Noise Assessment

Champlain Hudson Power Express
Horizontal Directional Drill
Stony Point, New York

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1.0 Introduction

The Champlain Hudson Power Express project (State of New York Public Service Commission Case 10-T-0139) includes the construction of a 1250 MW high voltage direct current circuit from the Canadian Border to New York City. The cable route extends approximately 336 miles over land and marine pathways.

This noise assessment report describes the estimated sound levels for one Horizontal Directional Drilling (HDD) location in New York State, specifically shoreline crossing in Stony Point, NY to transition the submarine cable laid in the Hudson River to the approved underground route. Horizontal Directional Drilling will be employed to install two separate 12" DR9 HDPE conduits of approximately 2,400 linear feet (LF) commencing from the shore landing and ending in the Hudson River.

The drilling aspect of the operation will be performed by Huxted Trenchless, LLC (HT). Caldwell Marine International, LLC (CMI) will provide marine support, permanent materials, supervision, and management of the operation.

2.0 Concepts of Environmental Sound

Sounds are generated by a variety of sources (e.g., a musical instrument, a voice speaking, or an airplane that passes overhead). Energy is required to produce sound and this sound energy is transmitted through the air in the form of sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear. The range of sound pressures that can be detected by a person with normal hearing is very wide, ranging from about 20 micro-pascals (µPa) for very faint sounds at the threshold of hearing to nearly 10 million µPa for extremely loud sounds, such as a jet during take-off at a distance of 300 feet. Because the range of human hearing is so wide, sound levels are reported using "sound pressure levels", which are expressed in terms of decibels. The sound pressure level in decibels is the logarithm of the ratio of the sound pressure of the source to the reference sound pressure of 20 µPa, multiplied by 20.

Table 2.1 provides some examples of common sources of sound and their sound pressure levels. All sound levels in this assessment are provided in A-weighted decibels, abbreviated "dB(A)" or "dBA." The A-weighted sound level reflects how the human ear responds to sound, by deemphasizing sounds that occur in frequencies at which the human ear is least sensitive to sound (at frequencies below about 100 hertz and above 10,000 hertz) and emphasizing sounds that occur in frequencies at which the human ear is most sensitive to sound (in the mid-frequency range from about 200 to 8,000 hertz). In the context of environmental sound, noise is defined as "unwanted sound

Table 2.1 Examples of Common Sound Pressure Levels

Sound Level dB(A)	Common Indoor Sounds	Common Outdoor Sounds
110	Rock Band	Jet Takeoff at 1000 feet
100	Inside NYC Subway Train	Chain Saw at 3 feet
90	Food Blender at 3 feet	Impact Hammer (Hoe Ram) at 50 feet
80	Garbage Disposal at 3 feet	Diesel Truck at 50 feet
70	Vacuum Cleaner at 10 feet	Lawn Mower at 100 feet
60	Normal Speech at 3 feet	Auto (40 mph) at 100 feet
50	Dishwasher in Next Room	Busy Suburban Area at night
40	Empty Conference Room	Quiet Suburban Area at night
25	Empty Concert Hall	Rural Area at night

Sound pressure levels are typically presented in community noise assessments utilizing the noise metrics described below and expressed in terms of A-weighted decibels.

- "L_{10}" is the sound level that is exceeded for 10 percent of the time. This metric is a measure of the intrusiveness of relatively short-duration noise events that occurred during the measurement period.
- "L_{50}" is the sound level that is exceeded for 50 percent of the measurement period.
- "L_{90}" is the sound level that is exceeded for 90 percent of the time and is a measure of the background or residual sound levels in the absence of recurring noise events.
- "L_{eq}" is the is the constant sound level which would contain the same acoustic energy as the varying sound levels during the time period and is representative of the average noise exposure level for that time period.
- "L_{MAX}" is the instantaneous maximum sound level for the time period.

It is often necessary to combine the sound pressure levels from one or more sources. Because decibels are logarithmic quantities, it is not possible to simply add the values of the sound pressure levels together. For example, if two sound sources each produce 70 dB and they are operated together, their combined impact is 73 dB – not 140 dB as might be expected. Four equal 70 dB sources operating simultaneously result in a total sound pressure level of 76 dB. In fact, for every doubling of the number of equal sources, the sound pressure level goes up another three decibels. A tenfold increase in the number of sources makes the sound pressure level increase by 10 dB, while a hundredfold increase makes the level increase by 20 dB. The logarithmic combination of *n* different sound levels is calculated by the following equation:

$$L_{total}=10*\log_{10}\left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} +\ldots+10^{\frac{L_n}{10}}\right)$$

Perceived changes in sound level can be slightly more subjective. The average person will not notice a change of 1-2 dB. A 3 dB increase is just barely perceptible, while a 5 dB change is clearly noticeable.

3.0 Prior CHPE Construction Noise Impact Assessment and Reference Guidelines

The CHPE Article VII Certification process included characterization and evaluation of a wide array of Facility impacts, including potential noise impacts from installations such as the Stony Point HDD. The Public Service Commission ultimately found that the construction and operation of the CHPE Facility meets applicable standards under New York State Public Service Law § 126.

In the Joint Proposal, adopted as part of the project's April 2013 Certificate Order, parties including the Certificate Holders and New York State agencies stipulated to anticipated noise impacts from Facility construction, as well as measures to minimize and mitigate impacts during construction. Relevant to noise, the Joint Proposal found at paragraph 89 that construction noise from Facility installation:

> *"will be temporary in nature and impact will vary according to the construction equipment in use and existing background or ambient noise at given times and locations. Residents and businesses could be temporarily affected by noise from construction activities associated with the installation of the overland segments of the cables and the Converter Station. No residence will be exposed to significant noise levels for an extended period . . . The Applicants have requested that the Commission refuse to apply local noise ordinances during the construction phase of the Facility outside of CNY as provided in the Proposed Certificate Condition 32 (Appendix C). Appropriate noise control measures are included in the construction and mitigation control measures agreed to be applied during facility construction. Measures to apply at residential areas and other noise sensitive locations include: public outreach, appropriate work hour/work operation restrictions, temporary sound barriers, employment of equipment fitted with sound deadening materials, selection of low noise equipment and procedures, and other noise reduction work methods or devices as determined appropriate for the locale and tasks."*

Section (A)(7) of the EM&CP Guidelines (also adopted in the Article VII Certificate) requires that the Certificate Holders show locations of noise sensitive receptors and describe specific procedures to be followed to avoid and/or minimize noise impacts in EM&CP submissions. Section 9 of the Stony Point EM&CP Narrative provides the information required in the EM&CP Guidelines, including an identification of the "types of major equipment to be used in construction or facility operation; sound levels at which that equipment operates; days of the week and hours of the day during which that equipment will normally be operated; any exceptions to these schedules; and any measures to be taken to reduce audible noise levels caused by . . . construction equipment." This report provides further identification of noise sensitive receptors proximate to the HDD work area.

Further, as noted in Section 25 of the Best Management Practices adopted in the Certificate Order, noise levels presented in the Article VII record and in the EM&CPs are presented at levels “that would be experienced by people outdoors. A building will provide significant attenuation of associated construction noise impacts. For instance, sound levels can be expected to be up to twenty seven (27) dBA lower indoors with windows closed. Even in homes with windows open, indoor sound levels can be reduced by up to seventeen (17) dBA (USEPA 1978).” Thus, it was anticipated during this project’s Certification process that the EM&CP would describe potential outdoor noise impacts from Facility construction, which would offer a more conservative estimate of actual noise experienced inside residences or other sensitive noise receptors during construction of the Facility.

Given the extensive existing record on these issues, further in-depth study or assessment of potential noise impacts from the Facility is neither required nor warranted; the Article VII record already includes findings and determinations related to noise impacts from Facility installation, including the Stony Point HDD and other transitional HDD installation activities, and the parties have stipulated to appropriate minimization and mitigation measures for noise. The agreed-to BMPs outline the reasonable noise control measures necessary to minimize noise impacts and achieve “appropriate noise control” during construction, such as by locating work areas away from sensitive receptors to the extent practicable, installing mufflers or appropriate noise-dampening equipment, and limiting work hours to non-overnight hours as much as possible when construction work is conducted proximate to noise sensitive receptors. Under the BMPs, only in “extreme cases” are further measures required, such as the installation of temporary sound barriers to further reduce noise.

Section 9 of the Stony Point HDD EM&CP addresses all of the required noise-related BMPs agreed to among the parties in the Certificate Order. Nevertheless, in response to requests for further information from DPS staff, and to determine whether the Joint Proposal or related components of the Certificate Order, such as Certificate Condition 159 (ll), might require further action by CHPE to mitigate anticipated noise impacts from transitional HDD activities on nearby sensitive residential receptors, the Certificate Holders agreed to perform this desktop analysis of anticipated noise levels at nearby residential receptors.

As is demonstrated in this report, a conservative desktop analysis of noise from the HDD operations does not indicate that significant adverse noise impacts will occur at nearby residential receptors, or that any “extreme case” exists which requires further noise mitigation beyond that included in the current transitional HDD EM&CPs.

Lastly, the Certificate Order does not impose specific numerical noise limits on construction noise. The following noise level standards are provided to offer a basis of comparison to the proposed HDD operations:

3.1 EPA Guidelines

According to the Environmental Protection Agency (EPA), the Day-Night Sound Levels (L_{DN}) and the Equivalent Sound Level (L_{EQ}) should not exceed certain limits to protect public health and welfare. Values that should not be exceeded:

Table 3.1 EPA-Recommended Noise Levels

Effect	Level*	Area
Hearing	L_{eq} (24) < 70 dBA	All areas
Outdoor activity interference and annoyance	L_{dn} < 55 dBA	Outdoors in residential areas and farms where people spend varying amounts of time in which quiet is a basis for use
Outdoor activity interference and annoyance	L_{eq} (24) < 55 dBA	Outdoor areas where people spend limited time such as school yards playgrounds, etc.
Indoor activity interference and annoyance	L_{dn} < 45 dBA	Indoor residential areas
Indoor activity interference and annoyance	L_{eq} (24) < 45 dBA	Indoor areas with human activities such as schools, etc.
L_{eq} (24) = average noise level over 24-hour period (see Section 2)		

Outdoor yearly L_{dn} levels protect public health and welfare if they do not exceed 55 dBA in sensitive areas as residences, schools, hospitals, etc. Inside buildings yearly L_{dn} levels protect public health and welfare if they do not exceed 45 dBA. To protect against hearing damage, one's 24-hour noise exposure at the ear should not exceed 70 dBA.

3.2 NYSDEC Guidelines

A NYSDEC Guidance Document entitled “Assessing and Mitigating Noise Impacts” states the following:

> *“In non-industrial settings the SPL* [Sound Pressure Level] *should probably not exceed ambient noise by more than 6 dB(A) at the receptor. An increase of 6 dB(A) may cause complaints. There may be occasions where an increase in SPLs of greater than 6 dB(A) might be acceptable. The addition of any noise source, in a nonindustrial setting, should not raise the ambient noise level above a maximum of 65 dB(A). This would be considered the “upper end” limit since 65 dB(A) allows for undisturbed speech at a distance of approximately three feet.”*

Ambient noise sound pressure levels (SPL) in industrial or commercial areas may exceed 65 dBA with a high end of approximately 79 dBA (EPA 550/9-79-100, Nov. 1979). In these instances, mitigative measures utilizing best management practices should be used in an effort to ensure that a facilities generated sound levels are at a minimum. Notably, the Stony Point HDD location is proposed adjacent to a mine and active railroad lines, in a partially industrial setting.

4.0 Predictive Modeling of Sound Impacts During Operation

This section describes the methods, assumptions, and results of the Cadna-A® noise modeling used to predict future sound levels resulting from HDD installation at Stony Point.

4.1 Noise Model

The Cadna-A® computer noise model was used to predict future sound pressure levels from the operation of the proposed HDD-related equipment at the noise-sensitive receptors nearest to the Stony Point HDD location. An industry standard model, CadnaA® was developed by DataKustik GmbH to provide an estimate of sound levels at distances from specific noise sources. This model takes into account:

- Sound power levels from stationary and mobile sources;
- The effects of terrain features including relative elevations of noise sources;
- Intervening objects including buildings and sound barrier walls (none proposed); and
- Ground effects due to areas of pavement and unpaved ground.

Cadna-A® can account for shielding and reflections due to intervening buildings or other structures in the propagation path, as well as diffracted paths around and over structures, which tend to reduce computed noise levels. The shielding effects due to intervening terrain are included in the model. The shielding effects due to existing off-site buildings, trees, and ground vegetation were excluded from the model to provide a level of conservatism to the analysis.

For ground effects, the reflectivity of the surface is described by a “ground factor” variable (G), which ranges from 0 for ‘hard’ ground (paved surfaces, concrete, etc.) to 1 for “porous” ground (grassland and other vegetated areas). The model used a “porous” ground absorption factor (G) of 1.0 to represent typical ground conditions and a reflective ground absorption factor of 0.0 for paved roadways, including Park Road, Battlefield Road, and Rt. 202 (Liberty Drive).

The International Standards Organization current standard for outdoor sound propagation (ISO 9613 Part 2 – “Attenuation of sound during propagation outdoors”) was used within Cadna-A®. This standard provides a method for calculating environmental noise in communities from a variety of sources with known emission levels. The method contained within the standard calculates the attenuation over the entire sound path under weather conditions that are favorable for sound propagation, such as for downwind propagation or “under a well-developed moderate ground-based temperature inversion." Application of conditions that are favorable for sound propagation yields conservative estimates of operational noise levels in the surrounding area.

4.1.1 Modeling Inputs

Based on the proposed HDD layout as shown in the Stony Point HDD Plan & Profile Drawings, the noise-producing sources on the site during operation will be the HDD drill rig, mud pump, and two backhoes. The modeling did not include the presence of temporary noise barriers.

The source model inputs were based on the octave band sound power levels in the table below, based on manufacturer specifications and published measurements. Since the sound-producing equipment were assumed to be continuously and simultaneously operating, the L_{90} (background level) and L_{EQ} (equivalent constant level) of the proposed equipment are the same for the purposes of this assessment.

Table 4.1 Noise Source Inputs to the Cadna-A Model

Name	Source Height*	Octave Band Sound Power Levels (dB)									Total (dBA)
		31.5	63	125	250	500	1000	2000	4000	8000	
Drill Rig (1)	5ft	99	95	103	103	99	99	96	93	86	104
Backhoes (2)	5ft	95	103	108	111	110	108	106	89	86	113
Mud Pump (1)	5ft	95	102	103	98	96	92	88	85	73	98

** Heights above ground based on assumed equipment dimensions and site arrangement.*

The sound pressure level of drill rigs similar to the proposed equipment was measured by CMI/HT at 98 dBA at a distance of 1 foot from the source. This corresponds to a source sound power level of approximately 98.6 dBA. The higher value of 104 dBA shown in Table 4.1 was used for conservatism. The backhoe sound power level is derived from FHWA construction noise guidance, which lists a sound pressure level of 78-80 dBA at 50 feet, for a source power level of 113 dBA.

The HDD area site layout from the EM&CP and existing topography was used to create a terrain model that represents the topography during operation of the proposed facility. Figure 1 shows the proposed topography within the site. The inputs to the model are 1-foot contours, derived from 2012 New York Coastal (hydroflattened) LIDAR topographic data. The model assumed continuous and simultaneous operation of all sound-producing equipment. This was a conservative assumption, since not all equipment will be operating continuously at full load. A search radius of 1 mile from the noise producing equipment was used in the model to ensure that all noise sources contributing to the predicted facility noise level were modeled at every noise-sensitive receptor.

4.1.2 *Predicted Noise Levels*

Cadna-A® allows the user to place receptors at selected locations and predicts sound levels at those specific receptor locations. For this analysis, specific receptors were placed at the nearest residences to evaluate projected noise levels.

Table 4.2 presents the predicted sound levels resulting solely from the operation of the proposed equipment. The model also calculated sound levels for the surrounding area, using a 5-foot receptor grid, with a receptor height of 5.1 feet (representative of average ear height). This data is displayed in the isopleths on Figure 2, which show lines of equal sound level at the site and the surrounding area.

Table 4.2 Cadna-A Modeling Result Sound Levels

Site ID	Approx. Distance from Equipment	Predicted Sound Level (dBA)
RR-1	1,140 ft	42.5
RR-2	940 ft	46.7
RR-3	620 ft	50.7
RR-4	740 ft	53.3
RR-5	680 ft	39.9
RR-6	730 ft	34.8
RR-7	800 ft	32.2
RR-8	870 ft	32.1

Site ID	Approx. Distance from Equipment	Predicted Sound Level (dBA)
RR-9	810 ft	34.5
RR-10	940 ft	50.9
RR-11	950 ft	51.1
RR-12	990 ft	50.6
RR-13	940 ft	51.8
RR-14	870 ft	52.3
RR-15	880 ft	51.9
RR-16	1,270 ft	48.0

5.0 Conclusion

The results of this Noise Impact Assessment demonstrate that sound level from the proposed HDD operations at nearby residences will not exceed 55 dBA at the nearest residential receptor (RR-3), which is 620 feet from the HDD equipment. The maximum predicted level at a residential receptor of 53.3 decibels (A-weighted) is at receptor RR-4, which is approximately 740 feet from the HDD equipment. Distances and sound levels at other nearby receptors are included in Table 4.2. Depending on ambient sound levels, this may increase total sound pressure level by 6 dBA or more but will not exceed EPA or NYSDEC thresholds.

Based upon the Joint Proposal, Certificate Order and BMPs agreed to among the parties, no extreme cases of noise will be caused at the nearby residential receptors due to HDD operations, and no other circumstances exist which would warrant additional noise impact mitigation measures related to transitional HDD installation work. Moreover, when compared with EPA and NYSDEC noise guidelines, the anticipated outdoor noise levels from HDD operations—even assuming a conservative worst-case in which all equipment is operating simultaneously—do not exceed indoor or outdoor noise guidelines such that further noise study or mitigation is warranted.

6.0 References

Caldwell Marine International (CMI), 2023. *NOISE ANALYSIS HORIZONTAL DIRECTIONAL DRILL (HDD) AT PUTNAM STATION, CEMENTON, CONGERS and STONY POINT.*

Environmental Protection Agency (EPA), 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* Office of Noise Abatement and Control. Accessed online at https://nepis.epa.gov/Exe/ZyPDF.cgi/2000L3LN.PDF?Dockey=2000L3LN.pdf

Federal Highway Administration (FWHA), 2006. *Construction Noise Handbook*. US Department of Transportation. Accessed online at https://www.fhwa.dot.gov/environment/noise/construction_noise/ handbook/handbook09.cfm

New York State Department of Environmental Conservation (NYSDEC), 2000. *Assessing and Mitigating Noise Impacts.* Accessed online at https://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf

LEGEND

- HDD ARRANGEMENT
- RESIDENTIAL RECEPTOR
- MAJOR CONTOUR (10')
- MINOR CONTOUR (1')

NOTES:
1. BASE MAP IMAGERY, ESRI/GOOGLE, 2020
2. HDD LAYOUT, TRC/HUXTED, 2023
3. ELEVATION DATA, NYSGIS, 2012

N

1:2,400
1" = 200'
0 200 400 FEET

PROJECT: CHPE HORIZONTAL DIRECTIONAL DRILLING CONSTRUCTION NOISE ASSESSMENT STONY POINT, NEW YORK

TITLE: SITE LAYOUT

DRAWN BY:	M. ERNSTING	PROJ. NO.:	490523.0001.0000
CHECKED BY:	P. WHITNEY	FIGURE 1	
APPROVED BY:	M. STOLTZFUS		
DATE:	FEBRUARY 2023		

TRC

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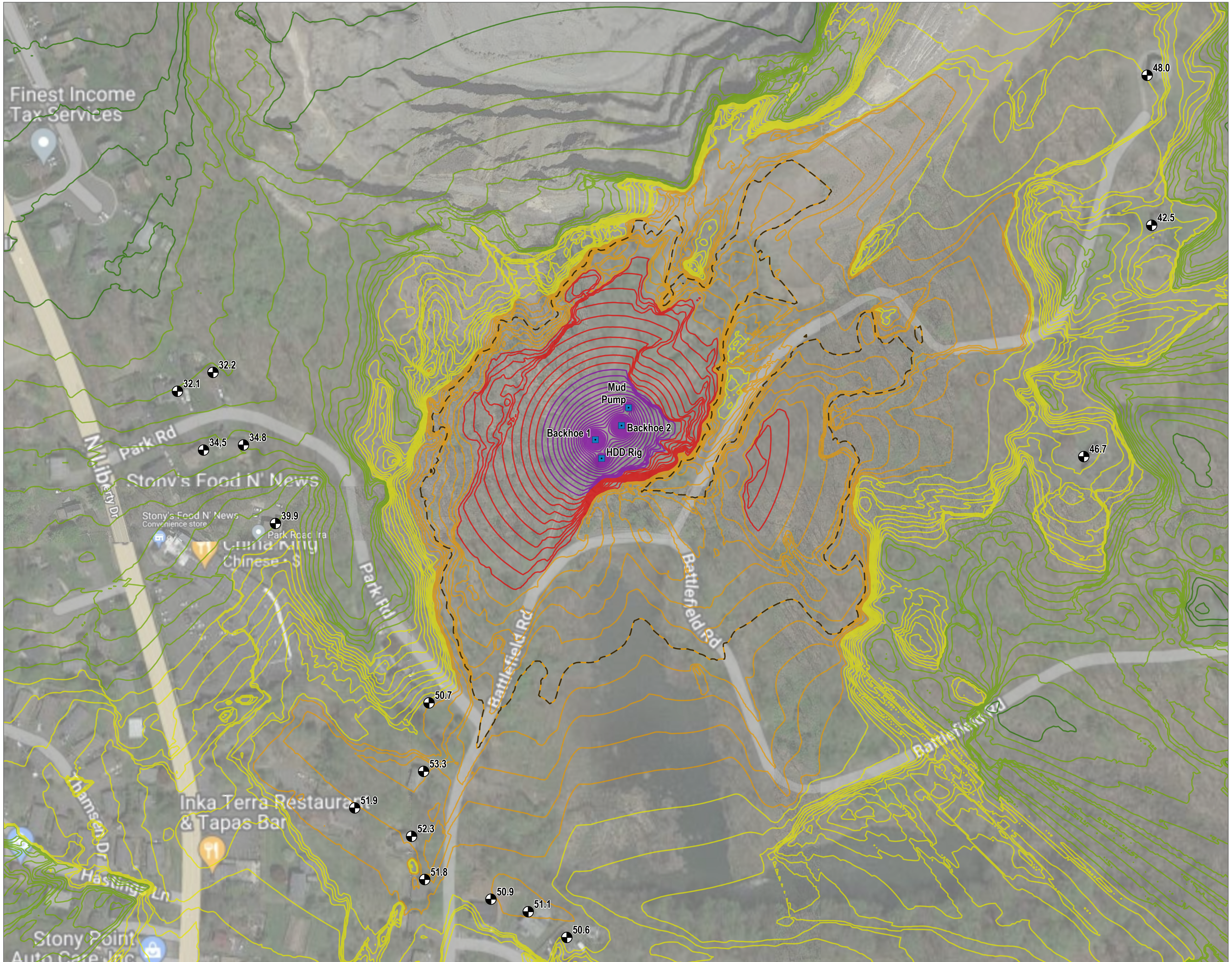


LEGEND

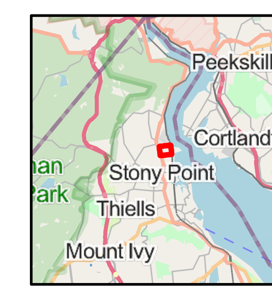
- EQUIPMENT LOCATION
- RESIDENTIAL RECEPTOR

PREDICTED SOUND LEVEL (DBA)

- 20 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 100
- 55 DBA CONTOUR

NOTES:

1. BASE MAP IMAGERY, ESRI/GOOGLE, 2020
2. HDD LAYOUT, TRC, 2023
3. NOISE ISO-DB LINES, TRC CADNA-A NOISE MODELING, FEBRUARY 2023



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1:2,400
1" = 200'

0 200 400 FEET

PROJECT: CHPE HORIZONTAL DIRECTIONAL DRILLING CONSTRUCTION NOISE ASSESSMENT STONY POINT, NEW YORK

TITLE: NOISE MODELING RESULTS

DRAWN BY:	M. ERNSTING	PROJ. NO.:	490523.0001.0000
CHECKED BY:	P. WHITNEY	FIGURE 2	
APPROVED BY:	M. STOLTZFUS		
DATE:	FEBRUARY 2023		

TRC

FILE: 490523-StonyPoint_NoiseStudy.aprx

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