1.0 Noise

This Technical Memorandum describes noise and how it is measured, the existing acoustic environment in the Proposed Action's Region of Influence (ROI), and potential noise impacts from the Proposed Action (i.e., Preferred Alternative) and No Action Alternative. Measures to reduce potential adverse noise effects from the Proposed Action are identified.

Treasury received comments related to potential noise impacts from stakeholders during the public scoping period. These comments generally concerned potential impacts of various sources of noise from the Proposed Action (i.e., proposed car and truck traffic, construction activities, and daily operations), and were particularly focused on potential impacts to residences located near the Project Site. Please refer to Treasury's Public Scoping Report for further details on the comments received during the scoping period. Concerns expressed during public scoping regarding noise are considered and addressed in this analysis.

1.1 Introduction

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air, and is sensed by the human ear. Sound intensity is quantified through the sound pressure level, described in decibels (dB). The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Sound frequency is measured in Hertz (Hz).

Noise is any sound that is undesirable to the receptor because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human and wildlife responses to noise vary according to the type of sound, characteristics of the sound source, distance and obstructions between the source and receptor, receptor sensitivity, and time of day. An organism's response to a sound source determines whether the sound is judged as pleasing or annoying. Noise can be detrimental if it disturbs an organism's normal behavior (USEPA, 1981).

The A-weighted decibel (dBA) is used to characterize sound levels that can be sensed by the human ear. "A-weighted" denotes the adjustment of the frequency range to what the average human ear can sense when experiencing an audible event. The lower threshold of audibility is generally within the range of 10 to 25 dBA for normal hearing. The threshold of pain occurs at the upper boundary of audibility, which is normally around 135 dBA. To the human ear, each 10-dBA increase seems twice as loud (USEPA, 1981).

Table 1 presents sounds encountered in daily life, their dBA levels, and how they affect hearing.

1.2 Affected Environment

1.2.1 Region of Influence

The ROI for noise includes the Project Site and areas within 1,500 feet of the Project Site (see **Figure 1**). These are the areas that would be expected to experience noise effects from the Proposed Action. Beyond 1,500 feet from the Project Site, noise generated during construction of the proposed Currency Production Facility (CPF) would be expected to attenuate to ambient levels (i.e., 60 to 70 dBA) and would not be noticeable. Operational noise from the proposed CPF would be anticipated to attenuate to ambient levels at approximately 800 feet (see **Section 1.3**).

1.2.2 Applicable Guidance

There are two noise regulations that apply to the Proposed Action: the Noise Control Act of 1972 and Prince George's County Noise Ordinance. These regulations are summarized in **Table 2** and described in more detail below. Treasury would comply with these guidelines and requirements under the Proposed Action.

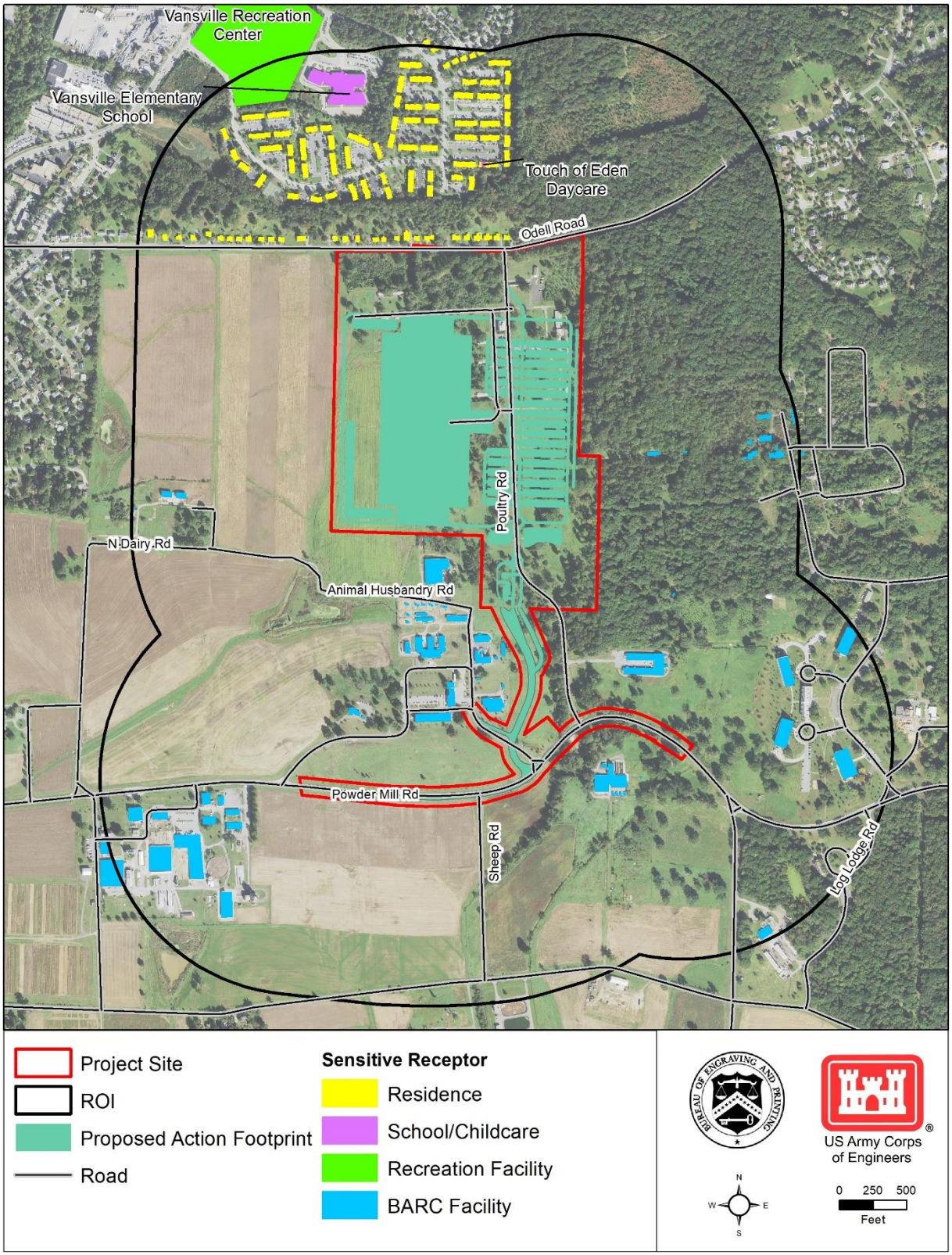

Figure 1: Noise Analysis ROI

Table 1: Common Sound Levels and Human Response

Sound Level (dBA)	Outdoor Example	Indoor Example	Effect
30	Rustling leaves	Soft whisper 15 feet away	Very quiet
40	Quiet residential area	Library	Quiet
55	Rainfall or light auto traffic 100 feet away	Refrigerator	Ambient
60	Normal conversation	Air conditioning unit 20 feet away	Intrusive
70	Freeway traffic	Noisy restaurant or TV audio	Telephone use difficult
80	Downtown of a large city	Alarm clock 2 feet away or ringing telephone	Annoying
90	Heavy truck	Garbage disposal	Very annoying; hearing damage possible after 8 hours
100	Garbage truck, motorcycle	Subway train	Very annoying
110	Pile drivers	Power saw at 3 feet away	Strained vocal effort
120	Jet takeoff 200 feet away or automobile horn 3 feet away	Rock concert	Maximum vocal effort
140	Carrier deck jet operation	--	Painfully loud

Source(s): (USEPA, 1981) (CHC, 2019)

Table 2: Noise Applicable Guidance and Regulations

Guidance/Regulation	Description/Applicability to Proposed Action
Noise Control Act of 1972 (42 United States Code [USC] 4901)	Establishes noise limits and protection requirements for individuals working in a constant noise environment. Applies to construction workers and noise-sensitive receptors located within the ROI.
Prince George's County Noise Ordinance (Prince George's County Code, Subtitle 19, Division 2)	Adopts the Maryland Department of the Environment (MDE) Noise Ordinance limits for industrial, commercial, and residential areas. Restricts construction activities to daytime hours with a maximum noise limit of 75 dBA without a noise-suppression plan and 85 dBA with an approved noise-suppression plan. Applies to the construction and operational phases of the Proposed Action.

Source(s): (USEPA, 1972) (MDE, 2012) (Prince George's County, 2019)

The Noise Control Act of 1972 establishes workplace standards for noise, such as:

- Constant noise exposure must not exceed 90 dBA over an 8-hour period as a minimum requirement.
- The highest allowable sound level to which workers can be constantly exposed is 115 dBA and exposure to this level must not exceed 15 minutes within an 8-hour period.
- Instantaneous exposure, such as impact noise, is limited to 140 dBA.

If noise levels exceed these standards, employers are required to provide hearing protection equipment that reduces sound levels to acceptable limits. The Occupational Safety and Health Administration (OSHA) is the primary federal agency for the administration and enforcement of Noise Control Act requirements.

The Noise Control Act also establishes a means for effective coordination of federal research and activities in noise control; authorizes the establishment of federal noise emission standards for products distributed in commerce; and provides information to the public regarding the noise emission and noise reduction characteristics of such products.

In 1974, the United States Environmental Protection Agency (USEPA) released guidance suggesting that continuous and long-term noise levels in excess of 65 dBA day-night sound level (DNL[1]) are normally unacceptable for noise-sensitive land uses such as residences, Environmental Justice communities, schools, churches, hospitals, and wildlife (USEPA, 1974). In 1982, the USEPA transferred the primary responsibility of regulating noise to state and local governments (Bronzaft, 1998).

The MDE was originally responsible for enforcing a statewide noise ordinance in Maryland. On October 1, 2012, the MDE assigned noise enforcement to local governments (MDE, 2012). The Prince George's County Noise Ordinance, last updated in 2019, establishes standards for industrial, commercial, and residential areas in Prince George's County (see **Table 3**) for common noise-producing acts, such as operating a device that amplifies sound, sounding a horn or similar signaling device, or operating a sound-producing device for commercial advertisement.

Table 3: Noise Ordinance Limits (dBA) for Common Noise-Producing Activities

Day/Night	Industrial	Commercial	Residential
Day	75	67	65
Night	75	62	55

Source(s): (Prince George's County, 2019)

The Prince George's County Noise Ordinance also establishes noise standards for construction activities (Prince George's County, 2019):

- Noise must remain below 75 dBA for construction activities during daytime hours (i.e., 7:00 a.m. to 6:00 p.m.) if the County ***has not*** approved a noise-suppression plan for the activity.
- Noise must remain below 85 dBA for construction activities during daytime hours (i.e., 7:00 a.m. to 6:00 p.m.) if the County ***has*** approved a noise-suppression plan for the activity.
- Construction activities during nighttime hours (i.e., 6:00 p.m. to 7:00 a.m.) are prohibited.

[1] Day-night Sound Level (DNL) is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to the nighttime levels (10:00 p.m. to 7:00 a.m.). It is a useful descriptor for noise because it averages ongoing, yet intermittent, noise and measures total sound energy over a 24-hour period.

1.2.3 Existing Conditions

The Project Site does not have any substantial existing sources of man-made noise, other than occasional vehicle traffic and landscaping equipment that are not discernable from ambient levels. Wildlife noise sources are present but are also not discernable from ambient levels.

The ROI is predominantly semi-rural/suburban with neighborhoods to the north, east, and west of the Project Site. Agricultural land associated with the Beltsville Agricultural Research Center (BARC) is to the south (see **Figure 1**).

Existing sources of noise within the ROI include vehicle traffic on Odell Road, Poultry Road, and Powder Mill Road (including, notably, noise from rumble strips on Powder Mill Road that has generated complaints from both BARC employees and the community); farm equipment at BARC; and other noises typically generated in a semi-rural/suburban area. For purposes of this analysis, Treasury assumed that existing noise experienced by receptors 50 feet from the ROI's roadways is 80 dBA (Caltrans, 2014).

As shown in **Figure 1**, there are 485 noise-sensitive receptors located within the ROI. These noise-sensitive receptors are primarily located in the northern and southern portions of the ROI. They include residences along Odell Road and in the Vansville community, active BARC buildings, the Vansville Recreation Center, Vansville Elementary School, and the Touch of Eden Daycare. The Vansville Recreation Center and Vansville Elementary School are 1,500 feet from the Project Site boundary; the Touch of Eden Daycare is approximately 1,300 feet from the boundary. The closest public (non-BARC) receptor to the Project Site is a residence along Odell Road located approximately 35 feet north of the Project Site boundary. There are no noise-sensitive receptors on the Project Site.

1.3 Environmental Effects

This section analyzes potential noise impacts within the ROI that would occur under the Proposed Action (i.e., Preferred Alternative) and the No Action Alternative. Measures to reduce potential adverse noise effects from the Proposed Action are also identified.

Additional information about potential noise impacts on wildlife and Environmental Justice communities is presented in the ***Biological Resources Technical Memorandum*** and the ***Socioeconomics and Environmental Justice Technical Memorandum***, respectively.

1.3.1 Approach to the Analysis

For this analysis, Treasury assumed that a significant adverse impact would occur if noise levels would:

- Violate applicable noise regulations (see **Table 2**).
- Exceed 85 dBA for noise-sensitive receptors during construction activities *with* implementation of a noise-suppression plan (see **Section 1.2.2**).
- Affect noise-sensitive receptors at levels above noise ordinance limits identified in **Table 3** during operation of the proposed CPF.

To determine potential noise impacts, Treasury assumed that operational maintenance activities (e.g., lawn mowing) would generate similar noise as construction activities, but would be of relatively short duration (i.e., a few hours or a few days at a time) and occur infrequently.

Treasury used the inverse square law to provide a conservative estimate of the noise impacts that would occur under each alternative. The inverse square law states that for every doubling of the distance from the sound source, the sound intensity will diminish by 6 dBA. This is considered an industry standard method of calculating sound levels at various distances (Acoustical Surfaces, Inc., 2020). For example, if a source

produces a 60 dBA sound at 3 feet away from a receptor, then the sound would be 54 dBA at 6 feet away and 48 dBA at 12 feet away.

The equation is as follows:

$$L_P(R2) = L_P(R1) - 20 \times Log_{10}(R2/R1)$$

$$L_P(R1) = Sound\ pressure\ level\ at\ initial\ location$$

$$L_P(R2) = Sound\ pressure\ level\ at\ the\ new\ location$$

$$R1 = Distance\ from\ the\ noise\ source\ to\ initial\ location$$

$$R2 = Distance\ from\ noise\ source\ to\ the\ new\ location$$

For example, the equation to calculate the sound volume of a source 6 feet away from a receptor of a 60 dBA sound at three feet away would be:

$$L_P(R2) = 60\ dBA - 20 \times Log_{10}\left(\frac{6\ feet}{3\ feet}\right)$$

$$L_P(R2) = 60\ dBA - 20 \times 0.3$$

$$L_P(R2) = 60\ dBA - 6.0$$

$$L_P(R2) = 54\ dBA$$

Treasury conservatively selected this method because it assumes there is no barrier (e.g., buildings or vegetation) between the source of the noise and the receptor.

While this method assumes no barriers between the noise and receptor, the proposed CPF would maintain the forested areas along the northern boundary of the Project Site, as well as forest vegetation along the other portions of the Project Site boundary. These vegetative buffers would minimally absorb, or decrease, some of the noise generated by the Proposed Action (BEP, 2019). Therefore, the actual noise levels experienced by noise-sensitive receptors would be lower than those analyzed in this section for some areas, especially receptors north, northwest, and east of the project site.

1.3.2 No Action Alternative

Under the No Action Alternative, Treasury would not construct the Proposed Action at BARC. Treasury would continue to operate the existing Washington, DC Facility (DC Facility) as under current conditions. These current conditions generate no noise complaints. The Project Site would remain in its current condition. Existing ambient noise conditions in the ROI would continue. Therefore, the No Action Alternative would have ***no impact*** on noise.

1.3.3 Preferred Alternative

Construction Site Noise

The Proposed Action would cause short-term (i.e., only during construction) noise increases in the ROI. Short-term construction noise would primarily result from the use of heavy equipment, such as cranes, excavators, bulldozers, and graders, on the Project Site.

Noise from construction-related equipment and activities would dominate the daytime noise environment within and near the Project Site; no construction would occur at night. Site preparation activities would be expected to generate the highest noise levels from the use of trucks, backhoes, graders, and other heavy equipment. Construction noise levels would likely be highest early in the construction phase (i.e., during site preparation, grading, and earth-moving activities) and gradually diminish as construction progresses. This is typical of most construction programs.

On the Project Site, construction noise levels could reach 80 to 90 dBA at a 50-foot distance from the noise source (see **Table 4**). Noise generated by multiple pieces of equipment operating concurrently could reach similar levels at distances of several hundred feet from the noise source. The zone of relatively high construction noise levels typically extends 400 to 800 feet from a major noise source (e.g., heavy trucks). Receptors seldom experience appreciable levels of construction noise beyond approximately 800 feet from the noise source (USEPA, 1974).

Table 4: Noise Levels Associated with Heavy Construction Equipment

Noise Generating Equipment	dBA L_{eq}[1] 50 feet from Noise Source
Bulldozer	93 -101
Grader	87 - 94
Truck	90
Roller	91 -104
Backhoe	64 - 93
Jackhammer	102 - 111
Concrete mixer	74 - 88
Welding generator	101
Paver	86 - 88

Source(s): (USEPA, 1971) (ELCOSH, 2019) (CHC, 2019)
1. L_{eq} = Equivalent Continuous Level

Treasury estimated noise levels generated by the Proposed Action at 400 feet, 800 feet, and 1,500 feet from the proposed construction activities[2] using the method described in **Section 1.3.1**; these noise levels are shown in **Table 5**, and the resulting noise contours are shown on **Figure 2**.

Table 5: Estimated Noise Levels at Various Distances from Construction Activities

Distance (feet)	Sound Level (dBA)
50	90
400	72
800	66
1,500	60

As shown in **Table 6**, during a normal daytime construction shift, the estimated maximum sound levels experienced by noise-sensitive receptors within the ROI would be below the lowest Prince George's County Noise Ordinance limit of 75 dBA (see **Section 1.2.2**). Noise experienced by these receptors would range from freeway traffic levels to normal conversation levels (see **Table 1**).

[2] Proposed construction locations (i.e., the proposed construction footprint) are represented on **Figure 2**. The forested areas along the northern boundary of the Project Site would remain intact with implementation of the Proposed Action.

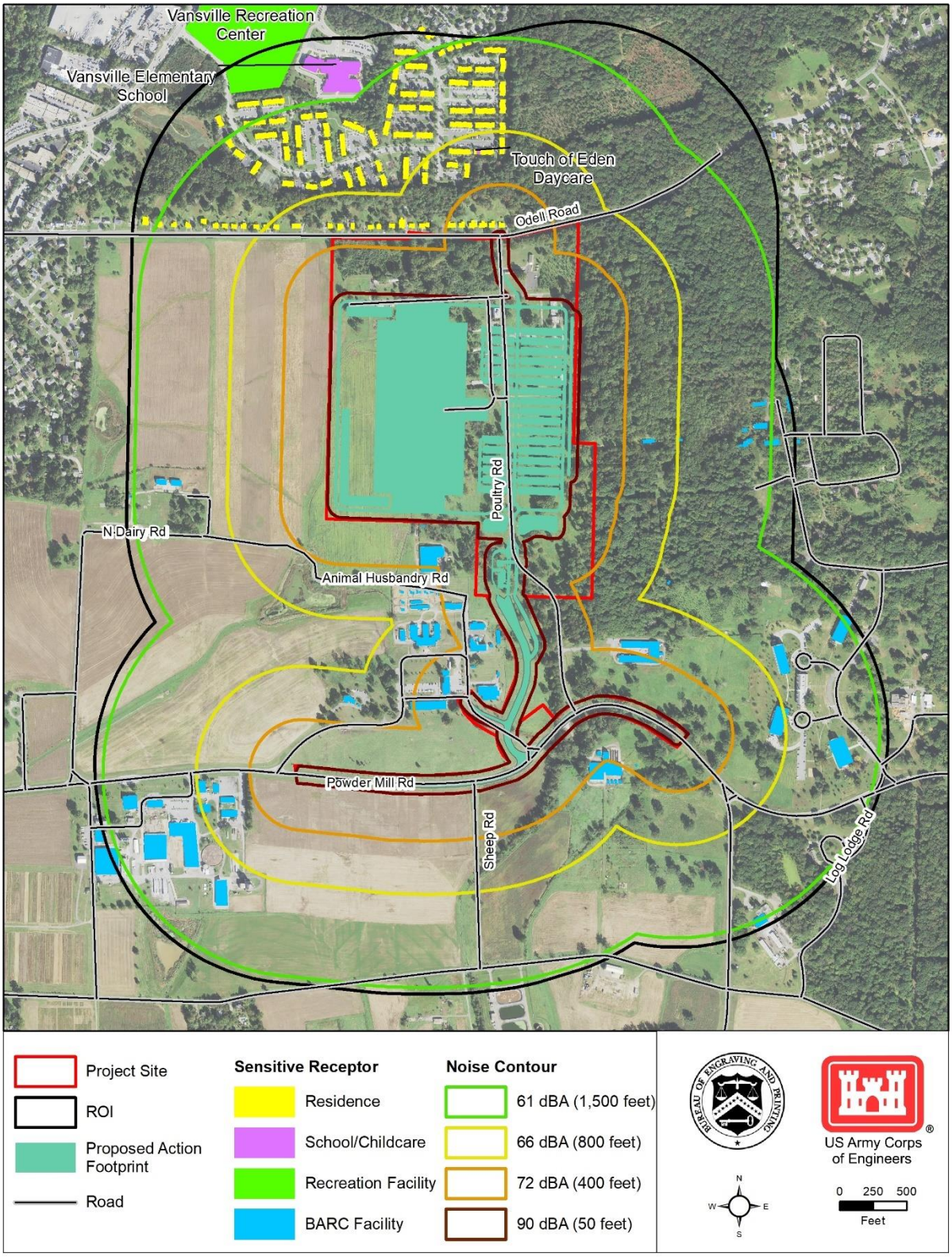

Figure 2: Proposed Action Construction Noise Contours

Table 6: Estimated Noise Levels at Various Distances from Construction Activities

Noise-Sensitive Receptor Type	Name or Location (# of resources)	Approximate Distance from Proposed Construction Activities (feet)	Noise Level (dBA)
School / Childcare	Touch of Eden Daycare	1,300	72 - 66
	Vansville Elementary School	1,500	60
Recreational Facility	Vansville Recreation Center	1,500	60
Residence	Along Odell Road (28)	500[1] - 1,500	90 - 60
	Vansville (~393)	800 - 1,500	66 - 60
BARC Facility	All BARC facilities within the ROI (~61)	50 - 1,500	90 - 60

1. Re-construction of the northern segment of Poultry Road between the proposed CPF and Odell Road would likely take 1 to 2 weeks; during this time, construction activities would be as close as 35 feet from off-site residences.

However, six residences along Odell Road could experience noise levels above 72 dBA and potentially approaching 90 dBA for approximately 1 to 2 weeks during re-construction of the northern segment of Poultry Road between the proposed CPF and Odell Road. Four BARC facilities immediately south of the Project Site could also experience noise levels close to 90 dBA while the proposed entrance road is being constructed (see **Figure 2**). These potential construction noise impacts would be maintained at ***less-than-significant adverse levels*** with implementation of the measures identified in **Section 1.4**.

Construction Traffic Noise

The Proposed Action would cause short-term (i.e., only during construction) noise increases in the ROI from heavy trucks and construction workers' privately owned vehicles (POVs) traveling to and from the Project Site via Powder Mill Road. Treasury estimated noise generated by construction vehicles traveling to and from the Project Site using the method described in **Section 1.3.1**.

As stated in **Section 1.2.3,** Treasury assumed that receptors within 50 feet of the ROI's roadways currently experience traffic noise levels of 80 dBA. Proposed Action construction-related increases in vehicle traffic would vary throughout the construction phases and would represent a small fraction of existing traffic volumes in the ROI (see ***Traffic and Transportation Technical Memorandum***). To the extent possible, construction-related heavy trucks would access the Project Site through BARC to minimize the number of noise-sensitive receptors that would be impacted. Based on the estimated noise levels presented in **Table 4** through **Table 6**, noise impacts from construction-related traffic would have a ***less-than-significant adverse impact*** on noise-sensitive receptors (BEP, 2019).

Operation

The Proposed Action would result in operational noise increases in the ROI. The proposed CPF would generate noise from permanent stationary sources, such as emergency generators; heating, ventilating, and air conditioning (HVAC) equipment; and similar types of support equipment.

This noise-generating equipment would be installed inside the proposed CPF or within enclosures adjacent to the proposed CPF. Currency production equipment (e.g., presses) would be fully enclosed within the proposed CPF and would have minimal potential to generate exterior noise.

Permanent equipment would be designed to operate at or below day and nighttime noise thresholds in accordance with the Prince George's County Noise Ordinance. If necessary, CPF personnel would wear appropriate protective gear during loud activities in accordance with OSHA safety requirements to prevent hearing damage or other adverse impacts.

Since operational equipment is proposed to be enclosed and in compliance with regulations, the proposed CPF operation would have a ***negligible adverse impact*** on noise in the ROI. Estimated noise levels are conservative because some of the noise generated by operational activities would be minimally shielded by retained (buffer) vegetation (BEP, 2019) (see **Section 1.3.1**).

The Proposed Action would also result in operational noise increases in the ROI from delivery trucks and employees' POVs traveling to and from the Project Site. All vehicle trips to and from the proposed CPF would be routed through BARC along Powder Mill Road; the northern access road along Odell Road would only be used as an emergency exit. The northern access road along Odell Road would not be used as regular access for deliveries or employees. The estimated noise impacts from this operational traffic during daytime and nighttime are as follows:

- **Daytime:** Delivery trucks and employees' POVs would generate ***negligible*** noise levels that are consistent with current daytime conditions.
- **Nighttime:** Truck shipments would generate noise levels that could be considered intrusive during nighttime hours to sensitive receptors in the ROI. These noise levels could reach 90 dBA at 50 feet from the traveled roadway. Based on existing delivery shipments at the DC Facility, Treasury assumed there would be seven heavy truck shipments that would occur between 1:30 a.m. and 8:00 a.m. These truck shipments would be routed through BARC to avoid passing within 50 feet of any noise-sensitive receptors. Further, BARC facilities are generally not occupied during nighttime hours. Therefore, the noise-sensitive receptors around the site (particularly those along Odell Road) may experience ***less-than-significant adverse impacts*** from nighttime shipments due to audible, but not intrusive, truck noise at the proposed CPF.

Finally, as part of the Proposed Action, Treasury would remove the rumble strips from Powder Mill Road within the Project Site, thereby reducing vehicle noise on Powder Mill Road during both day and night. This would constitute a ***beneficial impact*** to nearby noise-sensitive receptors, particularly BARC facilities and nearby residences.

1.4 Impact-Reduction Measures

As part of the Proposed Action, Treasury would implement the following impact-reduction measures to minimize potential adverse noise impacts:

- Prepare and submit a noise-suppression plan to Prince George's County, before construction, that identifies the most appropriate and reasonably available noise-suppression equipment, materials, and methods[3] to reduce noise levels to acceptable levels during construction. With implementation of these noise-suppression methods, construction noise from the Proposed Action would remain below 85 dBA for all noise-sensitive receptors and comply with the Noise Control Act and Prince George's County Noise Ordinance (see **Section 1.2.2**).
- Require construction workers to wear appropriate protective gear during loud activities in accordance with OSHA safety requirements to prevent hearing damage or other adverse impacts.

[3] Examples of noise-suppression techniques include use of temporary sound barriers or acoustic curtains (ANC, 2020).

- Require construction- and operation-related heavy trucks to access the Project Site through BARC to minimize impacts to off-site noise-sensitive receptors.
- Install noise-generating support equipment (e.g., emergency generators and HVAC units) inside the proposed CPF or within enclosures adjacent to the proposed CPF and operate such equipment in accordance with the Prince George's County Noise Ordinance.
- Fully enclose currency production equipment within the proposed CPF in a manner that reduces or avoids exterior noise.

1.5 Mitigation Measures

No project-specific mitigation measures are recommended.

1.6 References

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