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MARBLEMOUNT QUARRY

VIBRATION STUDY

1. INTRODUCTION

Kiewit Infrastructure West Co. (Kiewit) is proposing to mine rock from a quarry to be located in unincorporated Skagit County south of Marblemount, Washington. Ramboll US Corporation (Ramboll) has been asked to consider the potential effects of vibration from trucks transporting the material from the site. The following report reviews noise terminology, regulatory criteria applicable to the project, and the methods and findings of the analysis.

2. TERMINOLOGY AND BACKGROUND

Vibration is an oscillatory motion that can be measured and characterized by the frequency and amplitude of waves of motion. Because it takes time for the human body to perceive and respond to vibration signals, vibration amplitude (i.e., the size of the wave of motion) is usually characterized using a "smoothed" amplitude based on the root mean square (rms). Some methodologies used for assessing potential impacts from vibration consider vibration amplitude reported as rms velocity, converted to vibration decibel levels or VdB. The typical background level in residential areas is about 50 VdB, and most people generally cannot detect levels below about 65 VdB and generally do not consider levels below 70 VdB to be of significance. However, the duration of a vibration event has an effect on human response. Generally, as the duration of a vibration event increases, the potential for adverse human response increases. Additionally, the rate of recurrence of events can also affect human response.

3. FTA VIBRATION IMPACT CRITERIA

There are currently no applicable vibration limits or regulations established by Skagit County. Therefore, we are applying Federal Transit Administration (FTA) vibration impact criteria in this assessment to gauge the potential for vibration impacts from the proposed material transport activities.

FTA vibration impact criteria vary depending on the type of receiver and the frequency of occurrence of vibration events. FTA categorizes receiving properties as Category 1 (e.g., most sensitive, such as research facilities with vibration sensitive equipment), Category 2 (e.g., residences), and Category 3 (e.g., institutional uses such as schools, churches, etc.). For this project, groundborne vibration would have the potential to primarily affect residences (Category 2 receiving properties), and these types of properties are the focus of

this assessment. The FTA vibration impact criteria for Category 2 receivers are shown in [Table 1](#).¹

Table 1. FTA Vibration Impact Criteria

Land Use Category	Frequent Events	Occasional Events	Infrequent Events
Category 2 - Residential	72 VdB	75 VdB	80 VdB
"Frequent Events" is defined as more than 70 vibration events of the same source per day. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. FTA, 2006.			

4. OPERATIONAL VIBRATION IMPACT

Most rock mining operations do not typically result in perceptible vibrations at offsite locations, except for blasting, which has been considered by others. However, there is a potential for vibration impacts from trucks traveling between the site and SR 530 via Rockport Cascade Road. For this assessment, we used FTA vibration assessment methods in conjunction with the FTA vibration impact criteria identified earlier in this report.

FTA guidance includes a screening procedure to identify locations where there is little possibility of vibration impacts related to facility operations. Based on specific screening distances for various types of sources, the screening review applies the principle that if no sensitive receivers are identified within the screening distance, no vibration impacts would be expected, and no further assessment is necessary. Ramboll employed this screening procedure as the first step in the review of ground-borne vibration related to the Project. As per FTA guidance, the screening distance for rubber-tired vehicles affecting residences is 50 feet. Therefore, any residential structures farther than 50 feet from Rockport Cascade Road are not expected to be affected by vibration from trucks traveling to and from the site.

Ramboll reviewed aerial photographs to identify potential residential structures located within 50 feet of the nearest and farthest lanes of Rockport Cascade Road, west of the mine entrance. The distance between the site and SR 530 is approximately 7 miles, and most of the road is bounded by undeveloped forest. Several residential structures are adjacent to the Rockport Cascade Road within 1 mile of SR 530, but no residential structures were identified within the screening distance. The nearest residential structure to Rockport

¹ Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006. FTA-VA-90-1003-06.

Cascade Road is just west of the intersection with Stafford Lane and is approximately 58 feet from the centerline of the westbound lane and 70 feet from the centerline of the eastbound lane. Because there are no residential structures within the 50-foot screening distance, no vibration impacts are expected.

5. CONCLUSION

The potential for vibration impacts from haul trucks traveling along Rockport Cascade Road was considered in this assessment. Using FTA vibration impact methods and criteria, we found that there would be no residences within the screening distance of 50 feet to Rockport Cascade Road. Therefore, no vibration impacts are expected to residences from trucks traveling to and from the site on this road.