GRADIENTWIND
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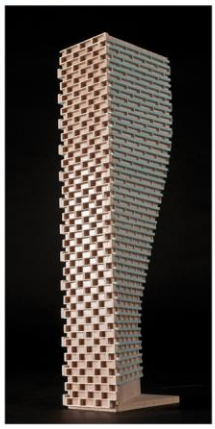
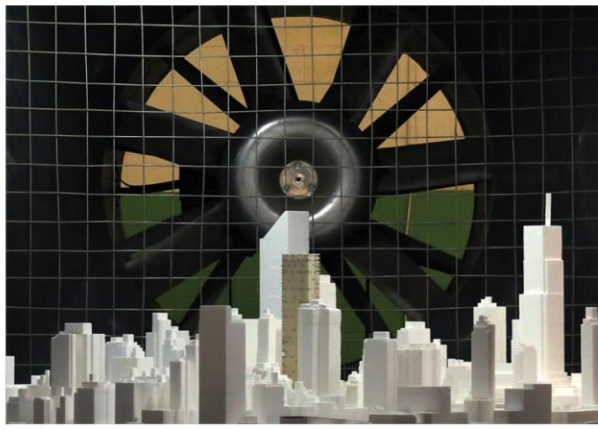
STATIONARY NOISE ASSESSMENT

507-515 1000 Islands Parkway
Lansdowne, Ontario

REPORT: 23-091-Stationary Noise R1





October 31, 2023

PREPARED FOR

Kehoe Developments Inc.
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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for a marine construction company located at 507-515 1000 Islands Parkway in Lansdowne, Ontario. The marine fabrication facility is expanding operations and seeking a zoning By-law Amendment to designate the site rural industrial. The site plan comprises several buildings, including a maintenance building, a fabrication shop, a staff and storage building, an office building, and a proposed engineered storage building. Outdoor spaces include various storage areas, as well as a boat ramp/loading area. Sources of stationary noise include forklift, skyjack, excavator, and loader operations, material/equipment drop off, fabrication, and barge loading/unloading operations. Figure 1 illustrates a site plan with surrounding context. Figure 2 illustrates the location of all noise sources included in this study.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) requirements; (ii) noise level criteria as specified by the MECP NPC-300 noise guidelines; (iii) site plan and survey drawings provided by Kehoe Developments Inc. in April 2023, and; (iv) sound data information derived from on-site measurements.

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the NPC-300 noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are adhered to. As such, the proposed development is expected to be compatible with the existing noise-sensitive land uses.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Kehoe Developments Inc. to undertake a stationary noise assessment for their facility at 507-515 1000 Islands Parkway in Lansdowne, Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise assessment.

The present scope of work involves assessing exterior noise levels generated by stationary noise sources associated with a marine construction and fabrication facility. The assessment was performed based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300[1] guidelines, site plan and survey drawings provided by Kehoe Developments Inc. in April 2023, sound data information derived from on-site measurements, surrounding street layouts obtained from satellite imagery, and recent site photos.

2. TERMS OF REFERENCE

The subject site is a marine construction/fabrication facility that is expanding operations. The site comprises several buildings, including a maintenance building, a fabrication shop, a staff and storage building, an office building, and a proposed engineered storage building. Outdoor spaces include various storage areas, as well as a boat ramp/loading area for barges. The entire site is to be rezoned rural industrial. The site is surrounded by rural residential properties, including detached dwellings to the north of 1000 Islands Parkway, along Champagne Point Lane and on Weston Island to the southeast. An existing residential dwelling is located on the Kehoe Marine property but is not considered to be noise-sensitive as per NPC-300 guidelines.

The facility operates 24 hours a day, however, certain sources are likely to have reduced operation during the nighttime period between 23:00 and 07:00. Sources of stationary noise include forklift, skyjack, excavator, and loader operations, material/equipment drop off, fabrication operations, and barge

[1] Ministry of the Environment, Conservation and Parks (MECP), Environmental Noise Guideline – Publication NPC-300, August 2013

loading/unloading activities. Figure 1 illustrates a site plan with surrounding context. Figure 2 illustrates the location of all noise sources included in this study.

2.1 Assumptions

The sound power levels used for each source are derived from on-site measurements. The following assumptions have been made in the analysis:

(i) Truck/vehicle movements for daytime and evening/nighttime periods are summarized in Section 4.4.

(ii) Truck/vehicle movements are assumed to have an average 10 km/h travel speed.

(iii) Source operational frequency for daytime and evening/nighttime periods are summarized in Section 4.4.

(iv) Sound data for stationary noise sources is based on measured data.

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the surrounding dwellings produced by stationary sources and (ii) ensure that exterior noise levels do not exceed the allowable limits specified by NPC-300, as outlined in Section 4 of this report.

4. METHODOLOGY

The impact of the external stationary noise sources on the nearby residential areas was determined by computer modelling. Stationary noise source modelling is based on the software program *Predictor-Lima* developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2. This computer program simulates three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. Twelve receptor locations were selected for the study site, as illustrated in Figure 3.

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 source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Its measurement 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 represents the noise perceived by the human ear. With this scale, a doubling of sound power at the source results in a 3 dBA increase in measured noise levels at the receiver and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

Stationary sources are defined as all sources of sound and vibration, whether fixed or mobile, that exist or operate on a premises, property or facility, the combined sound and vibration levels of which are emitted beyond the property boundary of the premises, property or facility, unless the source(s) is (are) due to construction.

4.2 Steady-state Stationary Noise

4.2.1 Criteria for Steady-state Stationary Noise

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 NPC-300 apply to points of reception (POR). A POR is defined as any location on a noise sensitive land use where noise from a stationary source is received. A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, campgrounds, and noise sensitive buildings such as schools and places of worship. The recommended maximum noise levels for a Class 2 are outlined in Table 1 below, or background noise levels, whichever is higher. The study site is considered to be in a Class

2 area because it is located along a Regional roadway. Gradient Wind conducted a roadway traffic noise calculation at Receptor 4, to determine daytime background noise levels. Calculations were performed with MECP approved STAMSON program, using hourly traffic count data found in the Rockport Strategic Plan. The STAMSON calculation and roadway traffic data is provided in Appendix A.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 2 AREA

Time of Day	Outdoor Points of Reception	Plane of Window
07:00 – 19:00	50	50
19:00 – 23:00	50	45
23:00 – 07:00	N/A	45

4.2.2 Noise Measurements

A site visit was conducted on April 14, 2023, to perform noise measurements around the study site. Measurements were recorded using a Brüel & Kjær (B&K) integrating sound level meter Type 2250, equipped with a Type 4189 Class 1 microphone. The meter was mounted on a tripod with the microphone set at a height of approximately 1.5 m above grade. Seven measurement locations were selected around the site as illustrated in Figure 3. Winds were calm with no observed precipitation.

4.2.3 Determination of Steady-state Sound Power Levels

The sound power levels used for each source are derived from on-site measurements.Table 2 summarizes the sound power of each source used in the analysis, as well as the operation parameters referenced in Section 2.1.

TABLE 2: STATIONARY NOISE SOURCES (STEADY&IMPULSIVE) SOUND POWER LEVELS (dBA)

Source ID	Description	Height Above Grade (m)	Total Sound Power Level (dBA)	Operational Parameters	
				Day (07:00-19:00)	Evening/Night (19:00-07:00)
S1-4	Shop Doors	2	84	100%	100%
S5-6	Loader	2	101	100%	50%
S7	Diesel Pump	1.5	100	10%	10%
S8	Forklift/Skyjack Route	2	96	15 veh./hour	5 veh./hour
S9	Loader Route	2	101	5 veh./hour	2 veh./hour
S10	Truck Route	2	100	4 veh./hour	2 veh./hour
S11	Barge Route	1	100	5 veh./hour	2 veh./hour
S12	Dump Truck Gate Slams/Dropping of Materials	1	110	4 times/hour	4 times/hour
S13	Dump Truck Gate Slams /Dropping of Materials	1	110	4 times/hour	4 times/hour

The shop door sources (S1-4) account for all the sources of noise occurring inside the fabrication shop, assuming the shop doors are open. This includes grinding and cutting of materials, as well as various use of power tools and compressors associated with the fabrication process. The loader sources (S5-6) are engine noise associated with idling loaders or excavators. The diesel pump source (S7) is engine noise associated with a pump used to operate the gates on a barge. The forklift/skyjack route source (S8) is a moving source associated with the forklift and skyjack activities around the storage yards. The louder route source (S9) is a moving source associated with the loader activities around the boat ramp area. The barge route source (S10) is a moving source associated with the barge and tugboat activities around the boat ramp area. The truck route source (S11) is a moving source associated with material drop-off activities along the central driveway and in front of the boat ramp.

4.2.4 Steady-state Source Noise Predictions

The impact of stationary noise sources on nearby residential areas was determined by computer modelling using the software program Predictor-Lima. This program was developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2 and is capable of representing three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The methodology has been used on numerous assignments and has been accepted by the Ministry of the Environment, Conservation and Parks (MECP) as part of Environmental Compliance Approval applications.

A total of 10 receptor locations were chosen around the site to measure the noise impact at points of reception (POR) during the daytime/evening period (07:00 – 23:00), as well as during the nighttime period (23:00 – 07:00). POR locations include outdoor points of reception (OPOR) and the plane of windows (POW) of the adjacent residential properties. An existing dwelling is located within the property of Kehoe Marine but is not considered as a point of reception because NPC-300 states, “A land use that would normally be considered noise sensitive, such as a dwelling, but is located within the property boundaries of the stationary source is not considered a noise sensitive land use”. Sensor locations are described in Table 3 and illustrated in Figure 3. All units were represented as point sources in the Predictor model. Table 4 below contains Predictor-Lima calculation settings. These are typical settings that have been based on ISO 9613 standards and guidance from the MECP.

Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). An absorption value of 0 is representative of hard ground, while a value of 1 represents grass and similar soft surface conditions. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
R1	POW – 518 1000 Islands Pkwy	2
R2	OPOR – 518 1000 Islands Pkwy	1.5
R3	POW – 520 1000 Islands Pkwy	3.5
R4	OPOR – 520 1000 Islands Pkwy	1.5
R5	POW – 524 1000 Islands Pkwy	4.5
R6	OPOR – 524 1000 Islands Pkwy	1.5
R7	POW – Champagne Point Ln Residence	4
R8	OPOR – Champagne Point Ln Residence	1.5
R9	POW – Weston Island Residence	2
R10	OPOR – Weston Island Residence	1.5

TABLE 4: CALCULATION SETTINGS

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2.0
Default ground attenuation factor	0.25
Ground attenuation factor for roadways and paved areas	0
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

4.3 Impulsive Stationary Noise

4.3.1 Criteria for Impulsive Stationary Noise

Impulse noise due to dropping off materials or dump truck gates is expressed in terms of the Logarithmic Mean Impulse Sound Level L_{LM}. According to NPC-300, the exclusion limit values for impulsive sound levels for Plane of Window and Outdoor Points of Reception are shown in Table 5 below.

TABLE 5: EXCLUSION LIMIT FOR IMPULSIVE SOUND LEVEL - CLASS 2 AREA[2]

Time of Day	Actual Number of Impulses in Period of One-Hour	L_{LM} (dBAI)	
		POW Points of Reception	OPOR Points of Reception
07:00 – 23:00/ 23:00-07:00	9 or more	50/45	50/-
07:00 – 23:00/ 23:00-07:00	7 to 8	55/50	55/-
07:00 – 23:00/ 23:00-07:00	5 to 6	60/55	60/-
07:00 – 23:00/ 23:00-07:00	4	65/60	65/-
07:00 – 23:00/ 23:00-07:00	3	70/65	70/-
07:00 – 23:00/ 23:00-07:00	2	75/70	75/-
07:00 – 23:00/ 23:00-07:00	1	80/75	80/-

4.3.2 Determination of Impulse Noise Sound Power

Sound power levels for the impulse noise due to dropping off materials or dump truck gates were based on noise measurements. Several impulse events were observed and recorded. These values were converted into the logarithmic mean sound level using Equation 1 below:

$$L_{LM} = 10^{*} \log \left[(1/N_{total}) * (10^{N1/10}+10^{N2/10}+10^{N3/10}+\ldots) \right] \quad (1)$$

Where:
N_{total} = Number of measurements to be averaged
N_x = Sound level
L_{LM} = Mean logarithmic sound level

The impulse sound levels have a logarithmic mean average impulse level (L_{LM}) of 80 dBAI of an average distance around 12 m. This was converted to a sound power of 110 dBA for the purposes of the noise modelling. The locations of these sources (S12-13) are illustrated in Figure 2. There were no more than 4 impulses expected during any one-hour period. Most unloading activities occur near the boat ramp away from the residences across the parkway. The storage area on the north side of the property rarely sees

[2] *Ministry of Environment and Climate Change (MOECC). Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (NPC-300). August 2013.*

any activity. The impulsive noise sources were modelled as point sources having a 1-metre height in the study.

4.3.3 Impulse Source Noise Predictions Assessment

The logarithmic impulse noise levels were examined at the same noise-sensitive points of reception considered for steady-state noise in the *Predictor-Lima* model. It is assumed impulse noise could occur at any time of day, therefore the overnight criteria are most critical.

5. RESULTS AND DISCUSSION

Noise levels at nearby sensitive receptors fall below NPC-300 criteria for stationary noise, as summarized in Tables 6 and 7 below, for steady-state sources and impulsive sources, respectively. The sound levels listed in Table 5 are based on the assumptions outlined in Section 2.1. Gradient Wind also performed correlation calculations at the seven noise measurement locations, which are summarized in Table 8.

TABLE 6: NOISE LEVELS FROM STEADY-STATE STATIONARY SOURCES

Receptor Number	Receptor Type	Noise Level (dBA)		Sound Level Limits		Meets NPC-300 Class 2 Criteria	
		Day	Evening/ Night	Day	Evening/ Night	Day	Evening/ Night
R1	POW	44	42	50	45	Yes	Yes
R2	OPOR	47	44	50	N/A*	Yes	Yes
R3	POW	44	41	50	45	Yes	Yes
R4	OPOR	48	46	50	N/A*	Yes	Yes
R5	POW	45	42	50	45	Yes	Yes
R6	OPOR	44	41	50	N/A*	Yes	Yes
R7	POW	50	47	50	45	Yes	Yes
R8	OPOR	41	38	50	N/A*	Yes	Yes
R9	POW	45	42	50	45	Yes	Yes
R10	OPOR	45	43	50	N/A*	Yes	Yes

*As per NPC-300 nighttime noise levels are not considered for OPOR.

TABLE 7: NOISE LEVELS FROM IMPULSIVE STATIONARY SOURCES

Receptor Number	Noise Level (dBA)		Sound Level Limits		Meets NPC-300 Class 2 Criteria	
	Day	Evening/ Night	Day	Evening/ Night	Day	Evening/ Night
R1	59	59	65	60	Yes	Yes
R2	62	62	65	N/A*	Yes	Yes
R3	57	57	65	60	Yes	Yes
R4	60	60	65	N/A*	Yes	Yes
R5	54	54	65	60	Yes	Yes
R6	55	55	65	N/A*	Yes	Yes
R7	53	53	65	60	Yes	Yes
R8	51	51	65	N/A*	Yes	Yes
R9	49	49	65	60	Yes	Yes
R10	49	49	65	N/A*	Yes	Yes

*As per NPC-300 nighttime noise levels are not considered for OPOR.

As Tables 6 and 7 summarize, noise levels fall below NPC-300 criteria at all receptors. Noise contours at 1.5 m above grade can be seen in Figures 4 and 5 for steady-state noise daytime and nighttime conditions, and Figure 6 for impulsive noise daytime and nighttime conditions. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing land uses.

TABLE 8: NOISE MEASUREMENT CORRELATION

Measurement Location	Measured Sound Level (dBA)	Calculated Sound Level (dBA)
T1	65	66
T2-4	72	72
T5	66	65
T6	49	49
T7	62	62

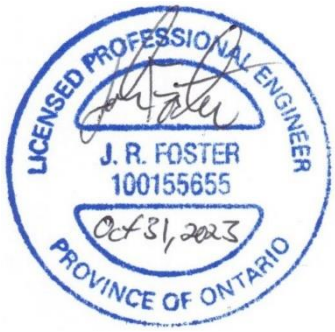
6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the NPC-300 noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are adhered to during the detailed design process. As such, the proposed development is expected to be compatible with the existing noise-sensitive land uses.

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.

Sincerely,

Gradient Wind Engineering Inc.



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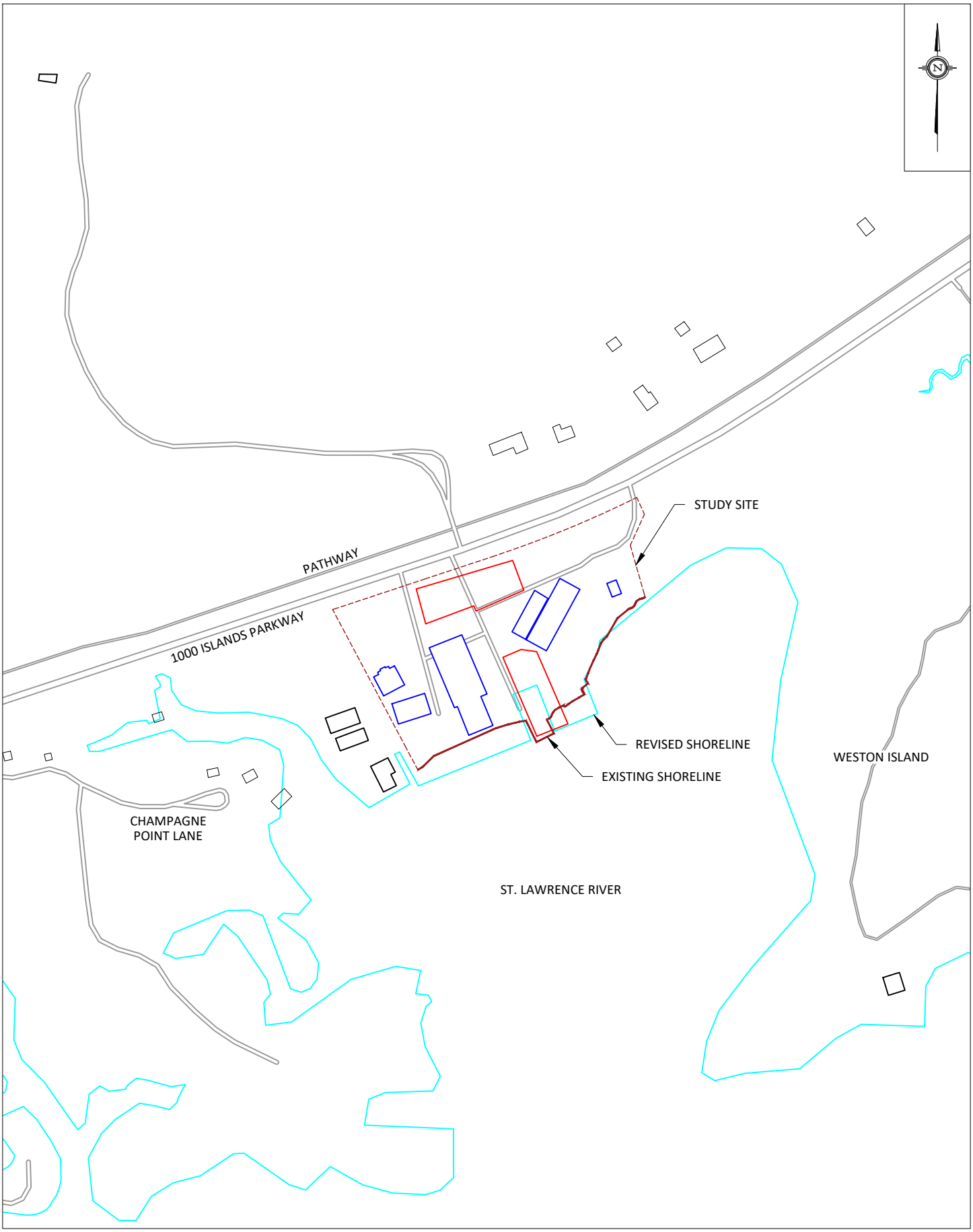
Gradient Wind File #23-091-Stationary Noise R1



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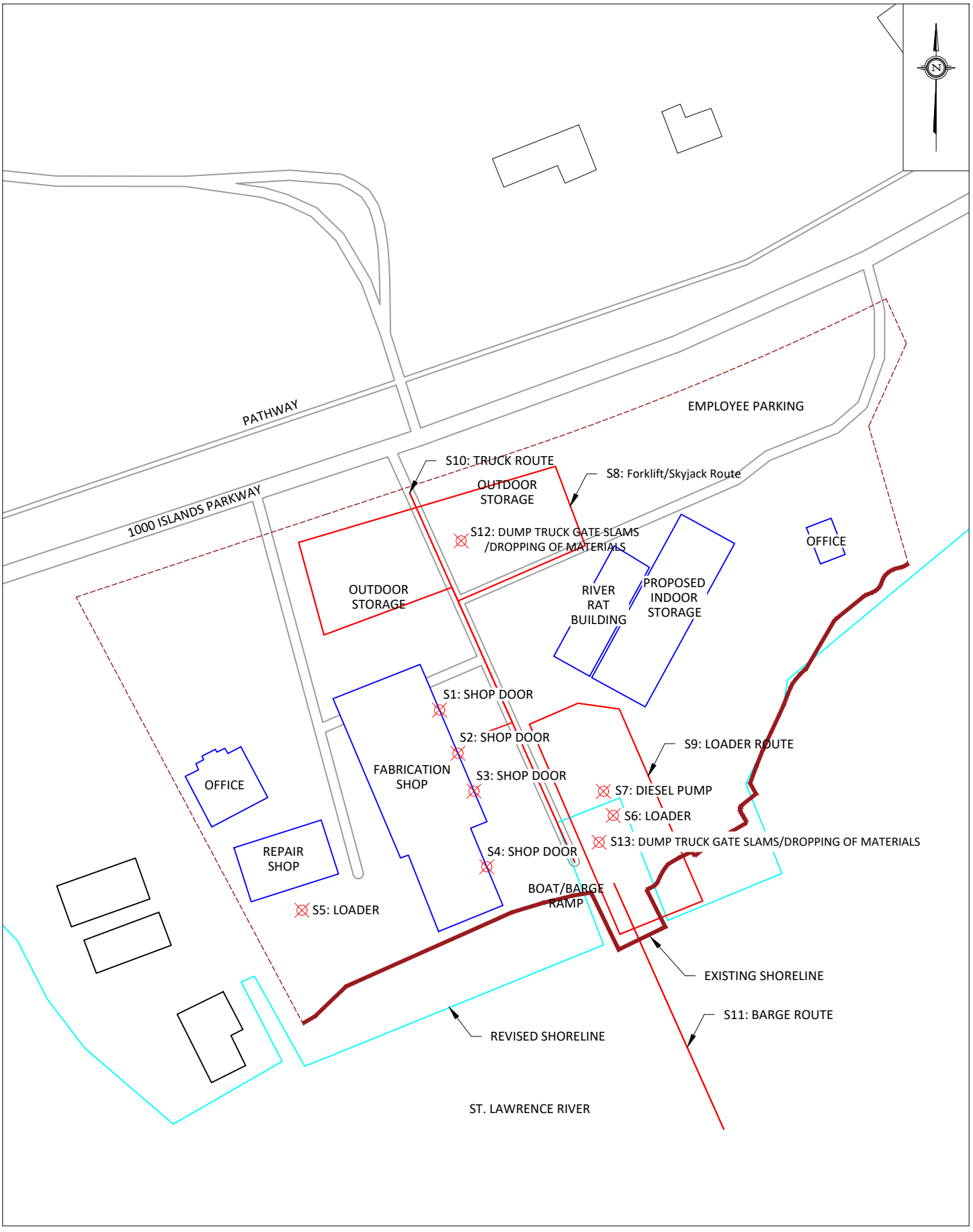
PROJECT	507-515 1000 ISLANDS PARKWAY, LANSDOWNE STATIONARY NOISE ASSESSMENT
SCALE	1:4000 (APPROX.)
DRAWING NO.	GW23-091-1
DATE	OCTOBER 20, 2023
DRAWN BY	M.L.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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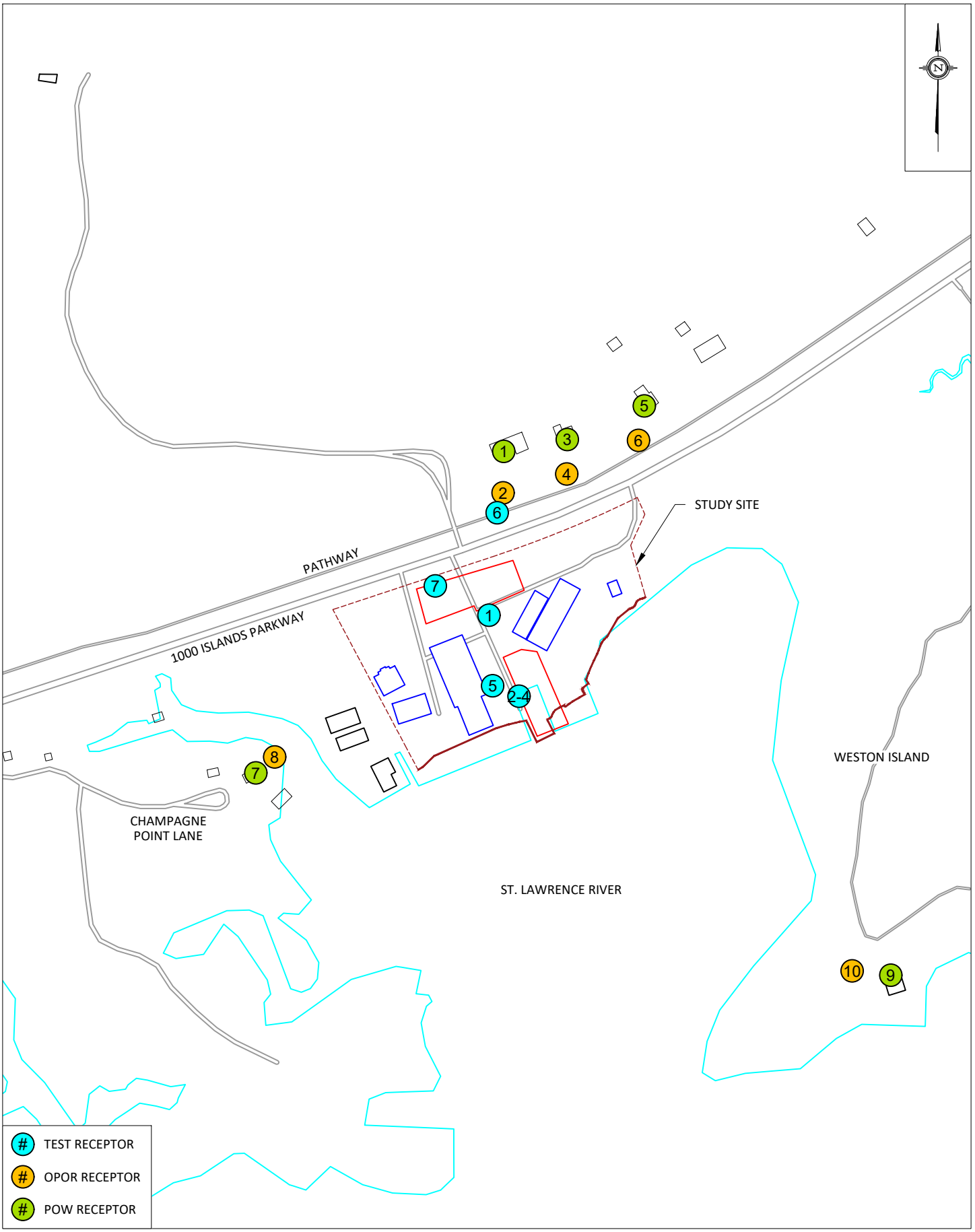
PROJECT	507-515 1000 ISLANDS PARKWAY, LANSDOWNE STATIONARY NOISE ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW23-091-2
DATE	OCTOBER 20, 2023
DRAWN BY	M.L.
DESCRIPTION	FIGURE 2: SOURCE LOCATIONS



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PROJECT	507-515 1000 ISLANDS PARKWAY, LANSDOWNE STATIONARY NOISE ASSESSMENT
SCALE	1:4000 (APPROX.)
DRAWING NO.	GW23-091-3
DATE	OCTOBER 20, 2023
DRAWN BY	M.L.

DESCRIPTION

FIGURE 3:
RECEPTOR LOCATIONS

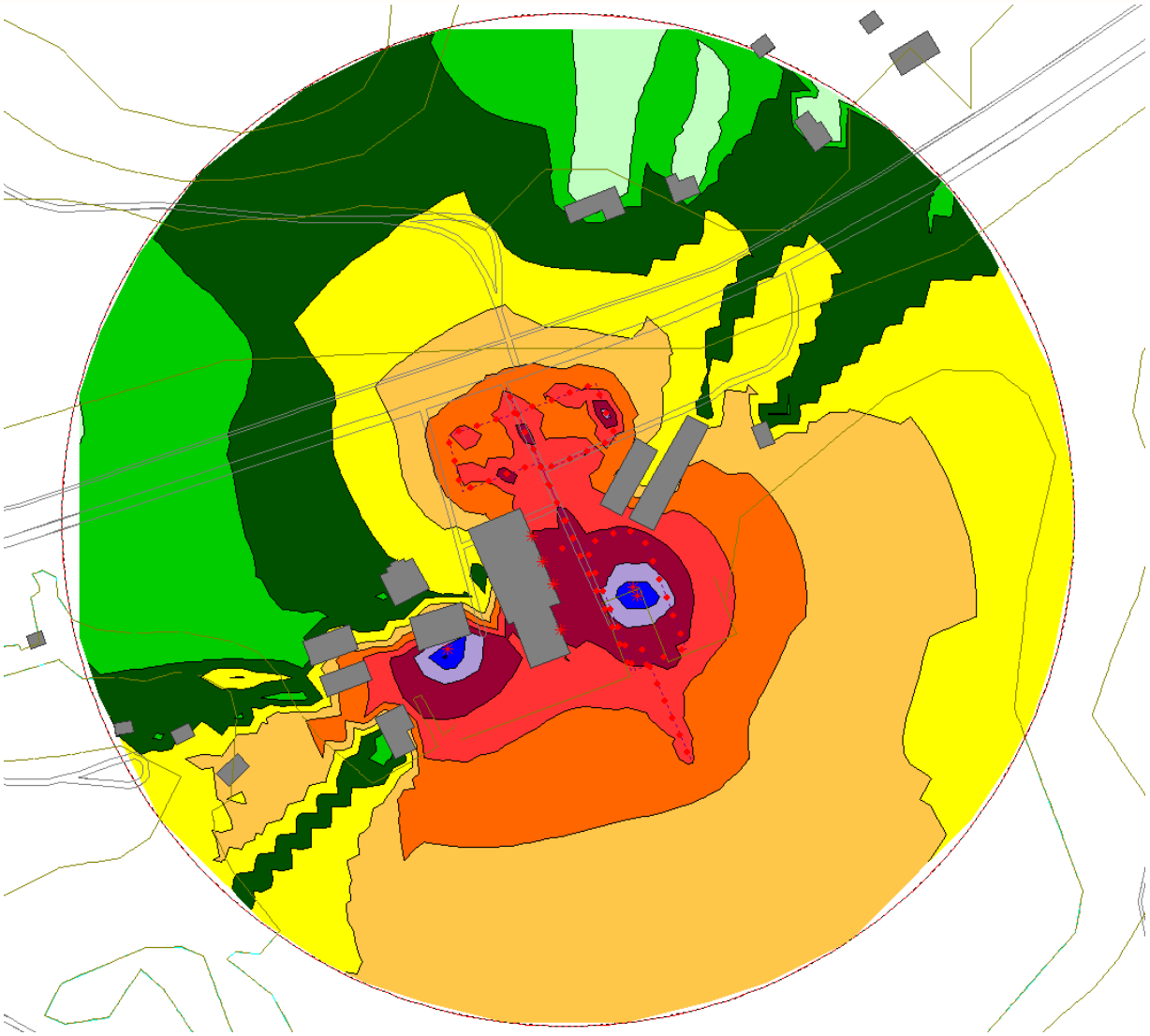

FIGURE 4: DAYTIME STEADY-STATE NOISE CONTOURS (1.5 M ABOVE GRADE)

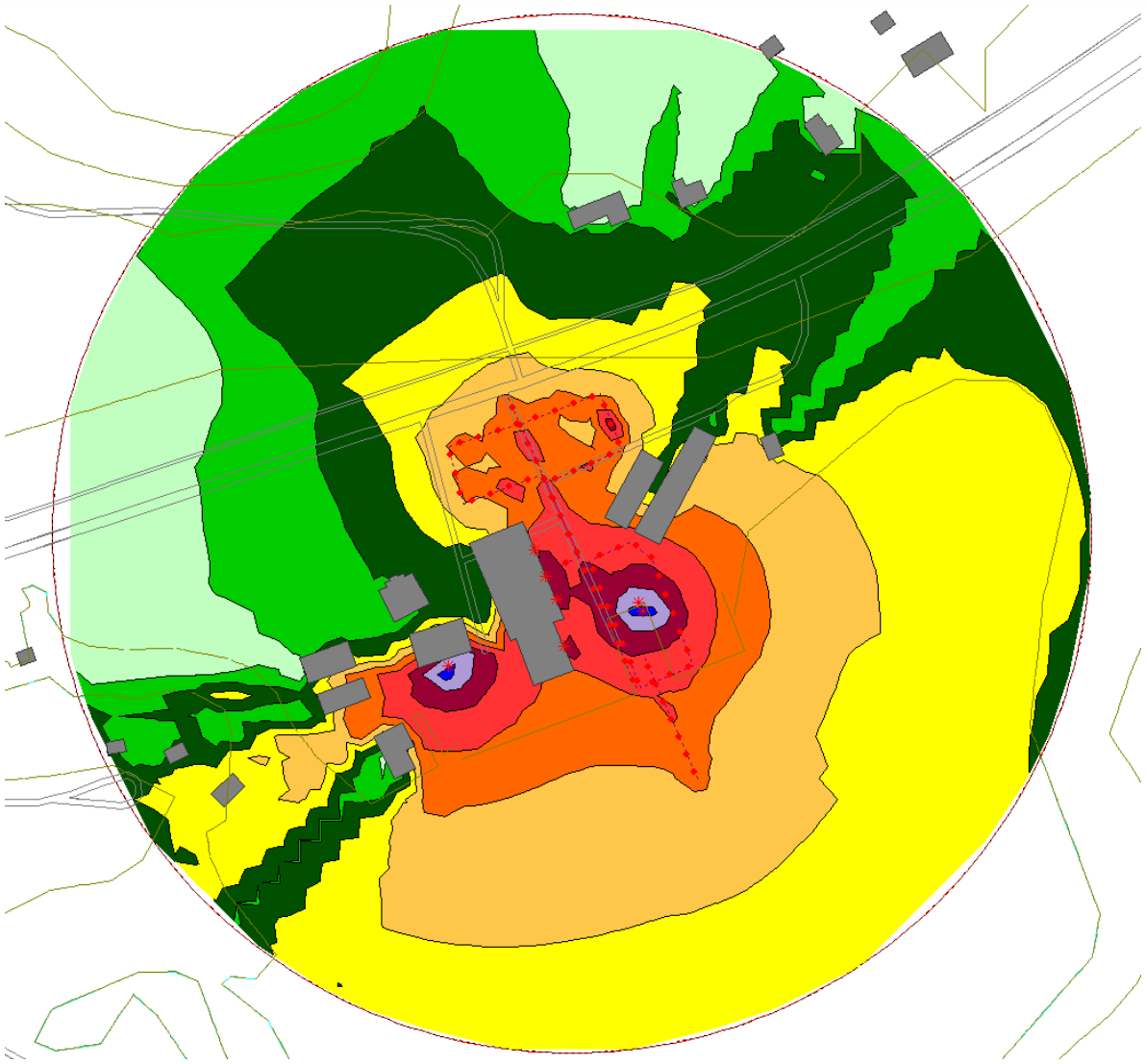

FIGURE 5: EVENING/NIGHTTIME STEADY-STATE NOISE CONTOURS (1.5 M ABOVE GRADE)

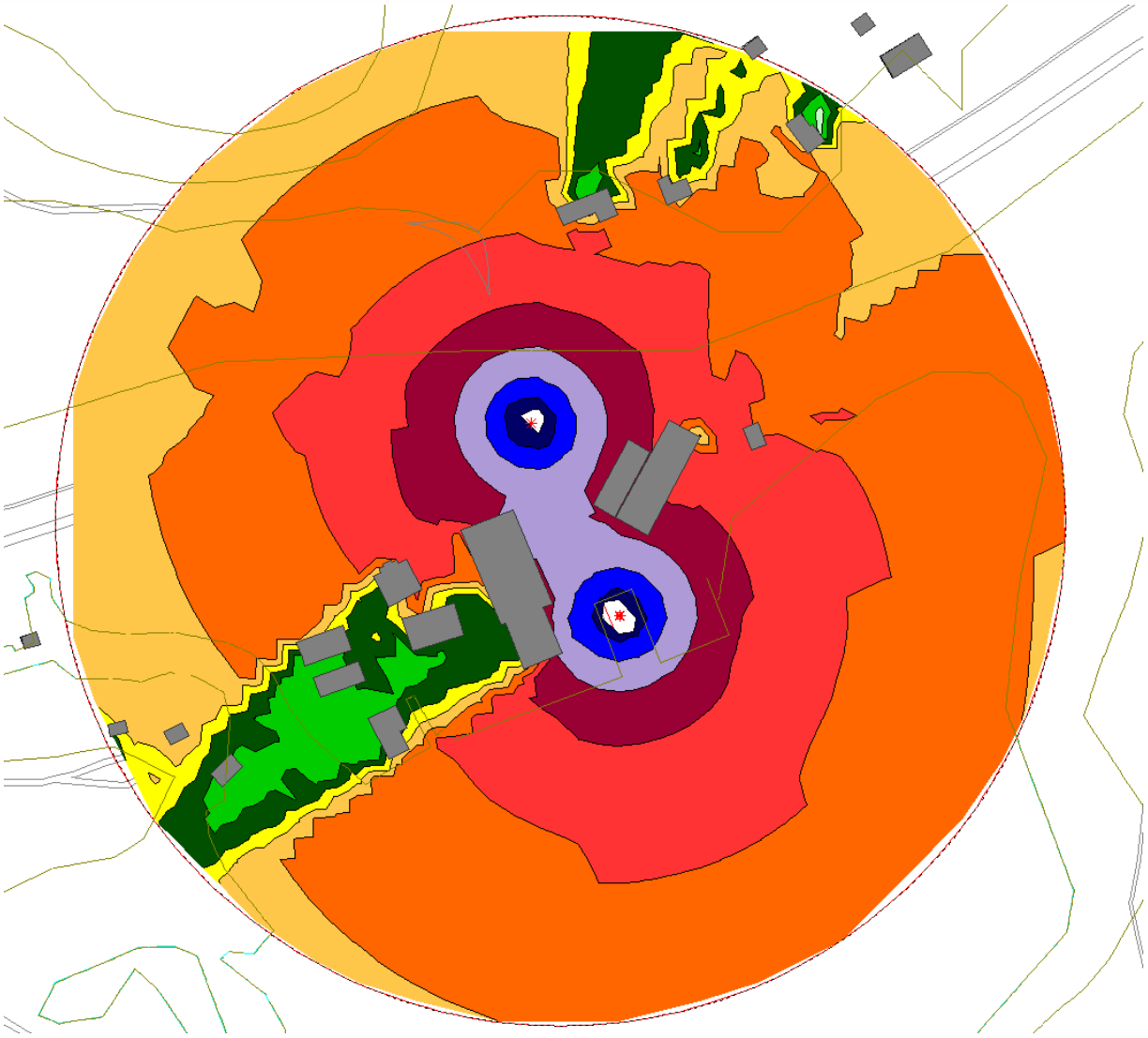

FIGURE 6: DAYTIME/EVENING/NIGHTTIME IMPULSIVE NOISE CONTOURS (1.5 M ABOVE GRADE)