Stationary Noise Assessment

5640 Bank Street

Ottawa, Ontario

REPORT: GWE14-106 - Noise

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EXECUTIVE SUMMARY

This document describes a stationary noise assessment performed for a proposed commercial development consisting of five one-storey buildings in Ottawa, Ontario. Figure 1 illustrates a site plan with surrounding context. The major source of roadway noise affecting the development is traffic along Bank Street.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ontario Ministry of the Environment and Climate Change (MOE) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) existing vehicular traffic volumes based on City of Ottawa traffic count data; and (iv) architectural drawings received from Architectural Design Associates.

It is expected that daytime noise levels at 7089 Marco Street will be marginally above the ENCG criteria, due to refrigerated trucks at the commercial retail unit (CRU 10) loading bay. To reduce noise levels, the following noise mitigation strategy is required to ensure compliance with MOE and City of Ottawa noise regulations:

- CRU 10 loading dock will need to be recessed 6.8 meters from its initial location
- The western end of the noise wall for CRU 10 needs only be extended west by an additional 1 meter
- The height of the noise wall for CRU 10 needs to be 3.5 meters above local grade
- The noise wall should be continuous without gaps and constructed from materials having a surface density of at least 20 kg/m^2, or a sound transmission class rating of at least STC 30, as per Appendix C of the ENCG

All other stationary sources of noise on site are expected to operate below the aforementioned criteria. No other noise mitigation is required.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by FOTENN to undertake a stationary noise assessment of a proposed commercial development in Ottawa, Ontario. GWE's scope of work involved assessing exterior noise levels generated from mechanical equipment and truck deliveries occurring on site. The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment[2] guidelines. Noise calculations were based on architectural drawings received from Architectural Design Associates, with future traffic volumes corresponding to City of Ottawa traffic counts.

2. TERMS OF REFERENCE

The focus of this stationary noise assessment is a proposed commercial development consisting of five one-storey buildings. The development is located on the south corner of the intersection of Bank Street and Mitch Owens Road. The major sources of roadway noise are Bank Street, with some influence from Mitch Owens Road. The site is surrounded by undeveloped land to the north, east and west; with residential developments to the south. Figure 1 illustrates a complete site plan with surrounding context.

Noise concerns from loading bays are generally attributed to refrigerated trailers (reefer units), which are used to transport refrigerated goods. The reefer unit is attached to the trailer and provides cold air to cool the cargo while being transported and loaded. As a conservative measure, each loading bay was assumed to have frequent refrigerated truck deliveries. For non-refrigerated deliveries, it is assumed that the truck engine can be turned off while the vehicle is stationary. Truck deliveries should not take place after 19:00.

DAYTIME HOURS (07:00 – 19:00)

- All truck reefers each idling a reefer for a one-hour period

The activities of truck movements and loading and unloading of trailers have not been included in this assessment, as they are not considered a primary source of noise; see Section 4 for more detail.

[1] City of Ottawa Environmental Noise Control Guidelines, SS Wilson Associates, May 10, 2006
[2] Ministry of the Environment – Publication NPC-300

3. OBJECTIVES

The main goals of this work are to: (i) calculate the future noise levels from the commercial development, (ii) calculate the future traffic noise levels on the residential developments, and (iii) ensure that exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 and 4.4 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Stationary Noise

4.2.1 Stationary Noise Criteria

The equivalent sound energy level, L_{EQ}, provides a weighted measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a selected period of time. For stationary sources, the L_{EQ} is commonly calculated on an hourly interval, while for roadways, the L_{EQ} is calculated on the basis of a 16-hour daytime / 8-hour nighttime split.

Noise criteria taken from MOE Publication NPC 300 apply to outdoor points of reception on the property (for daytime operations), taken as the outdoor living area (OLA) at the property line, and the plane of the window (POW) (for nighttime operations). According to this document, the recommended maximum noise levels in a Class 2 urban environment at the OLA's or POW's are 50 dBA between the hours of 07:00

and 19:00 and 45 dBA at the POW's between the hours of 23:00 and 07:00, or alternately the noise produced by roadway traffic, whichever is greater.

Background noise levels due to traffic from surrounding roadways on residential properties is expected to exceed the MOE criteria as described in Publication NPC 300. As such, 1-hour traffic noise levels were calculated using STAMSON and City of Ottawa traffic count data. Traffic noise calculations were only completed for residential properties located at 7089 and 7099 Marco Street.

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the Ministry of the Environment (MOE) computerized noise assessment program, STAMSON 5.04, for road and rail analysis. Appendix A includes the STAMSON 5.04 input and output data and traffic counts.

Roadway noise calculations were performed by treating each road segment as separate line sources of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 1, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions
- The day/night split was taken to be 92% / 8% respectively for all streets
- Absorptive and reflective intermediate ground surfaces based on specific source-receiver path ground characteristics
- The study site was treated as having flat topography

Noise receptors were strategically placed at four locations around the study area (see Figure 2).

TABLE 1: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Lowest 1-Hour Traffic Count
Bank Street	2-RAU	80	627

4.2.3 Determination of Sound Power Levels

The anticipated delivery schedule described in Section 2 is the assumed worst-case scenario. Noise levels were determined through field measurements for representative trucks operating at low speed and idling with no attached reefer unit. Measurements indicated that a typical idling truck with no reefer produces 70 dBA at 10 meters (m). According to sound data provided by Carrier, sound pressure levels from reefer units can range between 69 dBA and 76 dBA at 7 m. To represent the reefer units in this study, sound power levels of 97 dBA were used. Figure 3 illustrates the location of each noise source corresponding to the labels in Table 2 below. Other sources associated with the development include roof top air handling units, as listed below.

TABLE 2: SOUND DATA & OPERATING FREQUENCY OF STATIONARY NOISE SOURCES

Source	Sound Power (Hz)								
	63	125	250	500	1000	2000	4000	8000	Total (dBA)
VH-1 (S27)	43	56	58	63	68	65	64	59	72
RTU-1 (S34)	61	66	68	70	71	68	65	59	77
RTU-2 (S1, S2, S3, S4, S5, S7, S8, S36, S37)	62	69	73	76	77	75	72	65	83
RTU-3 (S29, S30, S31, S32, S35, S38, S39, S40)	63	70	74	78	79	75	71	63	83
RTU-5 (S12)		63	66	70	71	68	62	53	76
RTU-9 (S20)		67	72	77	76	73	68	61	81
RTU-6 (S9)		67	72	77	76	73	68	61	81
RTU-7 (S10, S11, S16, S25)		76	79	84	83	79	73	66	88
RTU-8 (S14, S15, S26)		76	79	84	83	79	73	66	88

TABLE 2: SOUND DATA & OPERATING FREQUENCY OF STATIONARY NOISE SOURCES (CONT'D)

Source	Sound Power (Hz)								
	63	125	250	500	1000	2000	4000	8000	Total (dBA)
Unit 1 (S17)					73				73
Unit 2 (S18)					75				75
Unit 3 (S19)					72				72
Unit 4 (S22)					72				72
Unit 5 (S24)					71				71
Unit 6 (S21)					75				75
Unit 7 (S23)					75				75
Truck Reefer (S6, S13, S28, S33, S41)	82	83	85	93	91	90	86	76	97

4.2.4 Stationary Source Noise Predictions

Six individual noise sensor locations were selected to represent daytime (07:00 – 19:00) and evening (19:00 – 23:00) noise levels at the outdoor living areas (OLA's) and plane of windows (POW's) of the residential properties surrounding the study site in the Predictor model. Outdoor amenity receiver heights were placed 1.5 meters above grade, while plane of window receiver heights represented the top floor of the specific residential property. Sensor locations are described in Table 4 and illustrated in Figure 2. Idling trucks were represented as point sources in the Predictor model, while truck movements were not included, as the primary source of noise from the trucks is idling. Air absorption was calculated assuming an air temperature of 10°C and a relative humidity of 70%. Hard surfaces, such as roads, bodies of water and parking lots, were modelled as reflective surfaces, while softer surfaces, such as grasslands and parks, were modelled as absorptive surfaces.

5. RESULTS AND DISCUSSION

5.1 Roadway Noise Levels

Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations. The results of the roadway noise calculations are summarized in Table 3 below.

TABLE 3: EXTERIOR 1 HOUR DAYTIME NOISE LEVELS DUE TO ROAD TRAFFIC

Receiver Number	Receptor Location	Noise Level (dBA)
1	7099 Marco Street - OLA	56
2	7099 Marco Street - POW	52
3	7089 Marco Street - OLA	52
4	7089 Marco Street - POW	51

As noise levels from road traffic at receivers 1 through 4 are greater than the MOE exclusionary daytime limit of 50 dBA, these levels are the acting noise limit for stationary noise sources at their respective locations. Since nighttime traffic count data are not available, the MOE nighttime exclusionary limit of 45 dBA will apply for stationary sources.

5.2 Stationary Noise Levels

The commercial development is part of a community with no existing noise mitigating features in the area between the commercial site and the residential housing to the south. Under these conditions noise levels from the loading bays on nearby sensitive points of reception will exceed the MOE exclusionary limits (as summarized in Tables 4 and 5), therefore noise mitigation must be considered. To ensure compliance, the following mitigation strategy must be implemented, as illustrate in Figure 4:

- CRU 10 loading dock will need to be recessed 6.8 meters from its initial location
- The western end of the noise wall for CRU 10 needs only be extended west by an additional 1 meter
- The height of the noise wall for CRU 10 needs to be 3.5 meters above local grade
- The noise wall should be continuous without gaps and constructed from materials having a surface density of at least 20 kg/m^2, or a sound transmission class rating of at least STC 30, as per Appendix C of the ENCG

With these noise mitigation features in place, daytime and evening noise levels at the nearby points of reception were found to be below the MOE criteria. As such, noise levels from the rooftop units and truck reefers will not exceed daytime and evening noise limits, as summarized in Tables 4 and 5 below and illustrated in Figures 5 and 6.

TABLE 4: PREDICTED DAYTIME NOISE LEVELS AT POR

Receptor Number	Location	L_{EQ} Sound Level (dBA)		MOE Daytime Criteria	Meets MOE Daytime Criteria	
		No Mitigation	With Mitigation		No Mitigation	With Mitigation
R 1	7099 Marco Street - OLA	54	53	56	Yes	Yes
R 2	7099 Marco Street - POW	52	51	52	Yes	Yes
R 3	7089 Marco Street - OLA	53	52	52	No	Yes
R 4	7089 Marco Street - POW	51	51	51	Yes	Yes
R 5	7055 Marco Street - OLA	47	47	50	Yes	Yes
R 6	7055 Marco Street - POW	44	44	50	Yes	Yes

TABLE 5: PREDICTED NIGHT TIME NOISE LEVELS AT POR

Receptor Number	Location	L_{EQ} Sound Level (dBA)		MOE Night time Criteria	Meets MOE Night time Criteria	
		No Mitigation	With Mitigation		No Mitigation	With Mitigation
R 1	7099 Marco Street - OLA	42	42	45	Yes	Yes
R 2	7099 Marco Street - POW	42	42	45	Yes	Yes
R 3	7089 Marco Street - OLA	44	44	45	Yes	Yes
R 4	7089 Marco Street - POW	42	42	45	Yes	Yes
R 5	7055 Marco Street - OLA	38	38	45	Yes	Yes
R 6	7055 Marco Street - POW	37	37	45	Yes	Yes

6. CONCLUSIONS AND RECOMMENDATIONS

It is expected that daytime noise levels at 7089 Marco Street will be marginally above the MOE criteria due to a refrigerated truck at the CRU10 loading bay. To reduce noise levels, the following noise mitigation strategy is required to ensure compliance with MOE and City of Ottawa noise regulations:

- CRU 10 loading dock will need to be recessed 6.8 meters from its initial location
- The western end of the noise wall for CRU 10 needs only be extended west by an additional 1 meter
- The height of the noise wall for CRU 10 needs to be 3.5 meters above local grade
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All other stationary sources of noise on site are expected to operate below the aforementioned criteria. No other noise mitigation is require. A future stationary noise assessment will be required for Sobeys once the mechanical equipment selection has been finalized for that development.

This concludes our assessment and report. If you have any questions or wish to discuss our findings please advise us. In the interim, we thank you for the opportunity to be of service.

Yours truly,

Gradient Wind Engineering Inc.

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GWE14-106 - Stationary Noise Assessment

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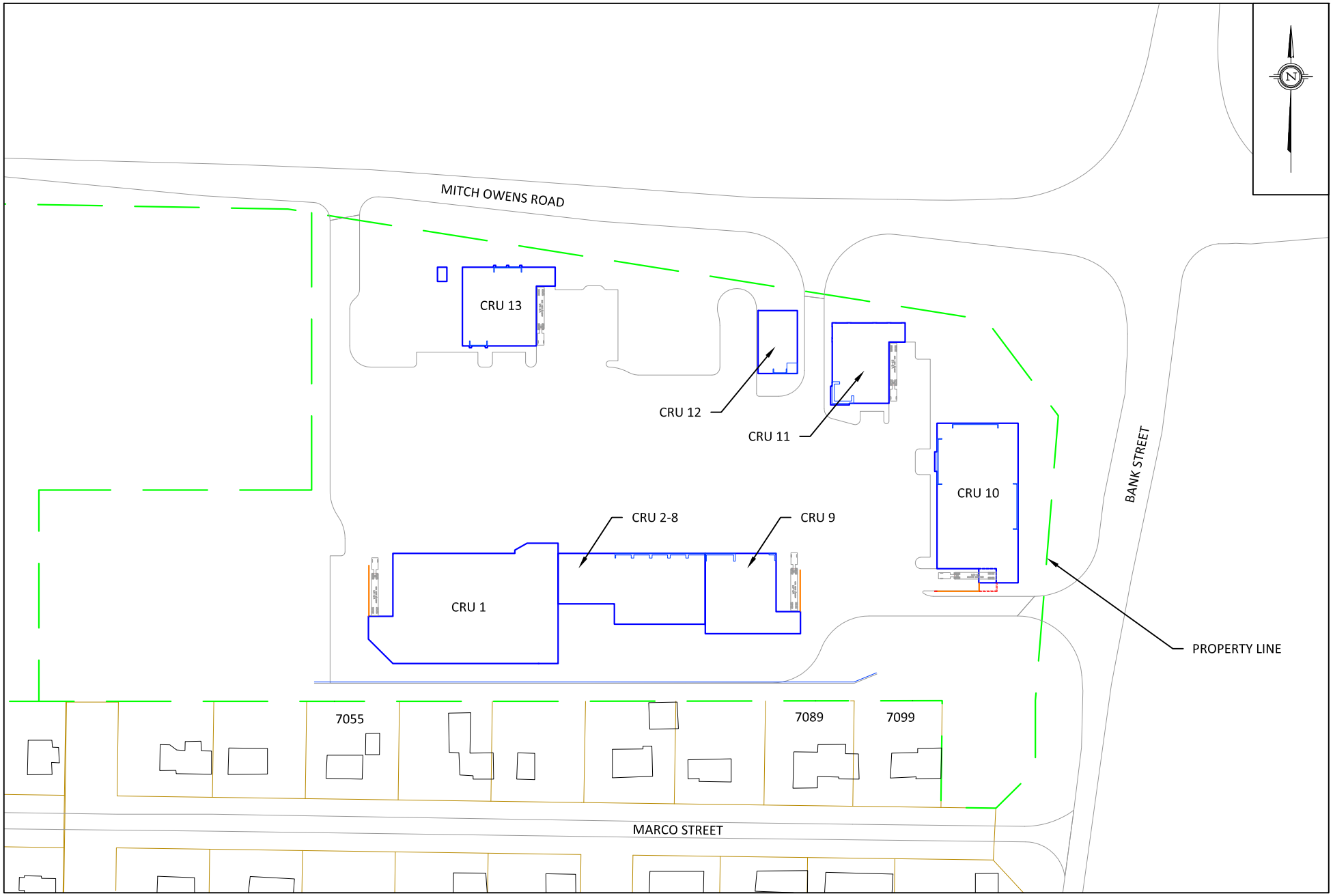

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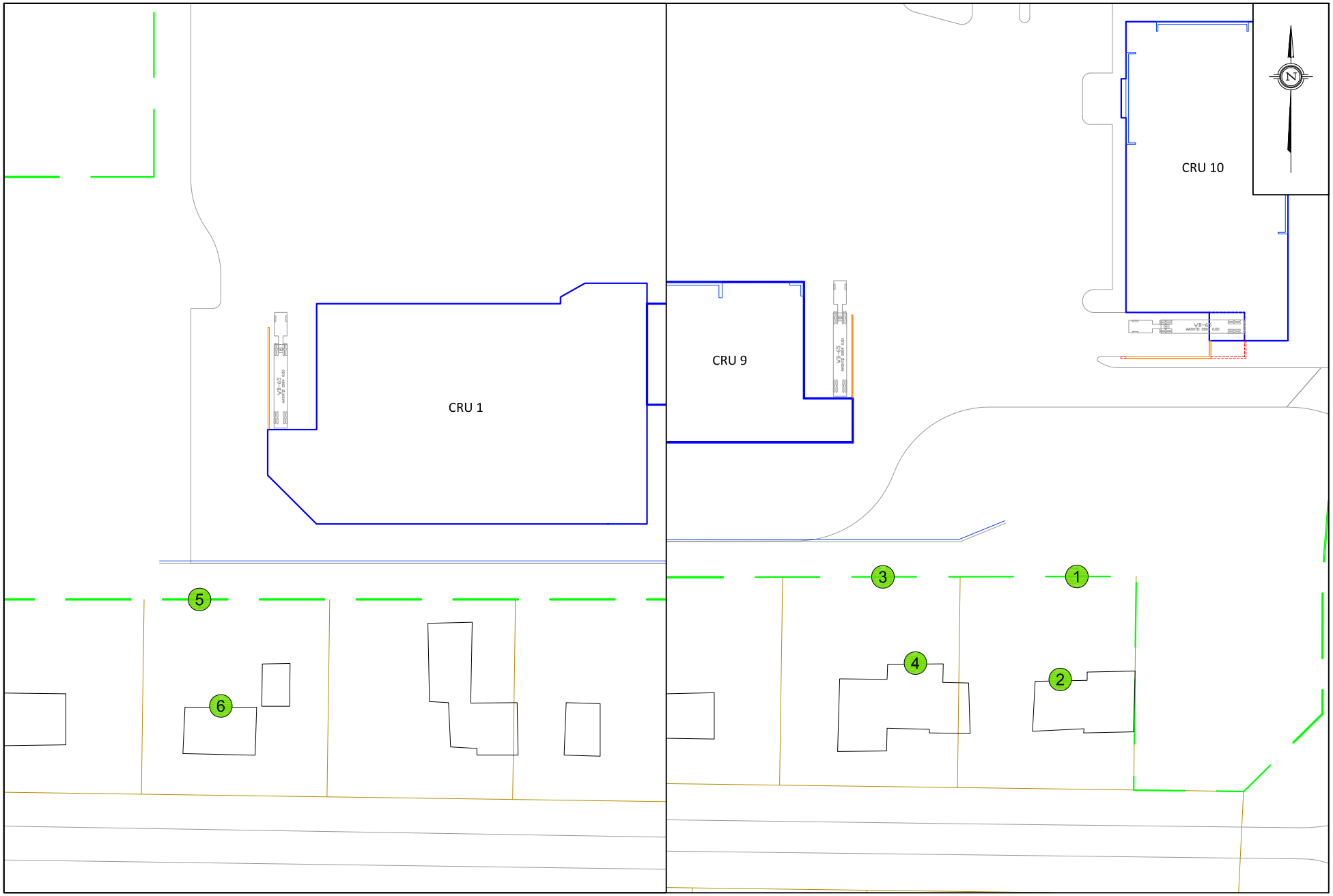
GRADIENT WIND ENGINEERING INC

PROJECT	5640 BANK STREET - STATIONARY NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GWE14-106-1
DATE	SEPTEMBER 4, 2015
DRAWN BY	T.C.

DESCRIPTION

FIGURE 1:
SITE PLAN & SURROUNDING CONTEXT



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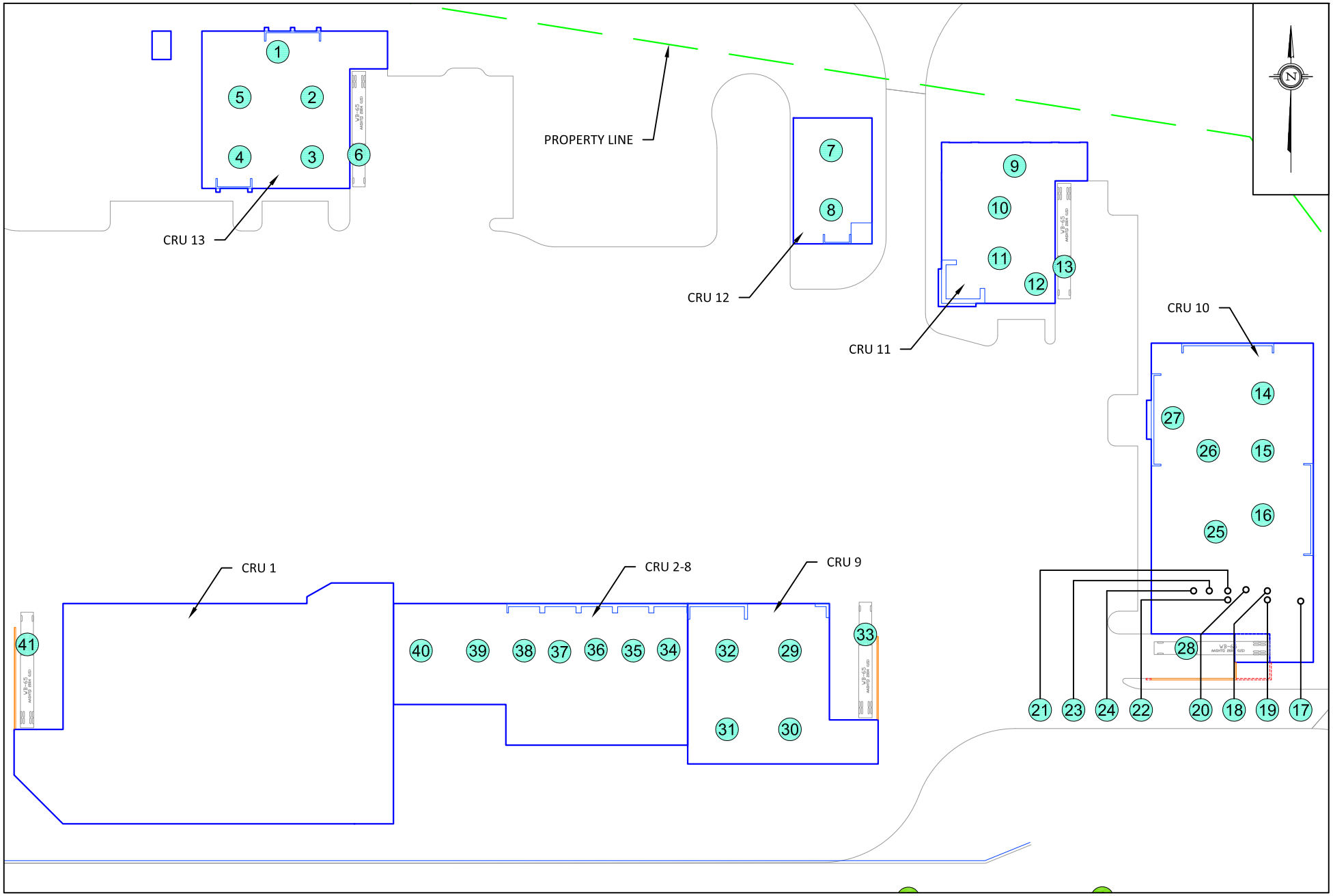
GRADIENT WIND ENGINEERING INC

PROJECT	5640 BANK STREET - STATIONARY NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE14-106-2
DATE	SEPTEMBER 4, 2015
DRAWN BY	T.C.

DESCRIPTION

FIGURE 2:
RECEIVER LOCATIONS



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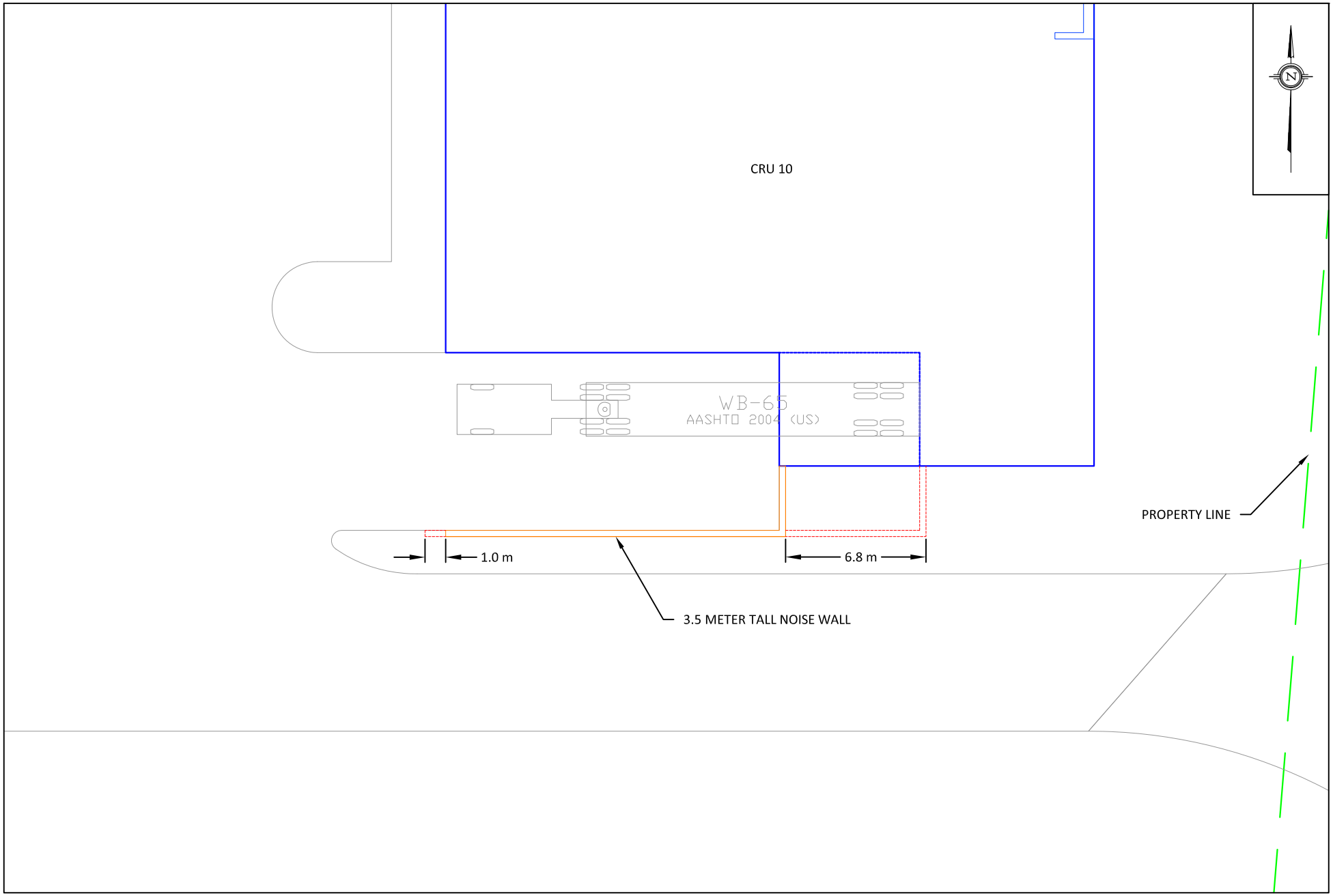
PROJECT	5640 BANK STREET - STATIONARY NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE14-106-3
DATE	SEPTEMBER 4, 2015
DRAWN BY	T.C.

DESCRIPTION

FIGURE 3:
SOURCE LOCATIONS



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GRADIENT WIND ENGINEERING INC

PROJECT	5640 BANK STREET - STATIONARY NOISE ASSESSMENT
SCALE	1:250 (APPROX.)
DRAWING NO.	GWE14-106-4
DATE	SEPTEMBER 4, 2015
DRAWN BY	T.C.

DESCRIPTION

FIGURE 4:
REQUIRED MITIGATION

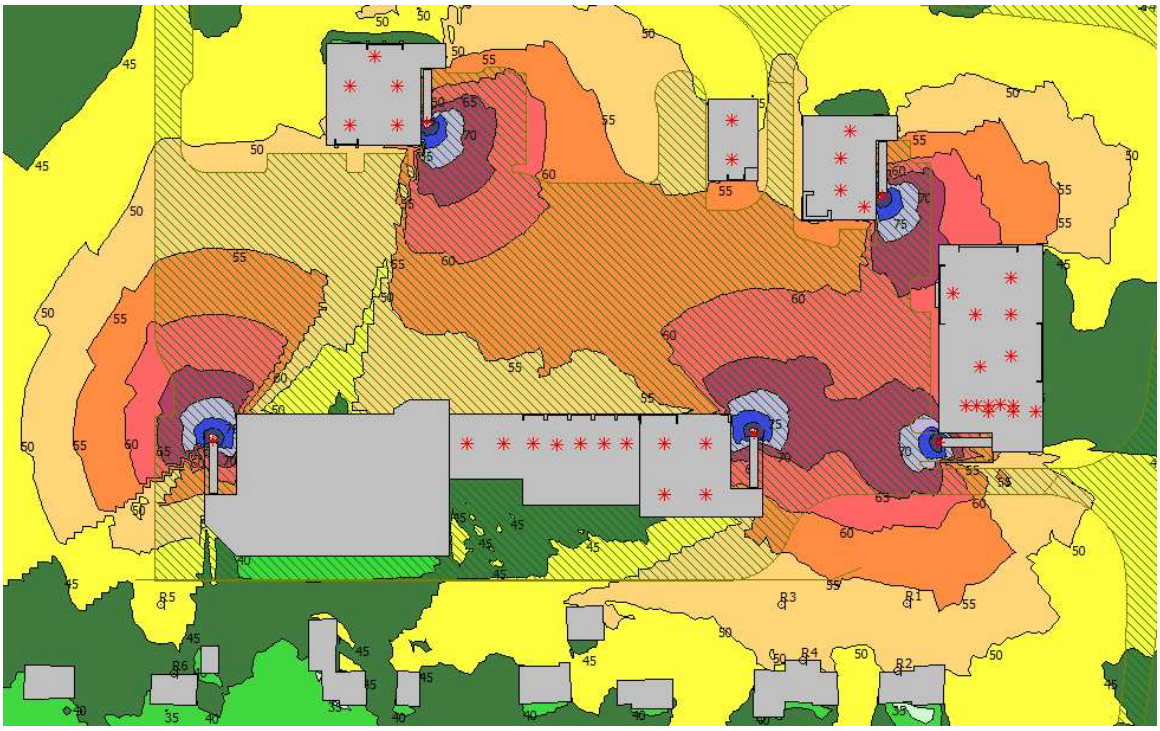

FIGURE 5: PREDICTED DAYTIME OUTDOOR NOISE LEVELS AT 1.5 METERS (WITHOUT MITIGATION)

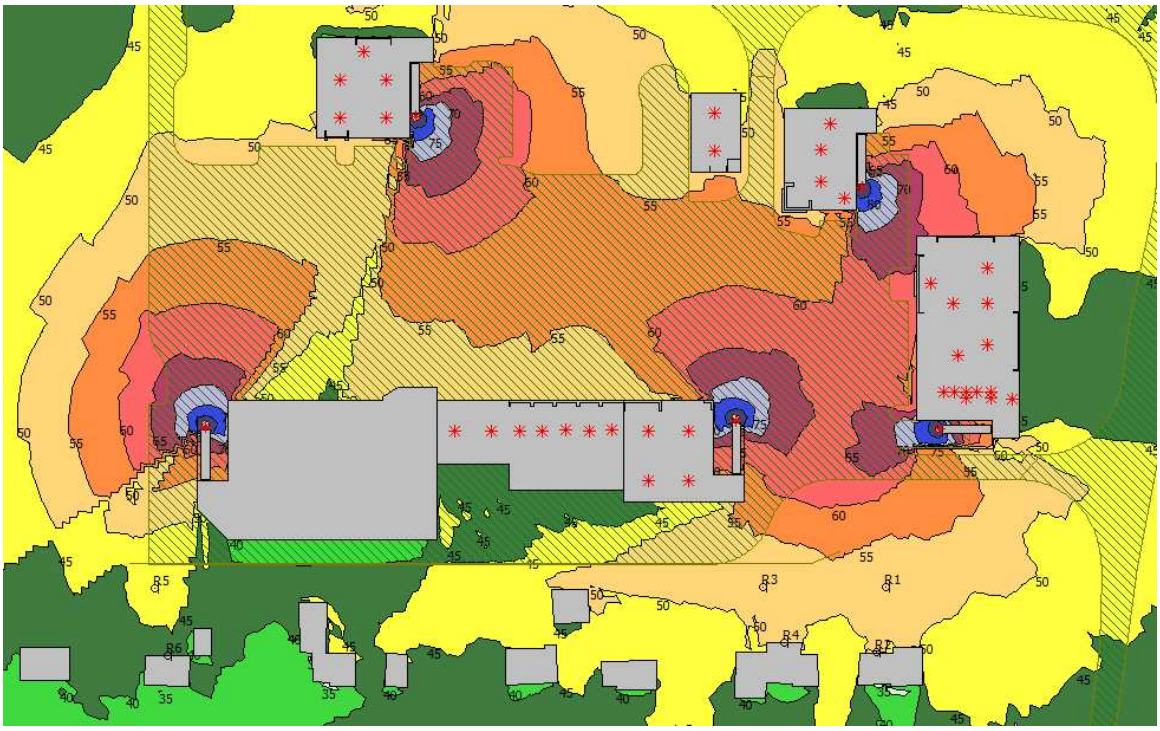

FIGURE 6: PREDICTED DAYTIME OUTDOOR NOISE LEVELS AT 1.5 METERS (WITH MITIGATION)