G4.3.1.8 Decommissioning

Noise associated with the decommissioning phase is likely to closely resemble the predictions and impacts from the construction phase and therefore no further assessment has been undertaken at this stage.

G4.3.1.9 Traffic

There is the potential for project traffic to change the noise environment in two ways, through:

- an increase in construction and operational traffic on existing roads
- new traffic noise source on new temporary and permanent roads.

Traffic data for the majority of the roads through Tanzania is not available and therefore it is impractical to undertake a 'typical' quantitative noise assessment of existing roads. As a result, a generic assessment has been undertaken for road upgrades and the use by construction traffic of new permanent roads and using the general principles for traffic noise presented in Section G4.2.6.5. This covers the roads associated with the AGIs and construction facilities for the construction phase only.

Table G4.3-12 shows the potential change in noise level as a result of construction traffic on existing roads before mitigation. This looks beyond the existing road upgrades and assumes that construction traffic will use the wider road network.

The significance scoring for impact is fixed in certain categories. See notes below the tables for assumed scores. For the extent (E) score, to account for impacts across the wider road network, a level of 3 (sub-national) has been assumed as there is the potential for changes in traffic flows beyond the area around the construction works. Although the changes in traffic noise further afield are much less than local changes (i.e., magnitude impacts will be much smaller), a change is still possible.

Table G4.3-13 presents the potential impacts from new road use.

Table G4.3-12 Existing Road Use – Potential Impacts Before Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
Permanent Facilities (AGIs)							
PS3	Local	44.4	Approximately 450 trucks. Maximum 10 movements in any single hour across a road segment No night movements	3	Most sensitive will notice	14	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
PS4	Local	42.8	Approximately 450 trucks Maximum 10 movements in any single hour across a road segment No night movements	3	Most sensitive will notice	14	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
PS5	Local	42.5	Approximately 450 trucks Maximum 10 movements in any single hour across a road segment No night movements	3	Most sensitive will notice	14	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant

Table G4.3-12 Existing Road Use – Potential Impacts Before Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
PS6	Local	46.8	Approximately 450 trucks Maximum 10 movements in any single hour across a road segment No night movements	3	Most sensitive will notice	14	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
PR1	Local	34.9	Approximately 450 trucks Maximum 10 movements in any single hour across a road segment No night movements.	3	Most sensitive will notice	14	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
PR2	Local	47.6	Approximately 450 trucks Maximum 10 movements in any single hour across a road segment No night movements	3	Most sensitive will notice	14	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant

Table G4.3-12 Existing Road Use – Potential Impacts Before Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
MST	Local	45.5	Approximately 450 trucks Maximum 10 movements in any single hour across a road segment No night movements	3	Most sensitive will notice	14	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
Construction Facilities							
CF	Local	58.0	Approximately 2500 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	All in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 50 trucks No more than 2 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY5	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant

Table G4.3-12 Existing Road Use – Potential Impacts Before Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
MCPY6	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY8	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY9	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements.	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant

Table G4.3-12 Existing Road Use – Potential Impacts Before Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
MCPY10	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY11	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements.	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY12	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant

Table G4.3-12 Existing Road Use – Potential Impacts Before Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
MCPY13	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY14	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY15	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment. No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant

Table G4.3-12 Existing Road Use – Potential Impacts Before Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
MCPY16	Local	43.9	Approximately 1000 trucks Maximum 10 movements in any single hour across a road segment No night movements	5	Most in local vicinity will notice	16	Not significant
	Area	61.6	Approximately 10 trucks No more than 1 trucks along a road segment in a single hour	<1	Imperceptible	13	Not significant

NOTES: [1] The extent for local traffic is 2 points and for area traffic is 3 points. Area traffic is further than the local road network and is assumed to be coming from greater distances than the local area for the project.

[2]Taken from the highest measurements, as the highest levels will be experienced near to roads because this was seen as the main noise source across most areas. For 'area' baseline, a level taken from the highest RoW measurements has been used.

[3] <3 dB change barely noticeable, 5 dB change perceived by most people, 10 dB change perceived doubling of loudness, 20 dB change perceived quadrupling of loudness (based on general acoustic principles).

[4]Duration for all is <5 years and therefore 1 point. Sensitivity is assumed to be very high as there is potential for hospitals and schools within 100 m of the road, and is therefore 5 points.

[5]Derived from the traffic assessment, see Section 6.4.3.15. The total construction traffic per phase is divided by the number of facilities in each phase, not taking into account workforce movements. 'Truck movement' numbers are considered for local road impacts where 'truck numbers' are considered for the area as there is a high likelihood of return trips by trucks along the same roads for the local area in a single day whereas this is unlikely to be the case for trucks coming from further afield.

[6]Based on theoretical assumptions in Section G4.2.6.5.

Table G4.3-13 New Road Use – Potential Impacts Before Mitigation (Short Term During Construction)

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
Permanent Facilities (AGIs)							
PS3	Local	44.4	Approximately 450 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant
PS4	Local	42.8	Approximately 450 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant
PS5	Local	42.5	Approximately 450 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant
PS6	Local	46.8	Approximately 450 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant
PR1	Local	34.9	Approximately 450 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant

Table G4.3-13 New Road Use – Potential Impacts Before Mitigation (Short Term During Construction)

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
PR2	Local	47.6	Approximately 450 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant
MST	Local	45.5	Approximately 450 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant
Construction Facilities							
CF	Local	58.0	Approximately 2500 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant
MCPY6	Local	43.9	Approximately 1000 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant

Table G4.3-13 New Road Use – Potential Impacts Before Mitigation (Short Term During Construction)

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Before Mitigation
MCPY10	Local	43.9	Approximately 1000 trucks Max 10 movements in any single hour across a road segment No night movements	10	Local community will notice change	17	Not Significant

NOTES: [1] Extent for local is 2 points, no 'Area' impacts associated with new roads.

[2]Taken from the highest measurements as the highest levels will be experienced near to roads as this was seen as the main noise source across most areas. For 'Area' baseline a level taken from the highest RoW measurements has been used.

[3]Perception taken as <3 dB change barely noticeable, change by 5dB most will perceive a change, change by 10 dB a perceived doubling of loudness, change in 20 dB a perceived quadrupling of loudness. Based on fundamental acoustic principles.

[4]Duration for all <5 years therefore 1point, Sensitivity assume high as routing will be chosen to avoid hospitals and schools therefore 4 points

[5]Derived from Traffic Assessment, see Section 6.4.3.15. Total construction traffic per phase divided by number of facilities in phase. Not taking into account work force movements. . 'Truck movement' numbers are considered for local road impacts where 'truck numbers' are considered for area as the there is a high likelihood of return trips by trucks along the same roads for local in a single day whereas this is unlikely to be the case for trucks coming from further afield.

[6]Based on theoretical assumptions in Section G4.2.6.5.

The noise associated with project construction traffic movements along new and existing roads will not result in a significant impact before mitigation. The existing noise environment around the proposed haul and access routes will increase. Increases in noise magnitude are likely to be very high in areas with proposed new roads. However, given the short-term nature of construction, the impact is not ranked as significant.

For new roads which will remain after the construction phase, the change in noise associated with the pipeline operational traffic will be less than 1 dB, far lower than the levels reported above, and will the impacts will therefore not be significant. There is a likelihood that these permanent new roads will have long-term use by non-pipeline traffic, but these numbers are challenging to estimate and doing so is beyond the scope of this assessment.

G4.3.2 Commissioning

Specific locations for commissioning noise sources are not defined and therefore these activities, although localised, have the potential to be undertaken along the RoW. Therefore, the RoW has been used as the extent for prediction purposes.

Noise emission for (in isolation) of pig launching, hydrostatic testing, cleaning and drying is assumed to be 68 dB(A) at 10 m (allowing for a single compressor, blower and dryer generator, and pump, all screened with 2-m high barriers).

This noise emission is lower than for the pipeline construction sources, and therefore, considering that commissioning will take place along the RoW, the impacts will be lower than those predicted for pipeline construction. Therefore, the noise associated with commissioning is ranked as not significant.

Although classed as not significant, the noise from these activities will be perceptible at receptors close to each commissioning location. This will particularly be the case for drying which will potentially be continuous for up to 48 hours.

G4.3.3 Operation

The permanent AGIs have the potential to operate 24 hours a day, 7 days a week. Where receptors are identified as having a significant impact before mitigation, further design mitigation is being progressed during detailed engineering to ensure that meeting PES will be the project target for noise emissions at any receptor.

Noise contour plots showing the operation of these facilities are presented in Annex F.

G4.3.3.1 Pumping Stations

Table G4.3-14 shows the impact assessment for PS3 operation before mitigation.

Table G4.3-14 Operation of PS3 – Assessment of Impact Before Mitigation

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors exceeding PES	Significant Impact before mitigation (i.e., greater than 19 SS)	Significant Impact before mitigation (exceeds PES)
Operation	Day	16	Medium	19	51	Not significant	Significant
Operation	Night	20	Very large	97	232	Significant	Significant

NOTES: For the noise VEC, PS3 has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
PS3 AOI baseline noise levels (monitoring point TZ-3) – daytime 44.4 dB(A) $L_{eq,\ 1hr}$, 30.6 dB(A) $L_{90,\ 1hr}$
– Evening 49.7 dB(A) $L_{eq,\ 1hr}$, 45.2 dB(A) $L_{90,\ 1hr}$
– Night 46.2 dB(A) $L_{eq,\ 1hr}$, 43.4 dB(A) $L_{90,\ 1hr}$

Noise levels at receptors within 1 km of the installation are predicted to range from 40–70 dB(A) $L_{Aeq,T}$ throughout the PS3 study area before mitigation. Noise levels closest to PS3 are higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}. The greater the distance from the pumping station the less perceptible the pumping station noise will become.

During PS3 operation, the noise levels for up to 97 receptors (see Figure AttG4.6-1 in Attachment G4.6) have the potential to exceed the ‘very large’ magnitude ranking at receptors classed as ‘high sensitivity’, resulting in a SS of 20, with the impact for those receptors therefore ranked as significant before mitigation. In addition, 232 receptors are predicted to exceed the night time PES.

A 2-m-high boundary wall is included in the PS3 design. However, without further mitigation the levels are likely to still be above the PES for receptors within 1–1.25 km of the installation. A distance range is provided owing to the non-hemispherical propagation of noise from the site layout.

Table G4.3-15 shows the impact assessment for PS4 operation before mitigation.

Table G4.3-15 Operation of PS4 – Assessment of impact Before Mitigation

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors exceeding PES	Significant Impact before mitigation (i.e., greater than 19 SS)	Significant Impact before mitigation (exceeds PES)
Operation	Day	12	Negligible	>100	1	Not significant	Significant
Operation	Night	18	Large	1	7	Not significant	Significant

NOTES: For the noise VEC, PS4 has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
PS4 AOI baseline noise levels (monitoring point TZ9) – daytime 42.8 dB(A) $L_{eq,\ 1hr}$, 31.9 dB(A) $L_{90,\ 1hr}$
– Evening 57.6 dB(A) $L_{eq,\ 1hr}$, 51.7 dB(A) $L_{90,\ 1hr}$
– Night 53.5 dB(A) $L_{eq,\ 1hr}$, 46.0 dB(A) $L_{90,\ 1hr}$

Noise levels at receptors within 1 km of the installation are predicted to range from 40–55 dB(A) $L_{Aeq,T}$ throughout the PS4 AOI before mitigation. Noise levels closest to PS4 are higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}. The greater the distance from the pumping station the less dominant the pumping-station noise will become. At PS4, the operational noise is unlikely to be audible day or night at distances greater than 400–500 m.

During PS4 operation, the noise levels are unlikely to exceed the magnitude ranking of ‘very large’. However, the operational noise will have the potential to exceed night-time PES for up to 7 dwellings before mitigation.

A 2-m-high boundary wall is included in the PS4 design. However without further mitigation the levels are likely to still be above the PES for receptors within 400–500 m of the installation. A distance range is provided owing to the non-hemispherical propagation of noise from the site layout.

Table G4.3-16 shows the impact assessment for PS5 operation before mitigation.

Table G4.3-16 Operation of PS5 – Assessment of impact Before Mitigation

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors exceeding PES	Significant impact before mitigation (i.e., greater than 19 SS)	Significant impact before mitigation (exceeds PES)
Operation	Day	18	Large	1	10	Not significant	Significant
Operation	Night	20	Very large	5	13	Significant	Significant

NOTES: For the noise VEC, PS5 has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
PS5 AOI baseline noise levels (monitoring point TZ12) – daytime 42.5 dB(A) $L_{eq,\ 1hr}$, 35.7 dB(A) $L_{90,\ 1hr}$
– Evening 57.6 dB(A) $L_{eq,\ 1hr}$, 51.7 dB(A) $L_{90,\ 1hr}$ (from monitoring TZ-9)
– Night 53.5 dB(A) $L_{eq,\ 1hr}$, 46.0 dB(A) $L_{90,\ 1hr}$ (from monitoring TZ-9)

Noise levels at receptors within 1 km of the installation are predicted to range from 40–70 dB(A) $L_{Aeq,T}$ throughout the PS5 AOI before mitigation. Noise levels closest to PS5 is mostly higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}. The greater the distance from the pumping stations the less perceptible the pumping station noise will become.

During PS5 operation, the noise levels for up to 5 receptors have the potential to exceed the ‘very large’ magnitude ranking at receptors classed as ‘high sensitivity’; resulting in a pre-mitigation SS of 20, with the impact for those receptors therefore ranked as significant before mitigation (see Table G4.3-16). In addition, up to 13 receptors are predicted to exceed the night time PES.

A 2-m-high boundary wall is included in the PS3 design. However, without further mitigation the levels are likely to still be above the PES for receptors within 1–1.25 km of the installation. A distance range is provided owing to the non-hemispherical propagation of noise from the site layout.

Table G4.3-17 shows the impact assessment for PS6 operation before mitigation.

Table G4.3-17 Operation of PS6 – Assessment of Impact Before Mitigation

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors Exceeding PES	Significant Impact Before Mitigation (i.e., Greater than 19 SS)	Significant Impact Before Mitigation (Exceeds PES)
Operation	Day	12	Negligible	>100	1	Not significant	Significant
Operation	Night	18	Large	0	8	Not significant	Significant

NOTES: For the noise VEC, PS6 has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
PS6 AOI baseline noise levels (monitoring point TZ14) – daytime 46.8 dB(A) $L_{eq,\ 1hr}$, 30.0 dB(A) $L_{90,\ 1hr}$
– Evening 45.4 dB(A) $L_{eq,\ 1hr}$, 39.5 dB(A) $L_{90,\ 1hr}$
– Night 51.1 dB(A) $L_{eq,\ 1hr}$, 40.6 dB(A) $L_{90,\ 1hr}$

Noise levels at receptors within 1 km of the installation are predicted to range from 40–55 dB(A) $L_{Aeq,T}$ throughout the PS6 AOI before mitigation. Noise levels closest to PS6 are higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}. The greater the distance from the pumping stations the less dominant the pumping station noise will become. At PS6, the operational noise is unlikely to be audible day or night at distances greater than 400–500 m.

During PS6 operation, the noise levels are unlikely to exceed the magnitude ranking of ‘very large’. However, the operational noise will have the potential to exceed night-time PES for up to 8 dwellings before mitigation.

A 2-m high boundary wall is included in the PS6 design. However, without further mitigation the levels are likely to still be above the PES for receptors within 400 – 500 m of the installation. A distance range is provided owing to the non-hemispherical propagation of noise from the site layout.

G4.3.3.2Pressure Reduction Stations

Table G4.3-18 shows the impact assessment for PRS1 operation before mitigation.

Table G4.3-18 Operation of PRS1 – Assessment of impact before mitigation

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors exceeding PES	Significant Impact Before Mitigation (i.e., Greater than 19 SS)	Significant Impact Before Mitigation (Exceeds PES)
Operation	Day	-*	-*	0	0	Not significant	Not significant
Operation	Night	-*	-*	0	0	Not significant	Not significant

NOTES: *No receptors have been identified within 1 km and therefore magnitude scores are not relevant. For the Noise VEC, PRS1 has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
PRS1 AOI baseline noise levels – daytime 34.9 dB(A) $L_{eq,\ 1hr}$, 25.5 dB(A) $L_{90,\ 1hr}$
– Evening 45.1 dB(A) $L_{eq,\ 1hr}$, 36.1 dB(A) $L_{90,\ 1hr}$ (from monitoring TZ-19)
– Night 44.2 dB(A) $L_{eq,\ 1hr}$, 35.1 dB(A) $L_{90,\ 1hr}$ (from monitoring TZ-19)

No receptors within 1 km of the installation are identified within any of the magnitude ranges at PRS1 and therefore a detailed assessment has not been undertaken. Figure AttG4.6-5 in Attachment G4.6 presents the noise environment around PRS1. No receptors are predicted to exceed the PES before mitigation.

Table G4.3-19 shows the impact assessment for PRS2 operation.

Table G4.3-19 Operation of PRS2 – Assessment of Impact Before Mitigation

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors exceeding PES	Significant Impact Before Mitigation (i.e., Greater than 19 SS)	Significant Impact Before Mitigation (Exceeds PES)
Operation	Day	-*	-*	0	0	Not significant	Not significant
Operation	Night	14	Low	5	0	Not significant	Not significant

NOTES: *No receptors have been identified within any of the magnitude ranges during daytime periods and therefore not applicable. However at night where magnitude criteria are lower receptors have been identified.
For the Noise VEC PRS2 has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
PRS2 AOI baseline noise (monitoring point TZ17) – daytime 40.9-47.6 dB(A) $L_{eq,\ 1hr}$, 28.8-33.2 dB(A) $L_{90,\ 1hr}$
– Evening 45.1 dB(A) $L_{eq,\ 1hr}$, 36.1 dB(A) $L_{90,\ 1hr}$
– Night 44.2 dB(A) $L_{eq,\ 1hr}$, 35.1 dB(A) $L_{90,\ 1hr}$

Noise levels at receptors within 1 km of the installation are predicted to range from 30–60 dB(A) $L_{Aeq,T}$ throughout the PRS2 AOI before mitigation. Noise levels closest to PRS2 are mostly higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}.

At PRS2, the operational noise is unlikely to be audible day or night at distances beyond 200 m. Figure AttG4.6-6 in Attachment G4.6 presents the noise environment around PRS2.

During PRS2 operation, the noise levels at receptors are not ranked as significant. The highest SS of 14 during night operations results in a ‘low’ magnitude level at all receptors.

No receptors within 1 km of the installation are identified within any of the daytime magnitude ranges at PRS2 and therefore a detailed assessment has not been undertaken for the daytime operations.

No PES exceedances are noted.

G4.3.3.3Load-Out Facility

Table G4.3-20 shows the impact assessment for LOF operation.

Table G4.3-20 Operation of the Load-Out Facility – Assessment of impact Before Mitigation (Terrestrial)

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors exceeding PES	Significant Impact (i.e., Greater than 19 SS)	Significant Impact (Exceeds PES)
Operation	Day	-*	-*	0	0	Not significant	Not significant
Operation	Night	-*	-*	0	0	Not significant	Not significant

NOTES: *No receptors have been identified within 1 km and therefore magnitude scores are not relevant. For the noise VEC, the LOF has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
LOF AOI baseline noise levels (monitoring point TZ20) – daytime 33.6-47.2 dB(A) $L_{eq,\ 1hr}$, 29.2-43.8 dB(A) $L_{90,\ 1hr}$ – Evening 43.0 dB(A) $L_{eq,\ 1hr}$, 41.1 dB(A) $L_{90,\ 1hr}$
– Night 38.7 dB(A) $L_{eq,\ 1hr}$, 36.7 dB(A) $L_{90,\ 1hr}$

No receptors are identified within any of the magnitude ranges at the LOF and therefore a detailed assessment has not been undertaken. Figure AttG4.6.7 in Attachment G4.6 presents the noise environment around the LOF for terrestrial impacts only.

No PES exceedances are noted before mitigation.

Table G4.3-21 shows the impact assessment for MST operation before mitigation.

Table G4.3-21 Operation of Marine Storage Terminal – Assessment of Impact Before Mitigation

Activity	Period	Largest SS	Magnitude Score	Number of Receptors with Largest SS	Number of Receptors exceeding PES	Significant Impact Before Mitigation (i.e., Greater than 19 SS)	Significant Impact Before Mitigation (Exceeds PES)
Operation	Day	16	Medium	0	13	Not Significant	Significant
Operation	Night	20	Very large	45	138	Significant	Significant

NOTES: For the noise VEC, the MST has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
MST AOI baseline noise levels – daytime 45.5 dB(A) $L_{eq,\ 1hr}$, 39.9 dB(A) $L_{90,1hr}$
– Evening 43.0 dB(A) $L_{eq,\ 1hr}$, 41.1 dB(A) $L_{90,\ 1hr}$ (from monitoring LOF1)
– Night 38.7 dB(A) $L_{eq,\ 1hr}$, 36.7 dB(A) $L_{90,\ 1hr}$ (from monitoring LOF1)

Noise levels are predicted to range from 40–70 dB(A) $L_{Aeq,T}$ throughout the MST AOI before mitigation. Noise levels closest to the MST are higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}.

During MST operation, the noise levels at 45 receptors (see Figure G4.6-8 in Attachment G4.6) have the potential to exceed the 'very large' magnitude ranking at those receptors classed as 'high sensitivity'; resulting in a SS of 20, with those receptors therefore ranked as a 'significant impact' before mitigation. In addition, up to 138 receptors are predicted to exceed the night time PES.

A 2-m-high boundary wall is included in the MST design. However, without further mitigation the levels are likely to still be above the PES for receptors within 1–1.25 km of the installation. A distance rage is provided owing to the non-hemispherical propagation of noise from the site layout.

G4.3.3.4 Traffic

Operational traffic movements will be low level and infrequent and so quantitative assessment is unnecessary. The impacts would therefore be negligible.

G4.4 Vibration Impact Assessment

G4.4.1 Construction

G4.4.1.1 Pipeline

Piling along the RoW for linear works will be restricted to the setup of HDD sites, discreet blasting, rock breaking and soil stripping.

HDD is proposed for crossing the Kagera and Sigi Rivers. The drilling component has been screened out of the quantitative assessment. However, sheet-pile retaining walls are likely to be required for the entry and exit pits. The piles are expected to be driven into the ground using a vibratory head attachment to an excavator. The vibration generated as a result of this activity has been quantified and assessed. The assessment looks to identify the number of sensitive receptors (high sensitivity only, as no very high classifications are within the AOI around the HDD) exposed to the highest magnitudes and therefore the potential to be significantly impacted.

The PES duration significance for vibration in relation to structural damage is not considered to be applicable, as the shortest of durations can have a significant impact. Therefore, a duration score of 3 points at all receptors has been applied.

The vibration predictions are presented in Table G4.4-1 and Table G4.4-2 using the methodology discussed in Table G4.2-8.

Table G4.4-1 HDD Piling at Kagera River – Vibration Predictions (Large Sensitivity Receptors)

Magnitude[1]	Corresponding Vibration PPV, mms[1]	Distance from Piling, m	Number of Receptors	Largest SS	Significant Impact (i.e., Greater than 19 SS)
Negligible	<0.11	>401	Na	11	Not significant
Small	0.12–1.00	73–400	>200	13	Not significant
Medium	1.01–10.00	12–73	>200	15	Not significant
Large	10.01–15.00	9–12	0	17	Not significant
Very large	>15.01	<9	0	19	Not significant

NOTES: Impact scores are set: D = 3 point, E = 2 points, S = 4 points
[1]See Section G4.2.2.2 [2]Although SS is 19 there are no receptors within the specified distance, and therefore 'not significant'

Table G4.4-2 HDD Piling at Sigi River – Vibration Predictions (Large Sensitivity Receptors)

Magnitude[1]	Corresponding Vibration PPV, mms^{-1}	Distance from Piling, m	Number of Receptors	Largest SS	Significant Impact (i.e. Greater than 19 SS)
Negligible	<0.11	>401	N/A	11	Not significant
Small	0.12–1.00	73–400	0	13	Not significant
Medium	1.01–10.00	12–73	0	15	Not significant
Large	10.01–15.00	9–12	0	17	Not significant
Very Large	>15.01	<9	0	19	Not significant [2]

NOTES: Impact scores are set: D = 3 point, E = 2 points, S = 4 points
[1]See Section G4.2.2.2 [2]Although SS is 19 there are no receptors within the specified distance, and therefore 'not significant'

The vibration levels associated with sheet piling (for entry and exit temporary retaining walls) at the Kagera River HDD sites are considered very low and will not generate a significant impact. The vibration associated with the drilling component will be even lower. Although the highest SS is 15, dependent on the distance between source and receiver, the vibration levels are unlikely to be perceptible. Through detailed design, where the pit entry or exit points are piled within 12 m of sensitive receptors, additional predictions and assessments would be considered.

No sensitive receptors have been identified within 400 m of the HDD at the Sigi River HDD site, and therefore no exceedances of the PES are predicted.

Rock breaking and ripping has the potential to occur throughout the RoW where rock obstructions cannot be removed using standard trenching methods. However, the location of such activity will not be defined until work begins. Therefore, the risk

of impact is based on generic predictions for the activities and resultant offset distances.

The vibration resulting from rock breaking and ripping is presented in Table G4.4-3 using the methodology in Table G4.2-7. This also shows the highest possible SS assuming a 'very large' sensitivity receptor and a heavy rock breaker (see Appendix D).

Table G4.4-3 Rock Breaking and Ripping – Vibration Predictions

Magnitude[1]	Corresponding Vibration PPV, mms^{-1}	Distance from Activity, m^2	Number of Receptors	Largest Possible SS	Significant Impact (i.e., Greater than 19 SS)
Negligible	<0.11	50	0	9	Not significant
Small	0.12–1.00	15–50	0	11	Not significant
Medium	1.01–10.00	2–15	0	13	Not significant
Large	10.01–15.00	<2	0	15	Not significant
Very large	>15.01	Na	-	-	Not significant

NOTES: In a similar way to noise, certain impact scores are the set: D = 1 point, E = 2 points, S = 4 points
Assessment and reporting at medium, large and very large magnitudes is not applicable owing to the small predicted separation distances.
[1]See Section G4.2.2.2
[2]Distance at which magnitude level is exceeded.

The above table shows that rock breaking would be suitable along the RoW as significant impacts will not be expected at any sensitive receptors, nor are there exceedances of the PES. The predictions and outcome for rock breaking and ripping are also applicable to PS and PRS constructions, with no significant impacts anticipated.

G4.4.1.2Blasting

Vibration

Where rock obstructions cannot be removed efficiently with standard construction techniques, blasting will be considered.

Blasting has been identified as potentially being required from KP1082–1106 along the RoW. There are over 150 potential high sensitive receptors within the AOI adjacent to this section. These have the potential to be affected by blast-induced vibration and overpressure. Likely impacts are presented in Table G4.4-4 and Table G4.4-5 for non-heritage receptors and heritage receptors respectively. The definition of these is provided in Appendix D.

Table G4.4-4 Blasting (MIC 2kg) – Vibration at Non-Heritage Receptor

Magnitude[1]	Corresponding Vibration PPV, mms^{-1}	Distance from Possible Blasting Hole, m	Receptors Present	Largest SS	Significant Impact (i.e., Greater than 19 SS)[2]
Small	<15.00	>27	Yes	13	Not significant
Very large	>15.01	<27	Yes	21	Significant

NOTES: D = 5 point, E = 2 points, S = 4 points

[1]See Section G4.2.2.3

Table G4.4-5 Blasting (MIC 2kg) – Vibration at Heritage Receptor

Magnitude[1]	Corresponding Vibration PPV, mms^{-1}	Distance from Possible Blasting Hole, m	Receptors Present	Largest SS	Significant Impact (i.e., Greater than 19 SS)[2]
Small	<3.00	>58	Yes	13	Not significant
Very large	>3.01	<58	Yes	21	Significant

NOTES: D = 5 point, E = 2 points, S = 4 points

[1]See Section G4.2.2.3

Blasting with a 2 kg charge is likely to result in significant impacts from vibration where high sensitive receptors are within 27 m of the blast site. However, for very high sensitivity structures (those in very poor condition or heritage items), a 3 mm/s magnitude threshold is used which increases the impact distance for a 2 kg MIC to 58 m. Therefore, there is the potential for an exceedance of the PES.

Where geology permits the reduction to an extremely low MIC of 0.25 kg, the possible offset distances and significance is considered in Table G4.4-6 and Table G4.4-7 for non-heritage and heritage items respectively.

Table G4.4-6 Blasting (<0.25 kg MIC) – Vibration at Non-Heritage Receptor

Magnitude[1]	Corresponding Vibration PPV, mms^{-1}	Distance from Possible Blasting Hole, m	Receptors Present	Largest SS	Significant Impact (i.e. Greater than 19 SS)[2]
Small	<15.00	>7.5	Yes	13	Not significant
Very large	>15.01	<7.5	No	21	Not significant[2]

NOTES: D = 5 point, E = 2 points, S = 4 points

[1]See Section G4.2.2.2

[2]Although SS is 21, there are no receptors within the specified distance and therefore 'not significant'

Table G4.4-7 Blasting (<0.25 kg MIC) – Vibration at Heritage Receptor

Magnitude[1]	Corresponding Vibration PPV, mms^{-1}	Distance from Possible Blasting Hole, m	Receptors Present	Largest SS	Significant Impact (i.e. Greater than 19 SS)[2]
Small	<3.00	>21	Yes	13	Not significant
Very large	>3.00	<21	Yes	21	Significant

Although the vibration impacts for lower MICs are lower than those associated with higher charges, a significant impact is still a risk for sensitive receptors within 7.5 m of the blast location. However, within this section of the RoW (even if blasting were undertaken at the outer edge of the RoW), no receptors within 7.5 m have been identified and the impact for this project is therefore not considered significant. No exceedance of the PES is predicted.

From a vibration perspective, and considering the above, the most efficient form of mitigation is to ensure that no blasting (up to 2 kg MIC) occurs within 27 m of sensitive receptors or other structures (e.g., agricultural buildings). However, for very high sensitivity structures (those in very poor condition or heritage items), a 3-mm/s magnitude threshold is used which increases the impact distance for a 0.25-kg MIC to 21 m.

Air Overpressure

Air overpressure is the pressure caused by a (blast-induced) shock wave above normal atmospheric pressure. The pressure waves contain energy over a wide frequency range. Energy above 20 Hz is perceptible to the human ear as sound, while that below 20 Hz is inaudible, but can be sensed in the form of concussion. Sound and concussion together is known as air overpressure which is measured in decibels (dB).

Since both high and low frequencies are of importance, no frequency weighting network is applied (i.e., lin is used), unlike in the case of noise measurement when an A-weighted filter is employed. All frequency components, both audible and inaudible, can cause a structure to vibrate in a way which can be confused with the effects of ground vibrations. The lower, inaudible, frequencies are much less attenuated by distance, buildings and natural barriers. Consequently, air-overpressure effects at these frequencies can be significant over greater distances, and more readily excite a response within structures.

In accordance with British Standard BS 5228-2:2009, structural damage can occur at levels of overpressure equalling around 180 dB(lin). Poorly mounted windows can crack at around 150–170 dB(lin).

The air overpressure resulting from blasting has been predicted in accordance with empirical formulae (see Table G4.2-8) and is presented in Table G4.4-8. For the purpose of air overpressure, magnitude is the determining factor in impact and therefore a conservative value of 150 dB (lin) level has been used to determine significance (See Section G4.2.2.2).

Table G4.4-8 Blasting – Air Overpressure

Distance from Charge, m	Corresponding Air Overpressure, dB(lin)		Significant Impact (i.e., Greater than 140 dB (lin))
	2 kg MIC	0.25 kg MIC	
1000	90	81	Not significant
750	94	85	Not significant
500	99	90	Not significant
250	107	99	Not significant
100	119	110	Not significant
50	128	119	Not significant
25	136	128	Not significant
10	148	139	Not significant
5	157	148	Not significant [1]

NOTE: [1] Although these values are greater than 150 dB(lin) there are no receptors within the specified distance, and therefore 'not significant'

Air overpressure has the potential to cause damage, and is therefore a significant impact on lightweight structures at distances closer than 10 m. However, as no receptors have been identified within this distance along the area proposed for blasting the impact for this project is not considered significant. No exceedance of the PES is predicted.

G4.4.1.3 Commissioning

No commissioning-phase vibration sources have been identified that require assessment.

G4.4.1.4 Operation

No operational phase vibration sources have been identified that require assessment.

G4.4.1.5 Traffic

The use of existing and proposed unsealed roads during the construction phase increases the potential for vibration-induced damage to structures along the roads.

Unsealed roads are more susceptible to damage and deterioration (the creation of ruts, corrugations and pot holes) compared with sealed roads. The movement of heavy trucks and buses along the unsealed roads accelerates their deterioration and increases the potential for higher magnitude vibration events from uneven and abnormal load and axle movement.

Therefore, for this study, it is assumed that where damage to a sealed or unsealed road is within 10 m of a sensitive structure, there is the potential for vehicle movement to generate vibration through interactions between the axle and vehicle structure, suspension or load movement. The magnitude of the vibration is hard to quantify but has the potential to be generated at a magnitude which causes early signs of structural damage on the lightest of structures.

G4.4.1.6 Decommissioning

Vibration associated with the decommissioning phase is likely to closely resemble the predictions and impacts from the construction phase and therefore no further assessment has been undertaken at this stage.

G4.5 Impact Assessment Overview

A general summary of the changes in noise levels across the AOI before mitigation is presented in Table G4.5-1 for each of the modelled and calculated phases. This compares the project noise with the measured background noise throughout the AOI as a function of distance, i.e., the AOI around an AGI with a lower background will experience a higher change than an AOI with a higher baseline. This can be used to provide a high-level indication of noise impacts on people and wildlife across the project.

For reference and context, a 3 dB change in noise is often taken as the lowest perceptible change for humans, most people notice a 5 dB change, a 10 dB change is perceived as a doubling of the sound in loudness and a 20 dB change heard as fourfold increase in perceived loudness. In energy terms, a 3 dB change represents a doubling of energy, a 10-dB change a 10x increase in energy and a 20 dB change a 100x increase in energy. Therefore, a sudden change in 20 dB is perceived as 4x the loudness, but has 100x the energy.

Table G4.5-1 Project Summary of Noise Change Before Mitigation

Phase	Activity	Period	Possible Change in Baseline Noise with Distance from Source, dB (All Increases in Noise)					
			<50 m	50–100 m	100–250 m	250–500 m	500–1000	>1000 m
Construction	RoW	Day	20–30	10–20	5–10	1–5	<1	0
	HDD	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
	PS3	Day	20–30	10–20	5–10	1–5	<1	0
	PS4	Day	20–30	10–20	5–10	1–5	<1	0

Table G4.5-1 Project Summary of Noise Change Before Mitigation

Phase	Activity	Period	Possible Change in Baseline Noise with Distance from Source, dB (All Increases in Noise)					
			<50 m	50–100 m	100–250 m	250–500 m	500–1000	>1000 m
	PS5	Day	20–30	10–20	5–10	1–5	<1	0
	PS6	Day	20–30	10–20	5–10	1–5	<1	0
	PRS1	Day	20–30	10–20	5–10	1–5	<1	0
	PRS2	Day	20–30	10–20	5–10	1–5	<1	0
	LOF	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
	MST	Day	20–30	10–20	5–10	1–5	<1	0
	CF	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY5	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY6	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY7	Day	20–30	10–20	5–10	1-5	<1	0
	MCPY8	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY9	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY10	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY11	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY12	Day	20–30	10–20	5–10	1–5	<1	0
	New road	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
Commissioning	Pigging	Day	20–30	10–20	5–10	1–5	<1	0
	Hydro testing	Day	20–30	10–20	5–10	1–5	<1	0
Operation	PS3	Day	20–30	15–20	10-15	5-10	3-5	<3
		Night	20–30	15–20	10-15	5-10	3-5	<3
	PS4	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
	PS5	Day	20–30	15–20	10-15	5-10	3-5	<3
		Night	20–30	15–20	10-15	5-10	3-5	<3
	PS6	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
	PRS1	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
	PRS2	Day	20–30	10–20	5–10	1–5	<1	0

Table G4.5-1 Project Summary of Noise Change Before Mitigation

Phase	Activity	Period	Possible Change in Baseline Noise with Distance from Source, dB (All Increases in Noise)					
			<50 m	50–100 m	100–250 m	250–500 m	500–1000	>1000 m
		Night	20–30	10–20	5–10	1–5	<1	0
	LOF	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
	MST	Day	20–30	15–20	10-15	5-10	3-5	<3
		Night	20–30	15–20	10-15	5-10	3-5	<3

NOTE: Construction duration, <1 year. Operational duration, 25 years.

The impact assessment predicts seven areas where significant impacts may occur before mitigation either as a result of an exceedance of the PES or a SS of 19 or above, before mitigation:

- PS3 operational noise
- PS4 operational noise
- PS5 operational noise
- PS6 operational noise
- MST operational noise
- blasting (as a result of vibration)
- CF (during night time operations only).

G4.6 References

Literature Cited

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ATTACHMENT G4.1 CONSTRUCTION SOURCE DATA

RoW

Table AttG4.1-1 Cleaning and Grubbing (RoW)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dozer	C7.8	50t	75	20	2	0	-4	71
Hand tools	-	-	-	-	-	-	0	-
Skip wagon	C8.21	-	78	25	1	0	-6	72
Dumper	C4.1	25t	81	20	1	0	-7	74
TOTAL L_p								78
L_w								106

Table AttG4.1-2 Camp and Site Establishment (RoW)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Lorry with lifting boom	C4.53	6t	77	25	1	0	-6	71
Hand tools	--	--	--	--	--	--	0	--
MEWP	C4.57	8t	67	70	2	0	1	68
Tracked excavator	C2.17	28t	76	30	1	0	-5	71
TOTAL L_p								75
L_w								103

Table AttG4.1-3 Road Construction (RoW)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Hand tools	0	0	0	0	0	0	0	0
Tracked excavator	C2.17	28t	76	30	1	0	-5	71
Dumper	C4.1	25t	81	10	1	0	-10	71
Grader	C6.31	25t	86	10	1	0	-10	76
Tipper lorry	C8.20		79	10	1	0	-10	69
Roller	C5.19	22t	80	10	1	0	-10	70
TOTAL Lp								79
Lw								107

Table AttG4.1-4 – General Earthworks (RoW)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Articulated dump truck	C5.16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand tools	-	-	-	-	-	-	0	0
Hand trolley	-	-	-	-	-	-	0	0
Dozer	C2.13	11 t	78	20	1	0	-7	71
TOTAL Lp								78
Lw								106

Table AttG4.1-5 Trenching (RoW)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dumper	C4.1	25t	81	10	1	0	-10	71
Hand tools	-	-	-	-	-	-	0	
Trencher	4.63	40t	77	20	1	0	-7	70
Trench wacker	Manufacturer data	Wacker BS 50-4	79	30	1	-5	-10	69
Wacker plate	C2.41	-	80	15	1	0	-8	72
TOTAL Lp								78
Lw								106

Table AttG4.1-6 HDD Site Establishment (RoW)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	20	1	0	-7	69
Dumper	C4.1	25t	81	15	1	0	-8	73
Roller	C2.37	18t	79	15	1	0	-8	71
Telescopic handler	C2.35	10t	71	25	1	0	-6	65
Lorry with lifting boom	C4.53	6t	77	25	1	0	-6	71
Compressor	C5.5	1t	65	20	1	-10	-17	48
Vibratory piling rig	C3.8	52t	88	10	1	0	-10	78
TOTAL Lp								81
Lw								109

Table AttG4.1-7 HDD Drilling (RoW)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Compressor	C5.5	1t	65	20	1	-10	-17	48
Vacuum truck	Manufacturer data	78 Kw	86.7	40	1	-10	-14	73
Directional drill	C2. 44	106 Kw	77	40	1	-10	-14	63
Circular saw	C4.70	9 kg	91	10	1	-10	-20	71
TOTAL Lp								75
Lw								103

Table AttG4.1-8 Pipe Laying/Installation (RoW)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28 t	76	20	1	0	-7	69
Dumper	C4.1	25 t	81	25	1	0	-6	75
Hand tools	-	-	-	-	-	-	0	-
Generator	C4.78	-	66	40	1	-10	-14	52
Lorry with lifting boom	C4.53	6 t	77	20	1	0	-7	70
Hand trolleys	-	-	-	-	-	-	-	-
Welding equipment	C3.31	-	73	40	1	0	-4	69
Circular saw	C4.70	9 kg	91	10	1	-5	-15	76
TOTAL Lp								80
Lw								108

Table AttG4.1-9 Backfilling and Reinstatement (RoW)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dumper	C4. 1	25t	81	20	1	0	-7	74
Hand tools	-	-	-	-	-	-	0	-
Wacker plate	C2.41	-	80	15	1	0	-8	72
Roller	C2.37	18t	79	15	1	0	-8	71
Telescopic handler	C2.35	10t	71	20	1	0	-7	64
TOTAL Lp								78
Lw								106

Table AttG4.1-10 Rock Breaking (RoW)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Breaker mounted on excavator	C1.9	15t	90	10	1	0	-10	80
Dumper	C4.1	25t	81	20	1	0	-7	74
Hand tools	-	-	-	-	-	-	-	-
TOTAL Lp								81
Lw								109

Pumping Stations plus Pressure Reduction Station (PP and PRS)

Table AttG4.1-11 Cleaning and Grubbing

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	10	1	0	-10	66
Dozer	C7. 8	50t	75	20	2	0	-4	71
Hand tools	-	-	-	-	-	-	0	-
Skip wagon	C8.21	-	78	25	1	0	-6	72
Dumper	C4.1	25t	81	20	1	0	-7	74
TOTAL Lp								78
Lw								106

Table AttG4.1-12 General Earthworks

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Articulated dump truck	C5.16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand Tools	-	-	-	-	-	-	0	0
Hand Trolley	-	-	-	-	-	-	0	0
Dozer	C2.13	11 t	78	20	1	0	-7	71
TOTAL Lp								78
Lw								106

Table AttG4.1-13 Concrete Foundations

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
CAT and genny	-	-	-	-	-	-	-	-
Dumper	C4.1	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	76	10	1	0	-10	66
Hand tools	-	-	-	-	-	-	0	-
Concrete pump	C4.32	Pump and boom arm	80	50	1	0	-3	77
Generator	C4.78	-	66	40	1	-10	-14	52
Concrete poker	C4.33	-	78	20	1	0	-7	71
TOTAL Lp								79
Lw								107

Table AttG4.1-14 Steel and Formwork

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Hand tools	-	-	-	-	-	-	0	-
Concrete mixer truck	C4.27	-	79	40	1	0	-4	75
Concrete pump	C4.32	Pump and boom arm	80	25	1	0	-6	74
Crane	C4.50	600t	71	20	2	0	-4	67
Lorry with lifting boom	C4.53	6t	77	25	1	0	-6	71
TOTAL Lp								79
Lw								107

Table AttG4.1-15 Mechanical and Electrical Installations

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Hand tools	-	-	-	-	-	-	0	-
Core drill (electric)	C4.69	250 mm diameter	85	40	1	-5	-9	76
Cable winch	Manufacturer data	Handheld	63	75	2	0	2	65
TOTAL Lp								76
Lw								104

LOF

Table AttG4.1-16 Cleaning and Grubbing (LOF)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dozer	C 7. 8	50t	75	20	2	0	-4	71
Hand tools	-	-	-	-	-	-	0	-
Skip wagon	C 8. 21	-	78	25	1	0	-6	72
Dumper	C 4. 1	25t	81	20	1	0	-7	74
TOTAL Lp								78
Lw								106

Table AttG4.1-17- General Earthworks (LOF)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Articulated dump truck	C 5. 16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand tools	-	-	-	-	-	-	0	0
Hand trolley	-	-	-	-	-	-	0	0
Dozer	C 2.13	11 t	78	20	1	0	-7	71
TOTAL Lp								78
Lw								106

Table AttG4.1-18 Concrete Foundations (LOF)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
CAT and Genny	-	-	-	-	-	-	0	-
Dumper	C 4. 1	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	76	10	1	0	-10	66
Hand tools	-	-	-	-	-	-	0	-
Concrete pump	C 4.32	Pump and boom arm	80	50	1	0	-3	77
Generator	C 4. 78	-	66	40	1	-10	-14	52
Concrete poker	C.4.33	-	78	20	1	0	-7	71
TOTAL Lp								79
Lw								107

Table AttG4.1-19 Steel and Formwork (LOF)

Plant	Noise Data			On Time (%)	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m dB(A)
	Plant Reference	Type	Lp (at 10 m) dB(A)					
Hand Tools	-	-	-	-	-	-	0	-
Concrete mixer truck	C 4. 27	-	79	40	1	0	-4	75
Concrete pump	C 4.32	Pump and boom arm	80	25	1	0	-6	74
Crane	C 4. 50	600t	71	20	2	0	-4	67
Lorry with lifting boom	C 4. 53	6t	77	25	1	0	-6	71
TOTAL								79
Lw								107

Table AttG4.1-20 Mechanical and Electrical Installations (LOF)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Hand tools	-	-	-	-	-	-	0	-
Core drill (electric)	C4.69	250 mm diameter	85	40	1	-5	-9	76
Cable winch	Manufacturer's data	Hand Held	63	75	2	0	2	65
Oxy gas burner	C3.35	Hand-Held	65	60	1	-5	-7	58
TOTAL Lp								76
Lw								104

MST

Table AttG4.1-21 Cleaning and Grubbing (MST)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dozer	C 7. 8	50t	75	20	2	0	-4	71
Hand tools	-	-	-	-	-	-	0	-
Skip wagon	C 8. 21	-	78	25	1	0	-6	72
Dumper	C 4. 1	25t	81	20	1	0	-7	74
TOTAL Lp								78
Lw								106

Table AttG4.1-22 General Earthworks (MST)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Articulated dump truck	C 5. 16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand tools	-	-	-	-	-	-	0	0
Hand trolley	-	-	-	-	-	-	0	0
Dozer	C 2.13	11 t	78	20	1	0	-7	71
TOTAL Lp								78
L_w								106

Table AttG4.1-23 Concrete Foundations (MST)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Cable avoidance tool and generator	-	-	-	-	-	-	-	-
Dumper	C 4. 1	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	76	10	1	0	-10	66
Hand tools	-	-	-	-	-	-	-	-
Concrete pump	C 4.32	Pump and boom arm	80	50	1	0	-3	77
Generator	C 4. 78	-	66	40	1	-10	-14	52
Concrete poker	C.4.33	-	78	20	1	0	-7	71
TOTAL Lp								79
Lw								107

Table AttG4.1-24 Steel and Formwork (MST)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Hand tools	-	-	-	-	-	-	-	-
Concrete mixer truck	C 4. 27	-	79	40	1	0	-4	75
Concrete pump	C 4.32	Pump and boom arm	80	25	1	0	-6	74
Crane	C 4. 50	600t	71	20	2	0	-4	67
Lorry with lifting boom	C 4. 53	6t	77	25	1	0	-6	71
TOTAL Lp								79
Lw								107

Main Camp and Pipe Yards

Table AttG4.1-25 Cleaning and Grubbing (MCPY)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dozer	C 7. 8	50t	75	20	2	0	-4	71
Hand tools	-	-	-	-	-	-	-	-
Skip wagon	C 8. 21	-	78	25	1	0	-6	72
Dumper	C 4. 1	25t	81	20	1	0	-7	74
TOTAL Lp								78
Lw								106

Table AttG4.1-26 General Earthworks (MCPY)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Articulated dump truck	C 5. 16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand tools	-	-	-	-	-	-	-	-
Hand trolley	-	-	-	-	-	-	-	-
Dozer	C 2.13	11 t	78	20	1	0	-7	71
TOTAL Lp								78
Lw								106

Table AttG4.1-27 Pre-Fabrication Installation (MCPY)

Plant	Noise Data			On Time, %	Number of Plant Items	Screening, dB	Total Correction, dB	Total Lp at 10 m, dB(A)
	Plant Reference	Type	Lp (at 10 m), dB(A)					
Telescopic handler	C2.35	10t	71	25	1	0	-6	65
Hand tools	-	-	-	-	-	-	0	0
MEWP	C4.58	8t	63	50	1	0	-3	60
Disc cutter	Stihl TS400	-	73	25	1	-5	-11	62
Oxy gas burner	C3.35	Handheld	65	20	1	-5	-12	53
Hand trolleys	-	-	-	-	-	-	-	-
TOTAL Lp								68
Lw								96

ATTACHMENT G4.2 OPERATION SOURCE DATA

Table AttG4.2-1 Pumping Stations Source Data (PS3 and PS5, Bulk Oil Heaters Only for PS4 and PS6)

Operation	Noise Source Data			Tag (Reference to Attachment G4.3)	Embedded Mitigation or Assumptions
	Description	SPL @ 1m [1]	Spectrum		
PS3 and 5	Export pumps	85	Generic pump	25-PA-31000A/B/C/D	
	Nitrogen generators	85	Generic compressor	74-UB-5400	
	Diesel fuel supply pumps	85	Generic pump	71-PA-3700A/B	
	Crude fuel oil separator pumps	85	Generic pump	71-UZ-6500	
	Crude/diesel fuel oil pressurisation pumps	85	Generic pump	71-UZ-6550	
	Crude/diesel fuel oil circulation pumps	85	Generic pump	71-UZ-6600A/B/C	Fully enclosed
	Diesel fuel recirculation pumps	85	Generic pump	71-UZ-6800	
	Water distribution pumps	85	Generic pump	52-PA3650A/B	
	Heating medium pump	85	Generic pump	73-UZ-8500	
	Sump tank pumps	85	Generic pump	28-PC-3900A/B	
	Sump tank pumps	85	Generic pump	28-PC-3980A/B	
	Lube oil transfer pump	85	Generic pump	71-PA-3800	
	Power generators	85	Data provided by GIE	60-GE-8600	Fully enclosed
	Power generator exhausts		Data provided by GIE	N/A	Silenced
	Radiator fans	85	Generic axial fan	52-EA-2300	
Daytime and night	Equivalent total noise @ 1 m	96.5			2-m high boundary noise wall, minimum 12 kg/m^2 surface density

NOTES: [1]Not inclusive of embedded mitigation

Table AttG4.2-2 LOF Source Data

Operation	Noise Source Data			Tag (Reference to Attachment G4.3)	Embedded Mitigation or Assumptions
	Description	SPL @ 1m [1]	Spectrum		
LOF	Hydraulic power units (export)	80	Generic pump	25-DZ-9200A/B/C	
	Hydraulic power units (import)	80	Generic pump	25-DZ-9210A/B	
	Compressor unit for VOC	75	Generic compressor	23-KZ-3590	
	Export MLA stripping pumps	85	Generic pump	28-PC-3530A/B	Equipment only operates intermittently for 1 hour
	Import MLA stripping pumps	85	Generic pump	28-PA-3540A/B	Equipment only operates intermittently for 1 hour
Daytime and night	Equivalent total noise @ 1 m	89.4			2-m high boundary noise wall, minimum 12 kg/m^2 surface density

NOTES: [1]not inclusive of embedded mitigation

Table AttG4.2-3 PRS Source Data

Operation	Noise Source Data			Tag (Reference to Attachment G4.3)	Embedded Mitigation or Assumptions
	Description	SPL @ 1m [1]	Spectrum		
PRS	Reinjection pumps	80	Generic pump	24-PR-3300A/B	
	Sump tank pumps	80	Generic pump	28-PC-3900A/B	
Daytime and night	Equivalent total noise @ 1 m	83.0			2-m high boundary noise wall, minimum 12kg/m^2 surface density

NOTES: [1]not inclusive of embedded mitigation

Table AttG4.2-4 MST Source Data

Operation	Noise Source Data			Tag (Reference to Attachment G4.3)	Embedded Mitigation or Assumptions
	Description	**SPL @ 1m [1]**	**Spectrum**		
MST	Loading pumps	85	Generic pump	25-PA-3100A/B/C	
	Recirculation and transfer pumps	85	Generic pump	24-PZ-3200A/B/C	
	Nitrogen generation	85	Generic compressor	74-UB-5400	
	Diesel fuel supply pumps	85	Generic pump	71-PA-3700A/B	
	Water distribution pumps	85	Generic water pump	52-PA-3650A/B	
	Cooling water pump	85	Generic water pump	76-PA-3950	
	Heating medium pumps	85	Generic pump	73-UZ-8500	
	Crude fuel oil separator pumps	85	Generic pump	71-UZ-6500	
	Crude and diesel fuel pre-pressurisation pumps	85	Generic pump	71-UZ-6550	
	Crude/diesel fuel circulation pumps	85	Generic pump	71-UZ-6600A/B/C	
	Lube oil transfer pumps	85	Generic pump	71-PA-3800	
	Power generators	115	Data provided by GIE	60-GE-8600	Fully enclosed to 70 dB(A) @ 1 m
	Power generator exhausts	115 @ 2 m	Data provided by GIE	N/A	Silenced to 95 dB(A) @ 1 m
	Radiator fans	85	Generic axial fan	76-EA-2300	
Daytime and Night	Equivalent total noise @ 1 m	95.8			2-m high boundary noise wall, minimum 12 kg/m^2 surface density

NOTES: [1]Not inclusive of embedded mitigation

ATTACHMENT G4.3 OPERATIONAL NOISE REPORT (EACOP HSE STUDIES – NOISE STUDY DOCUMENT NO UT-MID-60-0010-000090 20/11/17)

ATTACHMENT G4.4 ROCK BREAKING SOURCE DATA

Typical Maximum Vibration Levels from Rock Hammering

Distance from Activity (m)	PPV Vibration Level (mm/s) at Distance (m)					
	5	10	20	30	40	50
Heavy rock hammer (1.5 t)	4.5	3	1.5	0.4	0.35	0.3
Medium rock hammer (0.6 t)	0.2	0.06	0.02	0.01	-	-

ATTACHMENT G4.5 CONSTRUCTION NOISE PREDICTION SEPARATION DISTANCES

Separation Distance for Exceedance of Magnitude Criteria (Construction)

The distances displayed are where receptors are likely to be exposed to magnitude scores as a result of the plant included in the assessment for each task, activity or AGI. Many distance are the same due to similar noise emissions and the way in which the noise sources have been modelled to account for worst case and without defined construction plans.

Phase	Activity	Period	Distance at which magnitude is exceeded, m				
			Magnitude 2 (55 (dB(A))	Magnitude 4 (60 (dB(A))	Magnitude 6 (65 (dB(A))	Magnitude 8 (70 (dB(A))	Magnitude 10(75 (dB(A))
RoW	Clearing and grubbing	Day	100	56	32	18	18
RoW	Camp/site establishment	Day	71	40	22	13	13
RoW	Road construction	Day	100	56	32	18	18
RoW	General earthworks	Day	100	56	32	18	18
RoW	Trenching	Day	100	56	32	18	18
RoW	HDD site establishment	Day	141	79	45	25	25
RoW	HDD drilling	Day	71	40	22	13	13
RoW	Pipe laying and installation	Day	126	71	40	22	22
RoW	Backfilling and reinstatement	Day	100	56	32	18	18
RoW	Rock breaking	Day	141	79	45	25	25
RoW	HDD drilling	Night	708	398	224	126	71
PS3	Clearing and grubbing	Day	100	56	32	18	18
PS3	General earthworks	Day	100	56	32	18	18

Phase	Activity	Period	Distance at which magnitude is exceeded, m				
			Magnitude 2 (55 (dB(A))	Magnitude 4 (60 (dB(A))	Magnitude 6 (65 (dB(A))	Magnitude 8 (70 (dB(A))	Magnitude 10(75 (dB(A))
PS3	Concrete foundations	Day	112	63	35	20	20
PS3	Steel and formwork	Day	112	63	35	20	20
PS3	M&E installation	Day	79	45	25	14	14
PS3	Rock breaking	Day	141	79	45	25	25
PS4	Clearing and grubbing	Day	100	56	32	18	18
PS4	General earthworks	Day	100	56	32	18	18
PS4	Concrete foundations	Day	112	63	35	20	20
PS4	Steel and formwork	Day	112	63	35	20	20
PS4	M&E installation	Day	79	45	25	14	14
PS4	Rock breaking	Day	141	79	45	25	25
PS5	Clearing and grubbing	Day	100	56	32	18	18
PS5	General earthworks	Day	100	56	32	18	18
PS5	Concrete foundations	Day	112	63	35	20	20
PS5	Steel and formwork	Day	112	63	35	20	20
PS5	M&E installation	Day	79	45	25	14	14
PS5	Rock breaking	Day	141	79	45	25	25
PS6	Clearing and grubbing	Day	100	56	32	18	18
PS6	General earthworks	Day	100	56	32	18	18
PS6	Concrete foundations	Day	112	63	35	20	20
PS6	Steel and formwork	Day	112	63	35	20	20
PS6	M&E installation	Day	79	45	25	14	14
PS6	Rock breaking	Day	141	79	45	25	25

Phase	Activity	Period	Distance at which magnitude is exceeded, m				
			Magnitude 2 (55 (dB(A))	Magnitude 4 (60 (dB(A))	Magnitude 6 (65 (dB(A))	Magnitude 8 (70 (dB(A))	Magnitude 10(75 (dB(A))
PRS1	Clearing and grubbing	Day	100	56	32	18	18
PRS1	General earthworks	Day	100	56	32	18	18
PRS1	Concrete foundations	Day	112	63	35	20	20
PRS1	Steel and formwork	Day	112	63	35	20	20
PRS1	M&E installation	Day	79	45	25	14	14
PRS1	Rock breaking	Day	141	79	45	25	25
PRS2	Clearing and grubbing	Day	100	56	32	18	18
PRS2	General earthworks	Day	100	56	32	18	18
PRS2	Concrete foundations	Day	112	63	35	20	20
PRS2	Steel and formwork	Day	112	63	35	20	20
PRS2	M&E installation	Day	79	45	25	14	14
PRS2	Rock breaking	Day	141	79	45	25	25
MST	Clearing and grubbing	Day	100	56	32	18	18
MST	General earthworks	Day	100	56	32	18	18
MST	Concrete foundations	Day	112	63	35	20	20
MST	Steel and formwork	Day	112	63	35	20	20
MST	M&E installation	Day	100	56	32	18	18
MCPY5	Clearing and grubbing	Day	100	56	32	18	18
MCPY5	General earthworks	Day	100	56	32	18	18
MCPY5	Prefabrication installation	Day	32	18	10	6	6
MCPY5	M&E installation	Day	79	45	25	14	14
MCPY5	Operation	Day	100	56	32	18	18

Phase	Activity	Period	Distance at which magnitude is exceeded, m				
			Magnitude 2 (55 (dB(A))	Magnitude 4 (60 (dB(A))	Magnitude 6 (65 (dB(A))	Magnitude 8 (70 (dB(A))	Magnitude 10(75 (dB(A))
MCPY6	Clearing and grubbing	Day	100	56	32	18	18
MCPY6	General earthworks	Day	100	56	32	18	18
MCPY6	Prefabrication installation	Day	32	18	10	6	6
MCPY6	M&E installation	Day	79	45	25	14	14
MCPY6	Operation	Day	100	56	32	18	18
MCPY7	Clearing and grubbing	Day	100	56	32	18	18
MCPY7	General earthworks	Day	100	56	32	18	18
MCPY7	Prefabrication installation	Day	32	18	10	6	6
MCPY7	M&E installation	Day	79	45	25	14	14
MCPY7	Operation	Day	100	56	32	18	18
MCPY8	Clearing and grubbing	Day	100	56	32	18	18
MCPY8	General earthworks	Day	100	56	32	18	18
MCPY8	Prefabrication installation	Day	32	18	10	6	6
MCPY8	M&E installation	Day	79	45	25	14	14
MCPY8	Operation	Day	100	56	32	18	18
MCPY9	Clearing and grubbing	Day	100	56	32	18	18
MCPY9	General earthworks	Day	100	56	32	18	18
MCPY9	Prefabrication installation	Day	32	18	10	6	6
MCPY9	M&E installation	Day	79	45	25	14	14
MCPY9	Operation	Day	100	56	32	18	18
MCPY10	Clearing and grubbing	Day	100	56	32	18	18
MCPY10	General earthworks	Day	100	56	32	18	18

Phase	Activity	Period	Distance at which magnitude is exceeded, m				
			Magnitude 2 (55 (dB(A))	Magnitude 4 (60 (dB(A))	Magnitude 6 (65 (dB(A))	Magnitude 8 (70 (dB(A))	Magnitude 10(75 (dB(A))
MCPY10	Prefabrication installation	Day	32	18	10	6	6
MCPY10	M&E installation	Day	79	45	25	14	14
MCPY10	Operation	Day	100	56	32	18	18
MCPY11	Clearing and grubbing	Day	100	56	32	18	18
MCPY11	General earthworks	Day	100	56	32	18	18
MCPY11	Prefabrication installation	Day	32	18	10	6	6
MCPY11	M&E installation	Day	79	45	25	14	14
MCPY11	Operation	Day	100	56	32	18	18
MCPY12	Clearing and grubbing	Day	100	56	32	18	18
MCPY12	General earthworks	Day	100	56	32	18	18
MCPY12	Prefabrication installation	Day	32	18	10	6	6
MCPY12	M&E installation	Day	79	45	25	14	14
MCPY12	Operation	Day	100	56	32	18	18
CF	Clearing and grubbing	Day	100	56	32	18	18
CF	General earthworks	Day	100	56	32	18	18
CF	Prefabrication installation	Day	32	18	10	6	6
CF	M&E installation	Day	79	45	25	14	14
CF	Operation	Day	28	16	9	5	5
CF	Operation	Night	112	63	35	20	20

ATTACHMENT G4.6 OPERATIONAL NOISE CONTOURS

Figure AttG4.6-1 PS3 Operational Noise

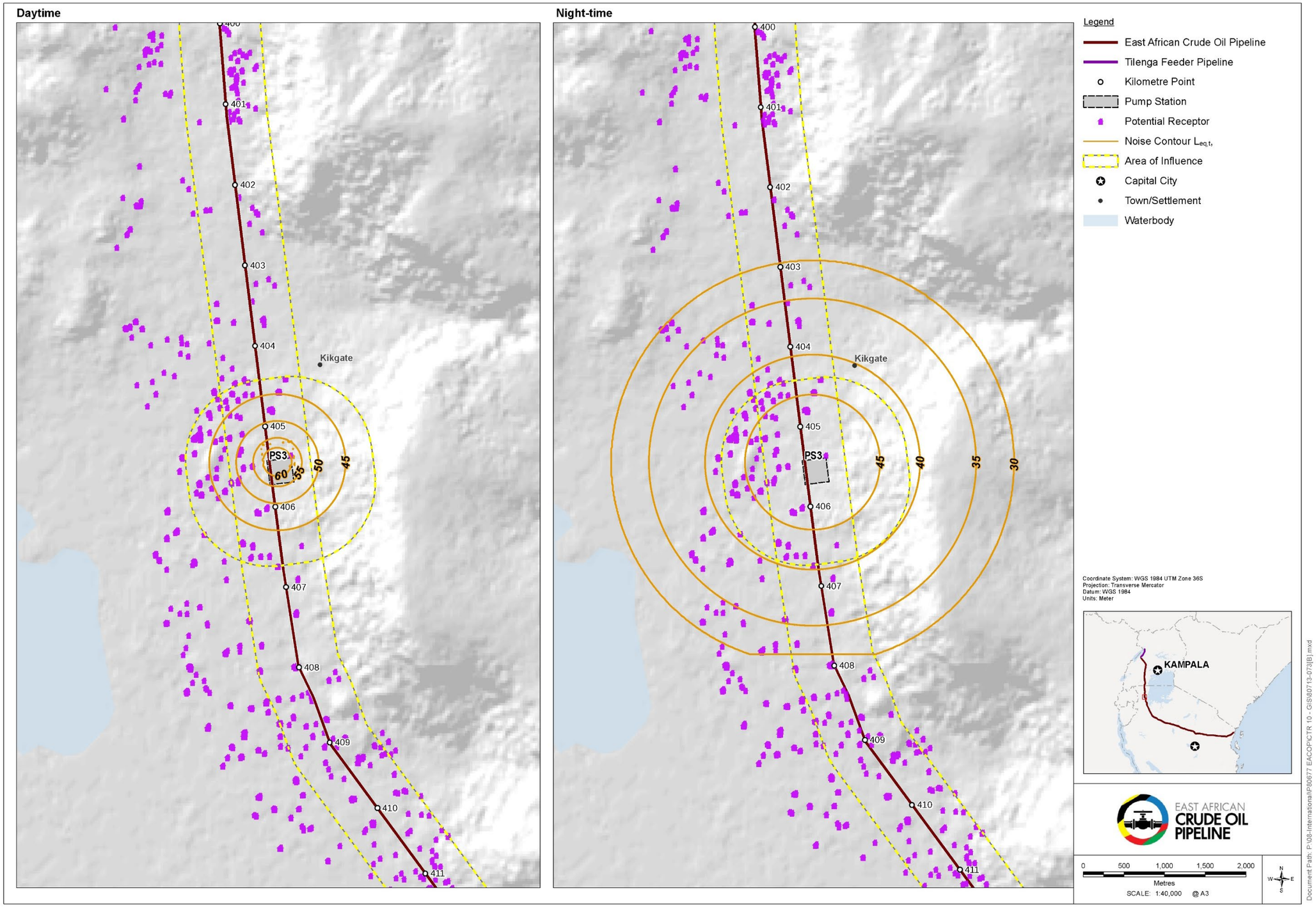

Figure AttG4.6-2 PS4 Operational Noise

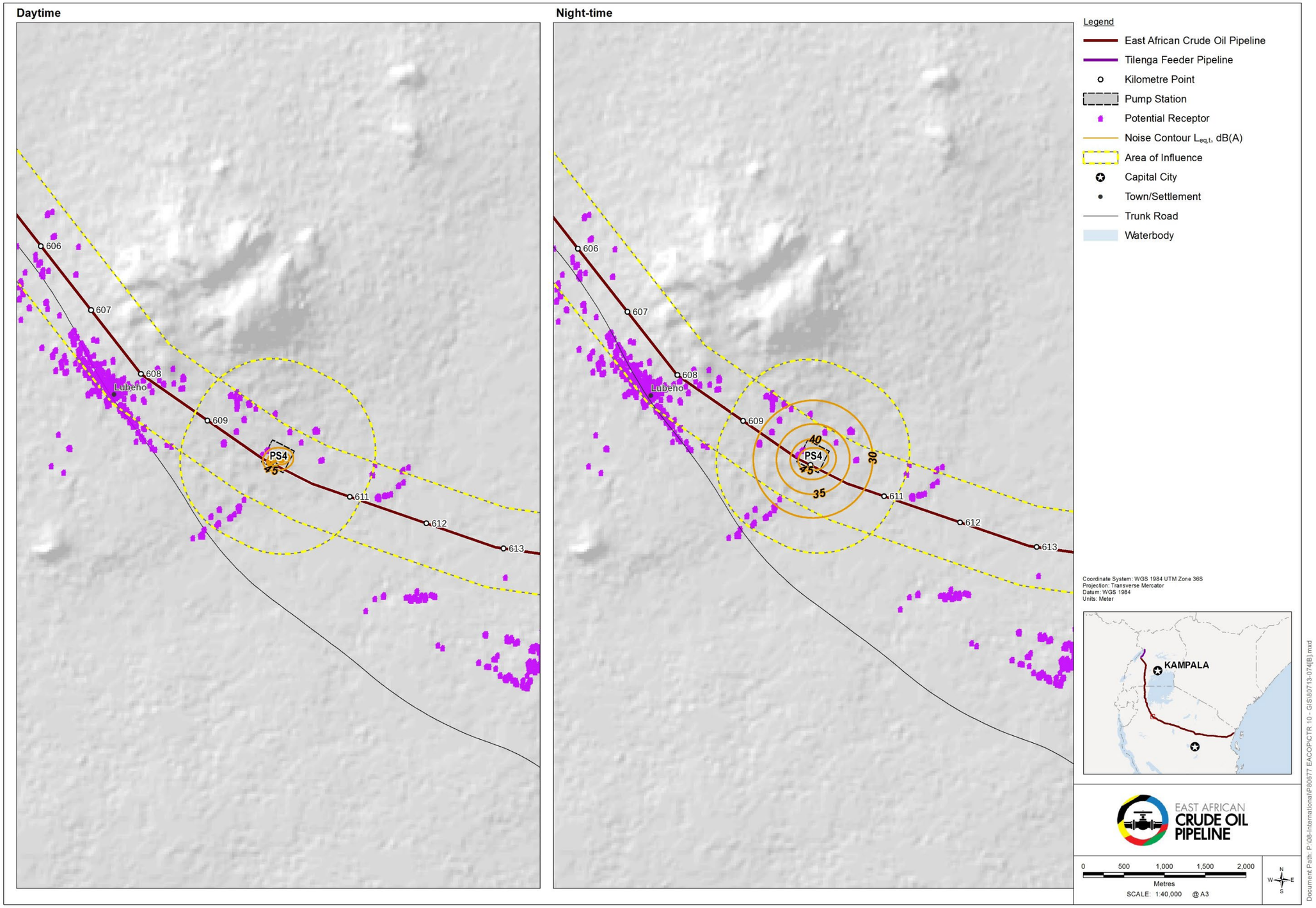

Figure AttG4.6-3 PS5 Operational Noise

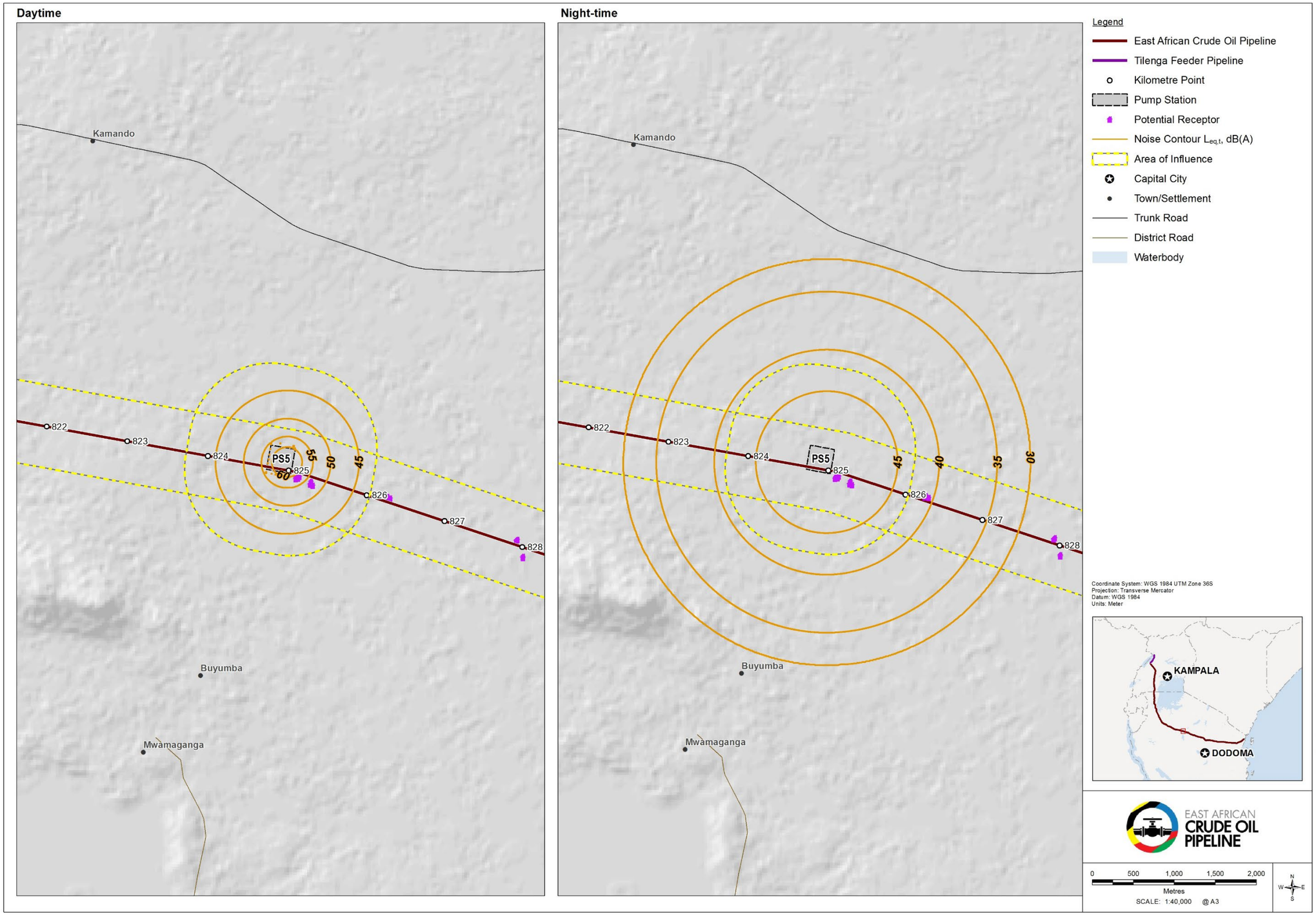

Figure AttG4.6-4 PS6 Operational Noise

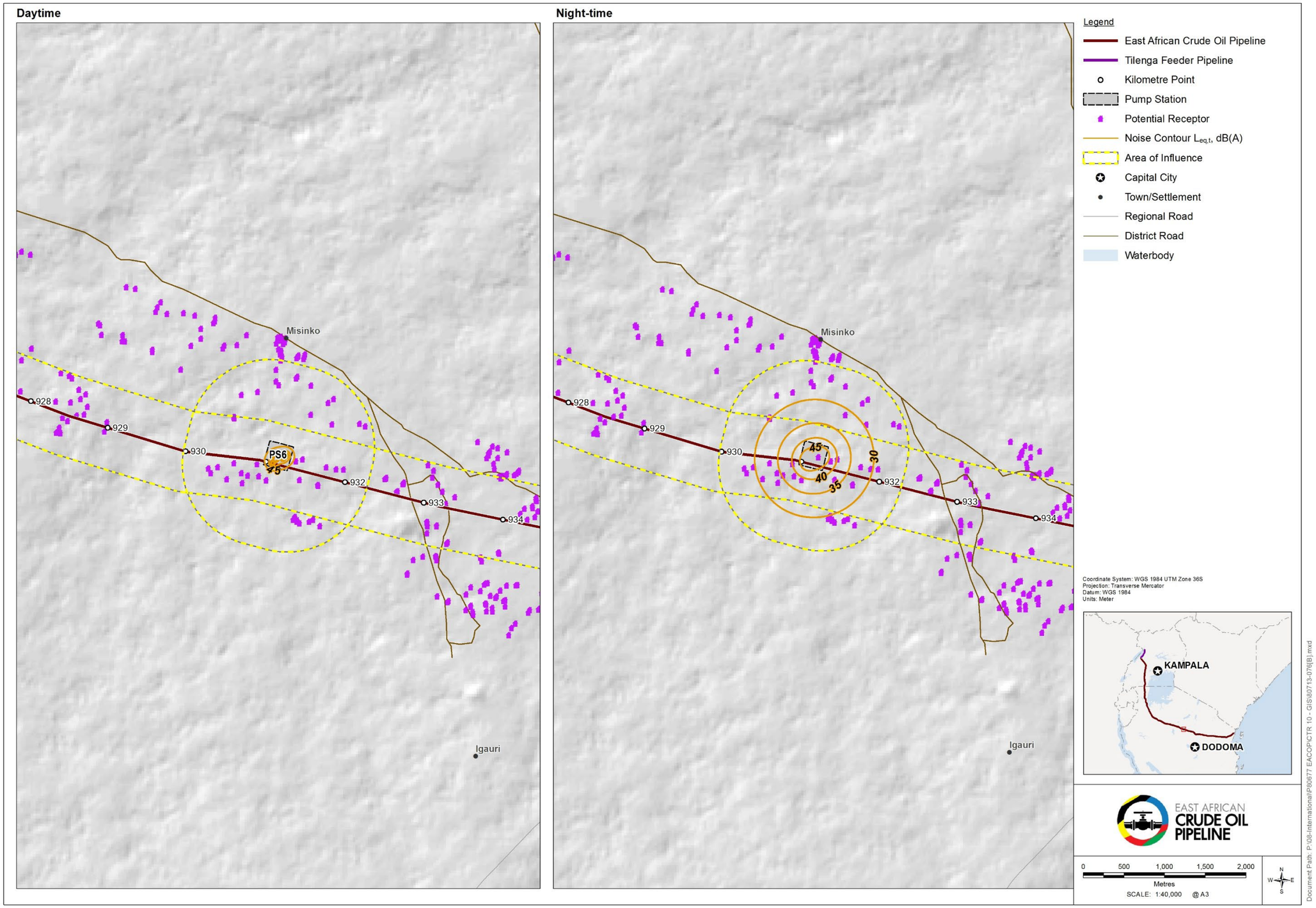

Figure AttG4.6-5 PRS1 Operational Noise

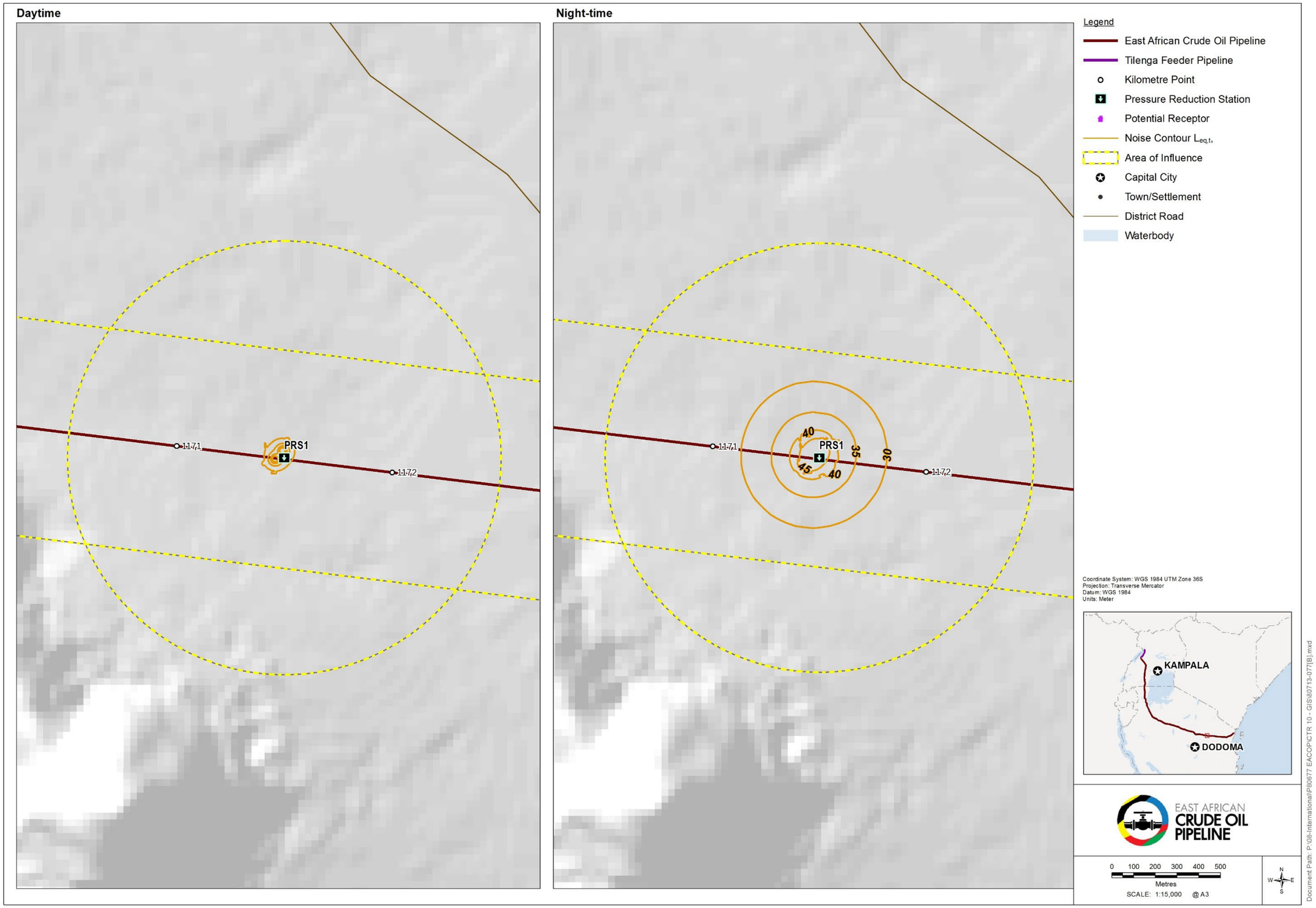

Figure AttG4.6-6 PRS2 Operational Noise

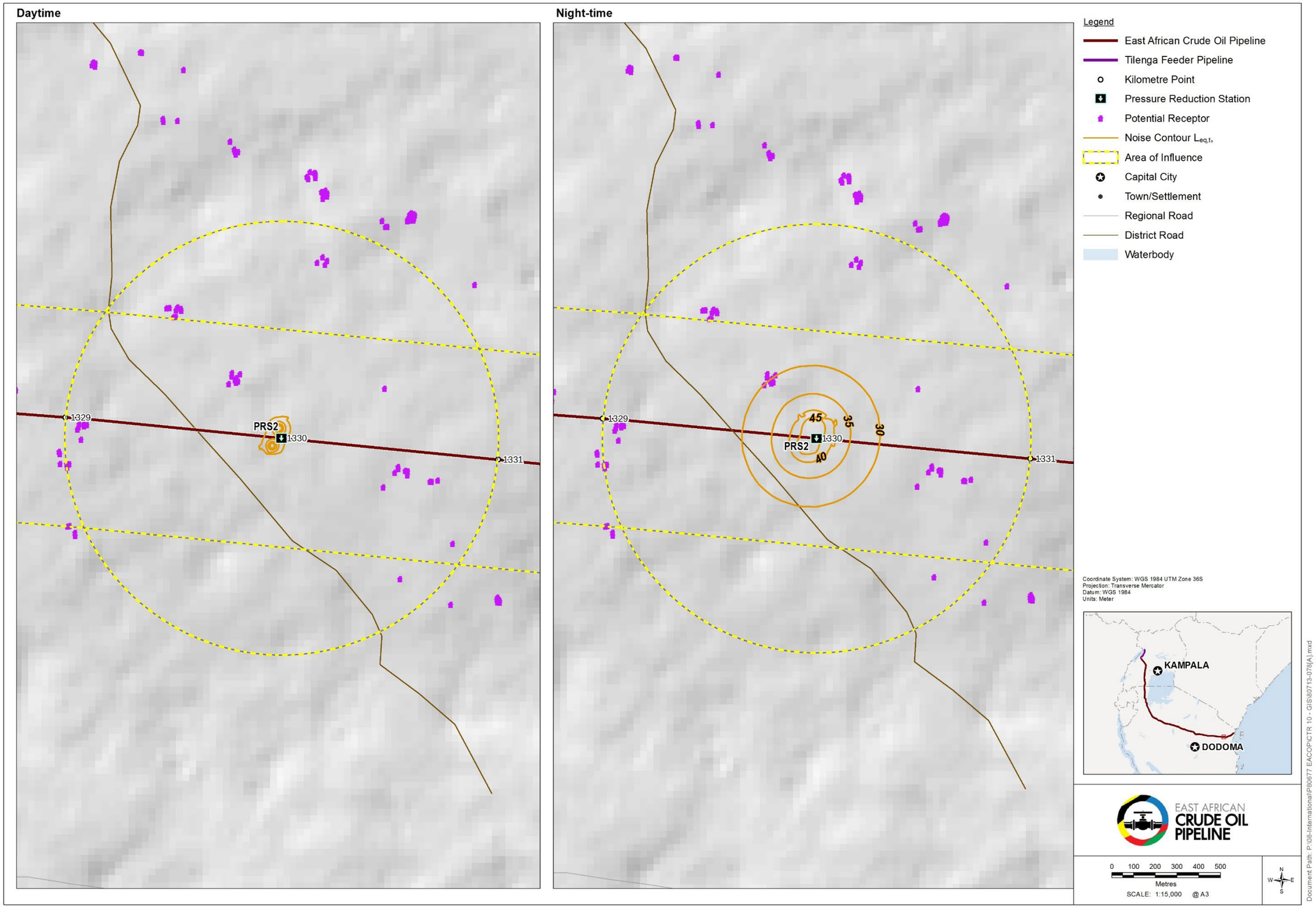

Figure AttG4.6-7 LOF Operational Noise

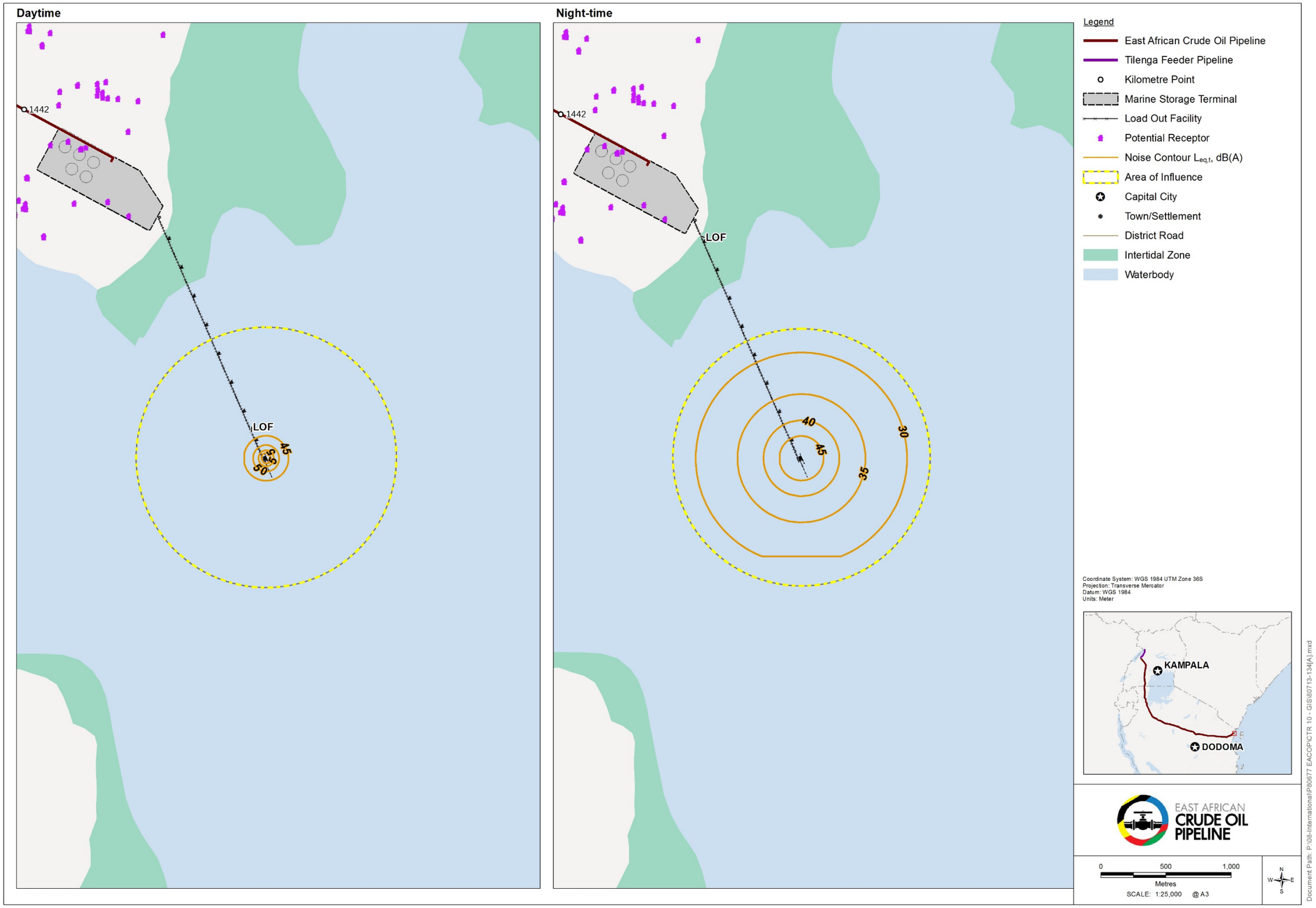

Figure AttG4.6-8 MST Operational Noise