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NOISE IMPACT STUDY

Proposed Grain Milling & Blending Facility

Lincolnville, Ontario

Prepared for

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1 INTRODUCTION & SUMMARY

HGC Engineering was retained by Grainboys Holdings Inc. ("GHI") to undertake a noise impact study of the proposed Port Royal Mills ("PRM") grain milling and blending facility in the community of Lincolnville and the Township of Whitchurch-Stouffville, Ontario, to support an application for rezoning of the subject lands, and the development approvals processes. A scaled location map of the surrounding area is included as Figure 1. This study uses predictive analysis to assess the potential impact of sound sources associated with the proposed operations with respect to Ontario Ministry of the Environment, Conservation and Parks ("MECP") guideline NPC-300, which is acceptable to the Township of Whitchurch-Stouffville.

Sound emissions from key items of equipment associated with the facility were based on measurements of the same type of equipment conducted by HGC Engineering at similar facilities and sound level data provided by equipment manufacturers. The source sound levels were used to develop an acoustical model of the facility in order to predict the sound levels of the proposed facility at the nearest sound sensitive points of reception, for evaluation with respect to MECP limits.

The analysis indicates that the sound emissions from the proposed facility are predicted to be within the applicable sound level limits of MECP guideline NPC-300. The reader is referred to the main body of the report for assumptions and results of the analysis.

2 SITE DESCRIPTION & NOISE SOURCES

The site is located approximately 4 kilometres northeast of Whitchurch-Stouffville, at 3469 York Durham Line, in the Community of Lincolnville, approximately 400 metres to the south of Durham Regional Highway 47. The facility will be a dry grain processing plant consisting of milling, blending, packing, warehousing, and shipping activities, with a total footprint of approximately 3,700 square metres. In general, the facility will likely be operating for up to 18 hours per day, with a maximum of ten total trucks arriving and departing per day; however, for the purpose of the assessment, it has conservatively been assumed that the facility will operate continuously 24 hours per day, with up to two trucks visiting and leaving the site per hour.

During a visit to the site and the surrounding area by HGC Engineering personnel on August 9, 2019, the background sound in the area was observed to be dominated by significant volumes of road traffic on Highway 47, as well as the local roadways Tenth Line and York Durham Line. The area surrounding the subject site is best categorized as a Class 1 ("urban") acoustical environment under the applicable MECP noise assessment guideline.

Figure 2 is a satellite image of the proposed site and surrounding lands. The nearest existing sound sensitive points of reception to the proposed facility are all single-family dwellings consisting of the following: A two-storey residence approximately 150 metres to the west, represented by R1; a two-storey residence 180 metres to the southwest, represented by R2; a two-storey residence 450 metres to the south, represented by R3; and a two-storey residence 830 metres to the northeast, represented by R4.

3 CRITERIA

In Ontario, the MECP guideline that forms the basis of environmental noise assessment is publication NPC-300[1]. This guideline draws a distinction between "stationary sources" (industrial or commercial sounds), and other types of sources such as road traffic or construction activities, for example. The sound sources associated with the proposed facility are classified as stationary sources. The sound level limit for stationary sources of sound are site specific and depend on the background sound in the vicinity of the receptors, which includes road traffic sound but excludes the source under assessment. The guideline also stipulates that the assessment consider the potential noise impact during a "predictable worst-case hour" of operation, which is defined as a situation when the normally busy activity of the source coincides with an hour of low background sound. In other words, the principle of assessment involves evaluating the subject source against the background sound on an hourly basis. If the acoustic environment in the vicinity is such that the ambient sound level falls off significantly during quiet hours, there are exclusionary minimum sound level limits, which set the lower bound for the acceptability criteria. Specifically, NPC-300 states that the sound level limit for a stationary source in a Class 1 environment is the greater of the minimum one-hour

[1] Ontario Ministry of the Environment and Climate Change Publication NPC-300, *Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning*, August, 2013.

energy-equivalent ambient sound level (L_{EQ}) during any hour that the subject source may operate or the exclusionary minimum limits of 50 dBA during daytime/evening hours (07:00 to 23:00) and 45 dBA during nighttime hours (23:00 to 07:00) at the plane of an outdoor window. For outdoor points of reception, the exclusionary minimum limit is 50 dBA during daytime hours and evening hours.

Where it can be demonstrated that the hourly background sound levels remain greater than the exclusionary minimum limits noted above, the criterion becomes the lowest measured/predicted one-hour L_{EQ} sound level. At locations where the ambient sound levels are lower, the exclusionary minimum criteria of 50/45 dBA apply. For the purposes of this assessment, measurements and observations indicated that the background sound levels fall below the exclusionary minimum levels outlined above during the quietest hours of the day and night, despite consistent audibility of traffic sound from Highway 47. Because the facility has been considered to operate 24 hours per day, the worst-case hour of operation occurs during nighttime hours at locations R1 through R4. Accordingly, the most stringent exclusionary minimum limit of 45 dBA is the key limit at locations R1 through R4.

4 OPERATING ASSUMPTIONS & ANALYSIS METHODS

On behalf of GHI, Lassing Dibben Consulting Engineers Ltd. prepared a preliminary building layout & process flow plan for the facility, included as Figure 3, which assisted with the acoustical modelling. Based on input from GHI, the primary sources of sound will include four dust collector exhaust stacks, a rooftop makeup air unit, a grain elevator, the offloading of grain delivery trucks (i.e. blower trucks) and onsite truck movements; GHI personnel indicate that the majority of process equipment will be located indoors, and thus will be acoustically insignificant outdoors.

Because the facility has not been constructed, our analysis of sound emissions from the key items of equipment has been based on a combination of measurements conducted by HGC Engineering at similar facilities and sound data provided by manufacturers. The sound power level of each source is summarized in Table 2, below, and the location of each sound source on the site is depicted in Figure 3. As stated above, for the purposes of this study, all sources were conservatively assumed to operate continuously, 24 hours per day. Descriptions of the sound sources are provided below.

Dust Collector Exhausts & Makeup Air Unit

This assessment considers sound emissions from four dust collector exhausts stack which will be situated atop the process building towards the east, and a rooftop makeup air unit positioned towards the centre of the process building. Although the majority of the dust collector systems will be located indoors with their sound emissions being acoustically negligible to the outdoors, the systems will exhaust to the outdoors. The dust collector exhaust stacks will also include acoustical silencers (inherent to the design of the equipment). The source sound power levels for these sources were based on sound level data provided by the manufacturer, Buhler Group.

Grain Elevator

Once material is received by transport truck, a grain elevator will be used to hoist material to the elevated distribution equipment. Grain will then be distributed using conveyor systems, via the grain ducts, into the storage silos. The Grain elevator will be situated atop the silos on the east side (shielded from the residences to the west by the process building). Sound emissions included in the analysis were based on measurements on file of similar equipment by HGC Engineering.

Unloading Tanker Trucks

Tanker trucks will unload raw material on the east side of the building towards the south end, with the trucks shielded from the residences by the process building. Typically, unloading will be passive (i.e. by gravity, into hoppers beneath the trucks) and therefore acoustically insignificant, however on occasion traditional truck-based blowers may be used. The sound emissions of the truck-based blowers included in the analysis were based on measurements on file of similar equipment by HGC Engineering.

On-Site Truck Movements

Raw materials and products will be delivered to and shipped from the site via tractor trailers. Trucks delivering fresh grain will enter the site via the driveway along York Durham Lilne and travel to a receiving pit on the east side of the building, at the south end. The trucks will then leave the site to access York Durham Line. This analysis also includes on-site movements of shipping trucks, which will be loaded at a shipping bay, on the south side of the building.

GHI personnel indicated that up to two tractor trailers (one delivery truck and one shipping truck) can enter and exit the site during a predictable worst-case hour. Truck sound emissions included in the analysis were based on measurements on file by HGC Engineering.

Table 2: Equipment Sound Power Levels

Source	Sound Power Level, dBA re: 10^{-12} W
Dust Collector Exhaust (1 of 4)	83 dBA
Makeup Air Unit	95 dBA
Grain Elevator	108 dBA
Tanker Unloading	109 dBA
Shipping Trucks	101 dBA
Delivery Trucks	101 dBA

Some types of sound have a distinctive character which may tend to increase their audibility and potential for disturbance or annoyance. For tonal sound, MECP guideline NPC-104[2] stipulates that an adjustment of +5 dBA be added to the measured source level. A tonal sound is defined as one which has a "pronounced audible tonal quality such as a whine, screech, buzz or hum." In the subsequent analysis, a tonal penalty has been applied to sound emissions from the dust collector exhausts and the unloading tanker trucks, based on the observed tonal character of sound emissions from similar installations visited by HGC Engineering in the past.

Considering the source sound levels detailed in Table 2 and the operating parameters outlined above, a computational acoustical model of the site was created using Cadna/A software, which is a computer implementation of ISO standard 9613-2, "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation" to predict sound levels at the nearest noise sensitive points of reception. The ISO method accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures such as buildings. Topographical details were included in the acoustical model based on site grading plans for the subject site, and Ontario Base Mapping for the surrounding lands.

[2] Ontario Ministry of the Environment and Climate Change Publication NPC-104, *Sound Level Adjustments*, August, 1978.

5 ANALYSIS RESULTS

Given the operating assumptions detailed in Section 4 and Table 2, above, the sound levels of the proposed PRM grain milling and blending facility were predicted at the selected points of reception, the results of which are summarized in Table 3, below.

Table 3: Predicted Facility Sound Levels, L_{EQ} [dBA]

Point of Reception	Facility Sound Level	Performance Limits			Within Limits?
		Day	Even'g	Night	
R1	43	50	50	45	Yes
R2	41	50	50	45	Yes
R3	42	50	50	45	Yes
R4	40	50	50	45	Yes

The prediction results outlined in Table 3 indicate that the sound emissions of the proposed facility can be within the applicable limits at the selected points of reception during all hours of the day and night. Figure 4 shows the predicted energy-equivalent (L_{EQ}) sound level contours resulting from operation of the facility.

6 CONCLUSIONS & RECOMMENDATIONS

The acoustical measurements and analysis indicate that sound emissions of the proposed PRM grain milling and blending facility can be within the applicable sound level criteria under typical "predictable worst case" operating conditions.

This report has been prepared for the purpose of obtaining approvals for the proposed land use from the Township of Whitchurch-Stouffville. When further details of facility plans and mechanical equipment selections are available, an acoustical engineer should verify that the source sound levels and locations of equipment conform to the assumptions made in this report, and that acceptable sound levels will result at all offside residential receptors.

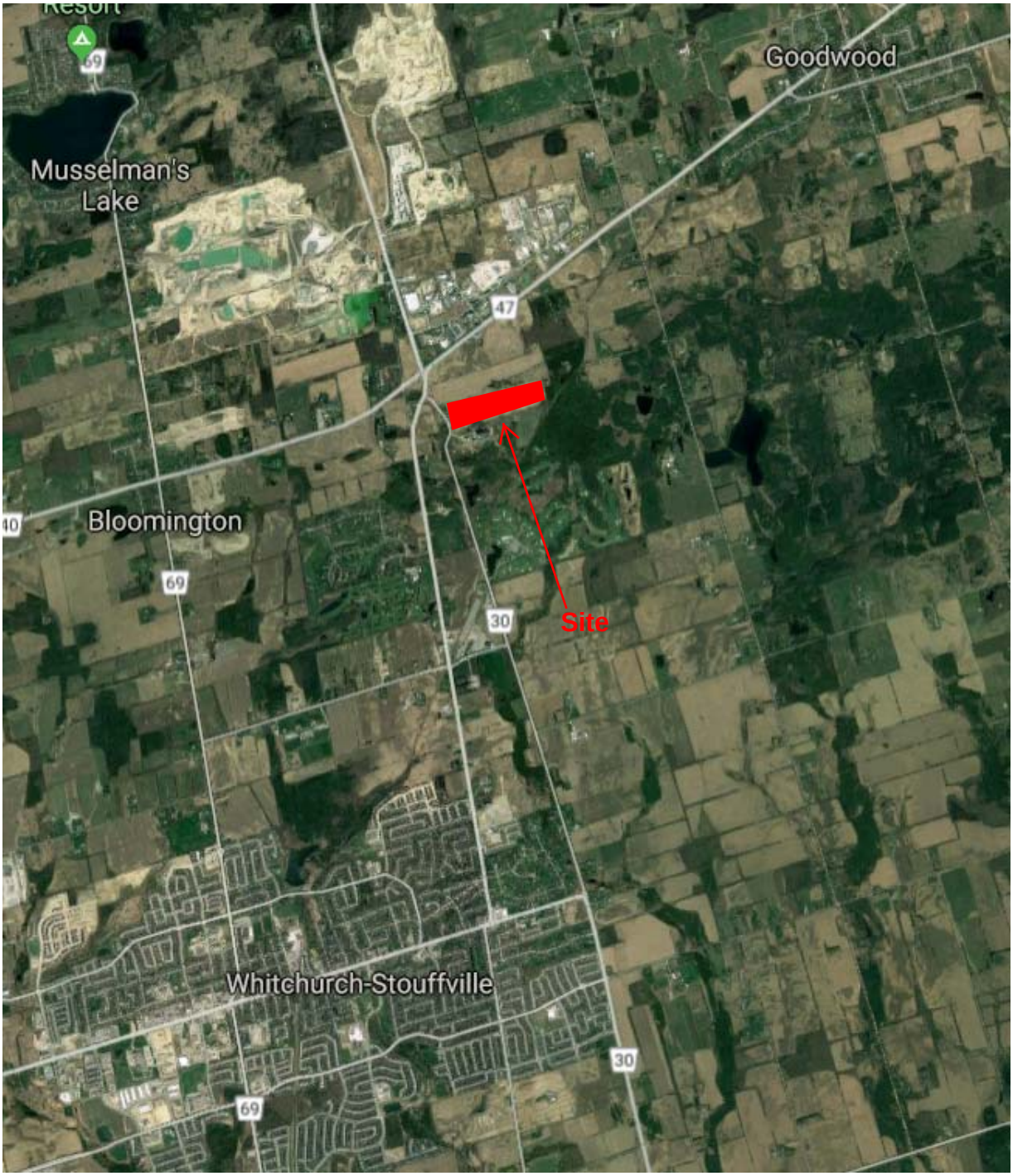

Figure 1: Location Plan

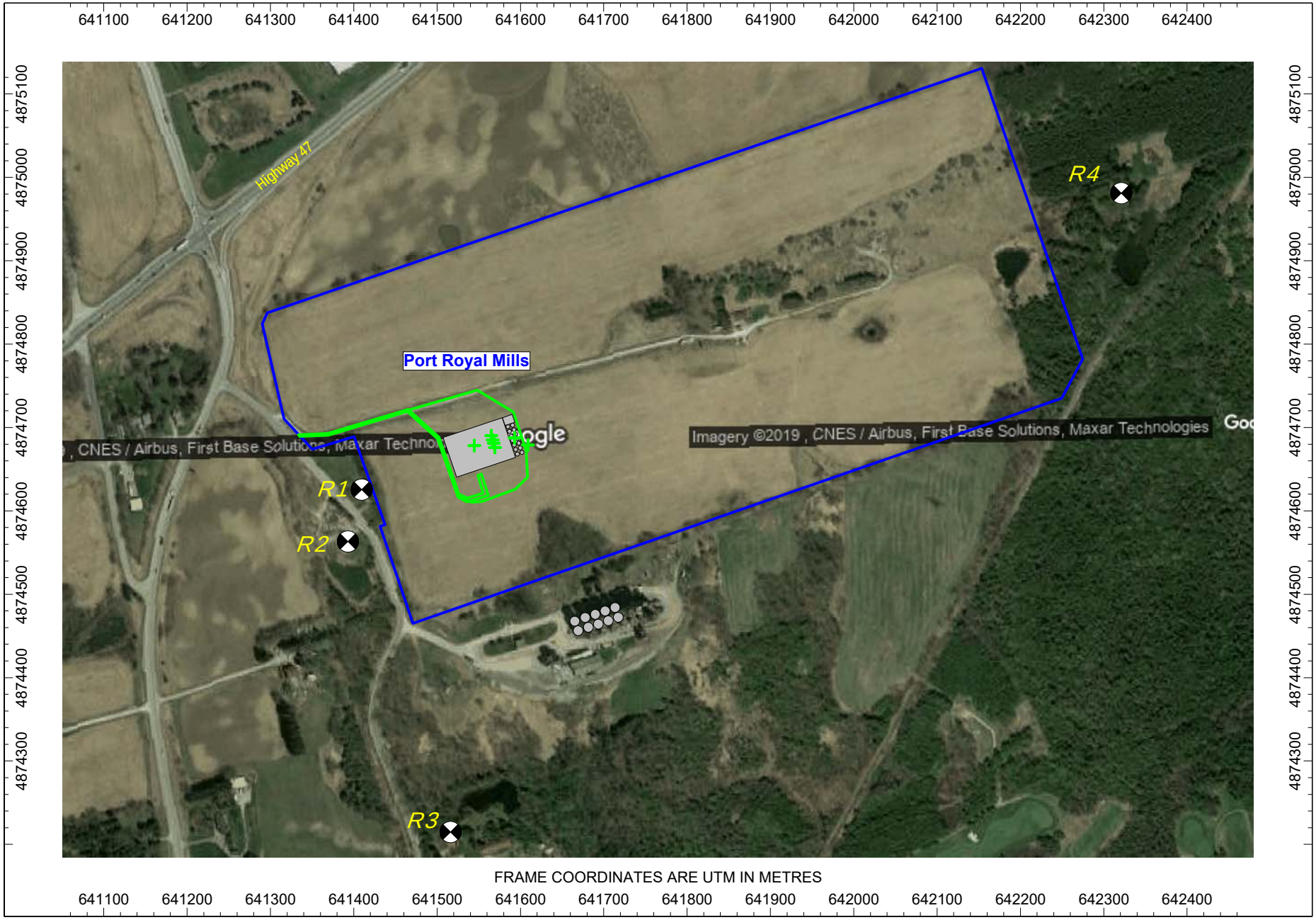

Figure 2: Aerial Image Showing Proposed PRM Facility and Noise Sensitive Points of Reception

Figure 3: Site Plan Showing Noise Sources

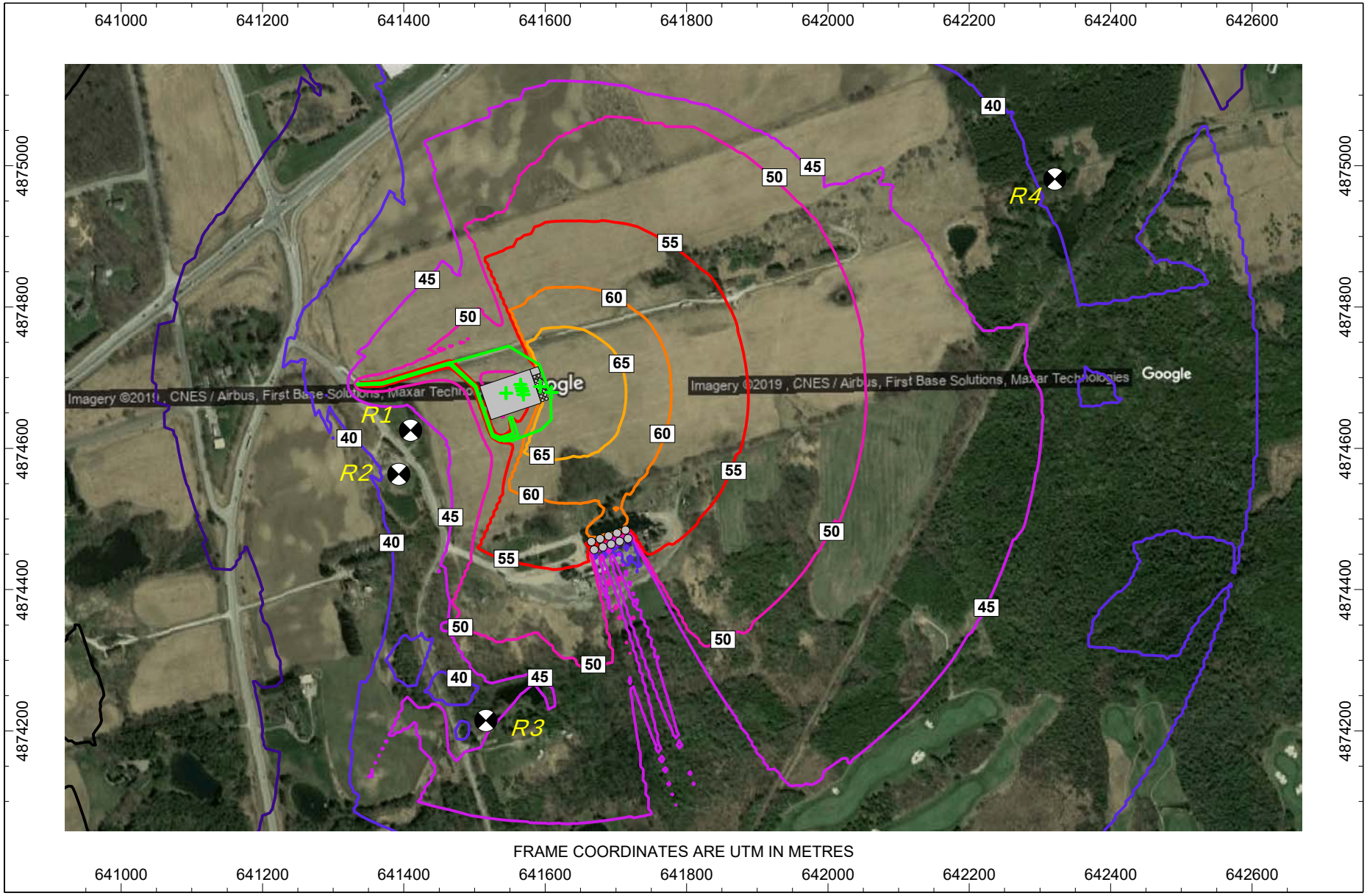

Figure 4: Predicted Sound Level Contours, Leq [dBA]
Port Royal Mills Grain Milling & Blending Facility
Prediction Height = 4.5m Above Grade