of properties where noise levels exceed NML—1 to 10 dBA	Number of properties where noise levels exceed NML—11 to 20 dBA	Number of properties where noise levels exceed NML—> 20 dBA	
Site establishment and laydowns						
NCA1	45	59	27	1	0	0
NCA2	45	53	4	0	0	0
NCA3	45	49	2	0	0	0
NCA4	45	45	0	0	0	0
NCA5	45	43	0	0	0	0
Total	45	59	33	1	0	0
Drainage works and earthworks						
NCA1	45	37	0	0	0	0
NCA2	45	78	2	0	1	1
NCA3	45	64	1	1	0	0
NCA4	45	75	0	0	1	1
NCA5	45	41	0	0	0	0
Total	45	78	3	1	2	2
Bridge and road works						
NCA1	45	< 20	0	0	0	0
NCA2	45	69	2	0	1	0
NCA3	45	42	0	0	0	0
NCA4	45	29	0	0	0	0
NCA5	45	40	0	0	0	0
Total	45	69	2	0	1	0
Track works						
NCA1	45	34	0	0	0	0
NCA2	45	75	2	0	1	1
NCA3	45	61	1	1	0	0
NCA4	45	72	0	0	1	0
NCA5	45	38	0	0	0	0
Total	45	75	1	1	2	1
Testing commissioning and reinstatement						

NCA	Noise management level, dBA	Maximum LAeq noise level, dBA	Number of receivers where NML is exceeded			
			Number of properties where noise levels exceed NML—1 to 10 dBA	Number of properties where noise levels exceed NML—11 to 20 dBA	Number of properties where noise levels exceed NML—> 20 dBA	Number of highly noise affected receivers
NCA1	45	31	0	0	0	0
NCA2	45	72	2	0	1	0
NCA3	45	58	1	1	0	0
NCA4	45	69	0	0	1	0
NCA5	45	35	0	0	0	0
Total	45	72	3	1	2	0

TABLE E.14: NUMBER OF PROPERTIES IMPACTED BY CONSTRUCTION NOISE IN OUT-OF-HOURS WORKS

NCA	Noise management level, dBA	Maximum LAeq noise level, dBA	Number of receivers where the NML is exceeded			
			Number of properties where noise levels exceed NML—< 5 dBA	Number of properties where noise levels exceed NML—5 to 15 dBA	Number of properties where noise levels exceed NML—16 to 25 dBA	Number of properties exceeding NML— > 25 dBA
Site establishment and laydowns						
NCA1	35	59	15	27	1	0
NCA2	35	53	0	4	0	0
NCA3	35	49	3	2	0	0
NCA4	35	45	3	0	0	0
NCA5	35	43	3	0	0	0
Total	35	59	24	33	1	0
Drainage works and earthworks						
NCA1	35	37	7	0	0	0
NCA2	35	78	1	2	1	1
NCA3	35	64	4	1	1	0
NCA4	35	75	1	0	1	1
NCA5	35	41	2	0	0	0
Total	35	78	15	3	3	2
Bridge and road works						
NCA1	35	< 20	0	0	0	0
NCA2	35	69	0	2	1	0
NCA3	35	42	1	0	0	0
NCA4	35	29	0	0	0	0
NCA5	35	40	2	0	0	0
Total	35	69	3	2	1	0
Track works						
NCA1	35	34	0	0	0	0
NCA2	35	75	1	2	1	1
NCA3	35	61	1	1	1	0

NCA	Noise management level, dBA	Maximum LAeq noise level, dBA	Number of receivers where the NML is exceeded			
			Number of properties where noise levels exceed NML—< 5 dBA	Number of properties where noise levels exceed NML—5 to 15 dBA	Number of properties where noise levels exceed NML—16 to 25 dBA	Number of properties exceeding NML—> 25 dBA
NCA4	35	72	0	0	1	0
NCA5	35	38	2	0	0	0
Total	35	75	4	3	3	1
Testing commissioning and reinstatement						
NCA1	35	31	0	0	0	0
NCA2	35	72	1	2	1	0
NCA3	35	58	0	1	1	0
NCA4	35	69	0	0	1	0
NCA5	35	35	0	0	0	0
Total	35	72	1	3	3	0

TABLE E.15: NUMBER OF PROPERTIES IMPACTED BY CONSTRUCTION NOISE BY SLEEPER DISTURBANCE

NCA	Sleep disturbance criteria	Maximum L _{A1,1min} noise level	Number of properties impacted—Sleep disturbance exceedances	Number of properties impacted—Awakening reaction
Site establishment and laydowns				
NCA1	45	67	42	1
NCA2	45	61	4	0
NCA3	45	57	5	0
NCA4	45	53	2	0
NCA5	45	51	2	0
Total	45	67	55	1
Drainage works and earthworks				
NCA1	45	45	0	0
NCA2	45	86	4	1
NCA3	45	72	5	1
NCA4	45	83	1	1
NCA5	45	49	2	0
Total	45	86	12	3
Bridge and road works				
NCA1	45	< 20	0	0
NCA2	45	77	3	1
NCA3	45	50	1	0
NCA4	45	37	0	0
NCA5	45	48	2	0
Total	45	77	6	1
Track works				
NCA1	45	42	0	0
NCA2	45	83	4	1

NCA	Sleep disturbance criteria	Maximum $L_{A1,1min}$ noise level	Number of properties impacted—Sleep disturbance exceedances	Number of properties impacted—Awakening reaction
NCA3	45	69	2	1
NCA4	45	80	1	1
NCA5	45	46	2	0
Total	45	83	9	3
Testing commissioning and reinstatement				
NCA1	45	39	0	0
NCA2	45	80	4	1
NCA3	45	66	2	1
NCA4	45	77	1	1
NCA5	45	43	0	0
Total	45	80	7	3