

Appendix 12.2

Operational Vibration Impacts

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There is no existing empirical formula for the calculation of vibration from industrial process as generally vibration is unwanted and is often designed out to prevent mechanical failure due to fatigue.

For the purpose of the Project maximum displacement levels at different distances have been calculated in order to quantify levels of perceptible vibration from the operation of the project.

BS 5228-2:2009 ‘Code of practice for noise and vibration control on construction and open sites - Vibration’ provides formulas for the calculation of resultant peak particle velocity (PPV) from piling activities. For the purpose of this assessment a steady state of vibratory compaction has been assumed using the following formula –

$$V_{res} = 75\sqrt{n_d} \left[\frac{A}{X + L_d} \right]^{1.5}$$

- Where V_{res} = Resultant PPV at Receptor
- n_d = Number of vibrating drums (in this case 1 for associated equipment)
- A = Maximum displacement
- X = Distance
- L_d = Width of Drum (in this case width of pipe 42")

The table below presents the maximum displacement required in 10 m bands before vibration would become perceptible at 1.14mms⁻¹ in sensitive situations as specified in BS 5228-2:2009.

Distance (in meters)	Maximum displacement required before vibration becomes perceptible
20.0	1.2
30.0	1.9
40.0	2.6
50.0	3.2
60.0	3.8
70.0	4.4
80.0	>5
90.0	>5
100.0	>5

The table below presents the maximum displacement required from any vibration from industrial process to be perceptible at receptors within the proximity of the Project.

Receptor	Distance to Nearest Industrial Process	Required Displacement for Vibration to be Perceptible
Cote Walls Farm	280	>5
Carter's Farm	550	>5
Elm Farm	140	>5
Ivy Cottages	20	1.2
Park Farm	30	1.9
Corcas Farm	55	3.5
Rossall Hospital	45	2.9
Rossall School	340	>5
Blackpool and The Fylde College	210	>5
Sportsman Cottage and Caravan Park	245	>5
Riverside Cottage	155	>5
Little Height o' th' Hill	35	2.3
Height o' th' Hill	22	1.5
The Grange	160	>5
Stanah House Caravan Park	290	>5
Harbour Village Development	42	2.7
Broadwater Caravan Park	45	2.8
Residential Dwellings Along West Way	71	4.3
Residential Dwellings Along South Strand	20	1.4

The levels of displacement required for vibration to be perceptible are all above 1mm/s^{-1} which is a positive indication that vibration from the Project will not be perceptible.

Generally levels above 1mms^{-1} would not be desirable as levels of this magnitude would have the potential to cause mechanical fatigue which would result in pipeline failure. The vibration levels required to be perceptible would be designed out to ensure pipeline integrity and safety and would not have a significant impact upon receptors within the local area.

Levels required to generate structural damage are generally required to be in excess of a minimum of 15mms^{-1} . PPV levels of this magnitude are not predicted to be generated during operation and structural damage would not be significant.