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Environmental Statement Addendum 2– Appendix 2 NOAA Tool Inputs and Spreadsheets

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Document Ref: 7.8.2.2

PINS Ref.: EN020022

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Environmental Statement Addendum 2– Appendix 2 NOAA Tool Inputs and Spreadsheets

PINS REF.: EN020022

DOCUMENT: 7.8.2.2

DATE: 25 JANUARY 2021

DOCUMENT

Document	7.8.2.2 Environmental Statement Addendum 2 – Appendix 2 NOAA Tool Inputs and Spreadsheets
Revision	001
Document Owner	Natural Power
Prepared By	K. Grellier
Date	26 November 2020
Approved By	S. Lister
Date	25 January 2021

Appendix 2: National Oceanic and Atmospheric Administration (NOAA) Tool inputs

Tab 'A.1: Vibratory Pile Driving' was used.

Table A1: Scenario 1 - Burgess SPL_12 h

Input		Justification/Source
Weighting Factor Adjustment (kHz)	2.5	NMFS suggested value
Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	155	Burgess (2005) - greatest 'more typical' received SPL
Number of piles within 24-h period	1	Project: Assumption = continuous vibro-hammering for one 12 h shift per day
Duration to drive a single pile (minutes)	720	12 h = 720 min
Transmission loss coefficient	15	NMFS suggested value (e-mail response from NOAA dated 13/11/2020)
Distance of sound pressure level (L_{rms}) measurement (meters)	14	Burgess (2005)

Table A2: Scenario 2 - Burgess SPL_24 h (considered to represent the ML scenario)

Input		Justification/Source
Weighting Factor Adjustment (kHz)	2.5	NMFS suggested value
Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	155	Burgess (2005) - greatest 'more typical' received SPL
Number of piles within 24-h period	1	Project: Assumption = continuous vibro-hammering for two 12 h shifts per day
Duration to drive a single pile (minutes)	1440	24 h = 1440 min
Transmission loss coefficient	15	NMFS suggested value (e-mail response from NOAA dated 13/11/2020)
Distance of sound pressure level (L_{rms}) measurement (meters)	14	Burgess (2005)

Table A3: Scenario 3 - W&H SPL_12 h

Input		Justification/Source
Weighting Factor Adjustment (kHz)	2.5	NMFS suggested value
Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	152	Watson & Hillhouse (2019)
Number of piles within 24-h period	1	Project: Assumption = continuous vibro-hammering for one 12 h shift per day
Duration to drive a single pile (minutes)	720	12 h = 720 min
Transmission loss coefficient	15	NMFS suggested value (e-mail response from NOAA dated 13/11/2020)
Distance of sound pressure level (L_{rms}) measurement (meters)	5	Watson & Hillhouse (2019)

Table A4: Scenario 4 - W&H SPL_24 h

Input		Justification/Source
Weighting Factor Adjustment (kHz)	2.5	NMFS suggested value
Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	152	Watson & Hillhouse (2019)
Number of piles within 24-h period	1	Project: Assumption = continuous vibro-hammering for two 12 h shifts per day
Duration to drive a single pile (minutes)	1440	24 h = 1440 min
Transmission loss coefficient	15	NMFS suggested value (e-mail response from NOAA dated 13/11/2020)
Distance of sound pressure level (L_{rms}) measurement (meters)	5	Watson & Hillhouse (2019)

Table A5: Scenario 5 - max Burgess SPL_24 h

Input		Justification/Source
Weighting Factor Adjustment (kHz)	2.5	NMFS suggested value
Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	161	Burgess (2005) - max received SPL
Number of piles within 24-h period	1	Project: Assumption = continuous vibro-hammering for two 12 h shifts per day
Duration to drive a single pile (minutes)	1440	24 h = 1440 min
Transmission loss coefficient	15	NMFS suggested value (e-mail response from NOAA dated 13/11/2020)
Distance of sound pressure level (L_{rms}) measurement (meters)	14	Burgess (2005)

Table A6: Scenario 6 - Blackwell SPL_24 h

Input		Justification/Source
Weighting Factor Adjustment (kHz)	2.5	NMFS suggested value
Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	164	Blackwell (2005) – greatest mean SPL (rms)
Number of piles within 24-h period	1	Project: Assumption = continuous vibro-hammering for two 12 h shifts per day
Duration to drive a single pile (minutes)	1440	24 h = 1440 min
Transmission loss coefficient	15	NMFS suggested value (e-mail response from NOAA dated 13/11/2020)
Distance of sound pressure level (L_{rms}) measurement (meters)	56	Blackwell (2005)

Table A7: Scenario 7 - Graham SPL_24 h (considered to represent the WC scenario)

Input		Justification/Source
Weighting Factor Adjustment (kHz)	2.5	NMFS suggested value
Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	192	Graham *et al*. (2017) – rms source level
Number of piles within 24-h period	1	Project: Assumption = continuous vibro-hammering for two 12 h shifts per day
Duration to drive a single pile (minutes)	1440	24 h = 1440 min
Transmission loss coefficient	15	NMFS suggested value (e-mail response from NOAA dated 13/11/2020)
Distance of sound pressure level (L_{rms}) measurement (meters)	1	Graham *et al*. (2017) – source level assumed to be 1 m away from the source as per the definition provided in NOAA (2018; Appendix E Glossary)

Scenario 1

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AQUIND
PROJECT/SOURCE INFORMATION	Vibro-hammering work at the marine HDD exit Scenario 1
Please include any assumptions	
PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[x]	2.5	default value

[x] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	155
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	720
Duration of Sound Production within 24-h period (seconds)	43200
10 Log (duration of sound production)	46.35
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	14

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	199	198	173	201	219
PTS isopleth to threshold (meters)	**20.0**	**1.8**	**29.5**	**12.1**	**0.9**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Scenario 2

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AQUIND
PROJECT/SOURCE INFORMATION	Vibro-hammering work at the marine HDD exit Scenario 2 (ML)
Please include any assumptions	
PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Weighting Factor Adjustment (kHz)¥	2.5	default value

¥ Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	155
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	1440
Duration of Sound Production within 24-h period (seconds)	86400
10 Log (duration of sound production)	49.37
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	14

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS isopleth to threshold (meters)	**31.7**	**2.8**	**46.8**	**19.3**	**1.4**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment valu
they need to make sure to download another copy
to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Scenario 3

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AQUIND	
PROJECT/SOURCE INFORMATION	Vibro-hammering work at the marine HDD exit Scenario 3	
Please include any assumptions		
PROJECT CONTACT		

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2.5	default value

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	152
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	720
Duration of Sound Production within 24-h period (seconds)	43200
10 Log (duration of sound production)	46.35
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	5

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	199	198	173	201	219
PTS isopleth to threshold (meters)	**4.5**	**0.4**	**6.6**	**2.7**	**0.2**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Scenario 4

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AQUIND
PROJECT/SOURCE INFORMATION	Vibro-hammering work at the marine HDD exit Scenario 4
Please include any assumptions	
PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2.5	default value

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	152
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	1440
Duration of Sound Production within 24-h period (seconds)	86400
10 Log (duration of sound production)	49.37
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	5

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	199	198	173	201	219
PTS isopleth to threshold (meters)	**7.1**	**0.6**	**10.6**	**4.3**	**0.3**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Scenario 5

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AQUIND
PROJECT/SOURCE INFORMATION	Vibro-hammering work at the marine HDD exit Scenario 5
Please include any assumptions	
PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2.5	default value

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	161
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	1440
Duration of Sound Production within 24-h period (seconds)	86400
10 Log (duration of sound production)	49.37
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	14

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	199	198	173	201	219
PTS isopleth to threshold (meters)	**79.6**	**7.1**	**117.6**	**48.4**	**3.4**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Scenario 6

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AQUIND
PROJECT/SOURCE INFORMATION	Vibro-hammering work at the marine HDD exit Scenario 6
Please include any assumptions	
PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[x]	2.5	default value

[x] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	164
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	1440
Duration of Sound Production within 24-h period (seconds)	86400
10 Log (duration of sound production)	49.37
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	56

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	199	198	173	201	219
PTS isopleth to threshold (meters)	**504.4**	**44.7**	**745.7**	**306.6**	**21.5**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Scenario 7

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	AQUIND
PROJECT/SOURCE INFORMATION	Vibro-hammering work at the marine HDD exit Scenario 7 (WC)
Please include any assumptions	
PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2.5	default value

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	192
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	1440
Duration of Sound Production within 24-h period (seconds)	86400
10 Log (duration of sound production)	49.37
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	1

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	199	198	173	201	219
PTS isopleth to threshold (meters)	**662.6**	**58.7**	**979.6**	**402.7**	**28.3**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (-dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$