APPENDIX J

SITE-SPECIFIC CSM AND ECO-SCOPING FORMS AND GRAPHICS

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORMS AND SCOPING FORMS

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC B- Feature B-DA-003/B-DA-004
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles
⊠ ASTs	
Dispensers/fuel loading racks	Transformers
⊠ Drums	Other:

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🖂 Leaks	Burning
	Other:

Impacted Media (check potentially-impacted media at the site)

Surface soil (0-2 feet bgs*)	⊠ Groundwater
⊠ Subsurface soil (>2 feet bgs)	Surface water
⊠ Air	🗌 Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- $\overline{|X|}$ Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- $\overline{\times}$ Trespasser

 \boxtimes Site visitor

- Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
DRO/RRO, 2-Methylnaphthalene, Naphthalene, and 1,2,4-Trimethylbenz 1,3,5-Trimethylbenzene have been detected in soil (between 0 and 15 for PALs, therefore this pathway is complete.	zene, and eet bgs) at this feature above	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil (Contamination at deeper depths may require evaluation on a s	between 0 and 15 feet below site specific basis.)	w the ground surface? \boxtimes
Can the soil contaminants permeate the skin (see Appendix B	in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
2-Methylnaphthalene and Naphthalene have been detected in soil (bet 2-Methylnaphthalene and Naphthalene are listed in Appendix B of the A compounds that can permeate the skin.	ween 0 and 15 feet bgs). ADEC Guidance document as	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be de or are contaminants expected to migrate to groundwater in the	etected in the groundwater, future?	$\overline{\times}$
Could the potentially affected groundwater be used as a current source? Please note, only leave the box unchecked if DEC has water is not a currently or reasonably expected future source or to 18 AAC 75.350.	nt or future drinking water determined the ground- f drinking water according	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	_
Comments:		
Groundwater is present at this feature on average at 11 feet bgs and is r drinking water source. DRO/RRO, 1-methylnaphthalene, 2-methylnapht 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected in th it has the potential to be used in the future as a source of drinking wate	not currently being used as a halene, naphthalene, he groundwater above PALs and r.	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature B-DA-003/B-DA-004 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Volatile compounds 1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene, and 1,2,4-Trimethylbenzene, and 1,3,5-Trimethylbenzene, as listed in Appendix D of the Guidance document have been detected in the subsurface soil at this feature. Because of wind and limited exposure it is unlikely to impact the current and future receptors, therefore this exposure pathway is

 $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile contaminants 1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene, and 1,2,4-Trimethylbenzene, and 1,3,5-Trimethylbenzene have been detected in at this feature.

 \overline{X}

 $\overline{\times}$

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 11 feet bgs. Contaminants that are known to permeate skin (Appendix B in the guidance document) have been detected in groundwater at this feature. Surface water does not exist at this feature. This exposure pathway is complete.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this feature is not currently being used for indoor household purposes. Volatile contaminants have been detected above the PALs in groundwater at this site. This exposure pathway is complete for future receptors.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete exposure pathway as nonvolatile compounds have not been identified on the toe 2 cm of soil and all metal concentrations have been determined to be representative of background metals concentrations within this feature. This complete exposure pathway is insignificant.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC B- Feature B-DA-003/B-DA-004 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespasse or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c $\overline{\mathbf{A}}$ Direct release to surface soil check soil ✓ Migration to subsurface [check soi Surface Other ✓ Migration to groundwater [Soil check groundwater (0-2 ft bas) \checkmark Volatilization C/F C/F C/F C/F Runoff or erosion Incidental Soil Ingestion C/F C/F rface wai Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil C/F C/F C/F C/F C/F C/F $\overline{}$ Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface \checkmark Migration to groundwater check aroundwater C/F C/F C/F C/F Ingestion of Groundwater C/F Soil Volatilization check air √ (2-15 ft bgs) F C/F C/F C/F C/F Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Other (list):_ F F Inhalation of Volatile Compounds in Tap Water F F Direct release to groundwater \square check groundwater Volatilization check ail ✓ Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water F F F F ✓ Inhalation of Indoor Air \checkmark air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC B- Feature B-DA-005
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	□ Vehicles
☐ ASTs	□ Landfills
Dispensers/fuel loading racks	Transformers
⊠ Drums	Other:
Release Mechanisms (check potential release mecha	nisms at the site)
⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	Other:
Impacted Media (check potentially-impacted media	at the site)
\boxtimes Surface soil (0-2 feet bgs*)	Groundwater
Subsurface soil (>2 feet bgs)	Surface water
Air	🗌 Biota
□ Sediment	Other:
Receptors (check receptors that could be affected by	contamination at the site)
Residents (adult or child)	$\overline{\times}$ Site visitor

- $\overline{|X|}$ Residents (adult or child)
- \overline{X} Commercial or industrial worker
- $\overline{\times}$ Construction worker
- Subsistence harvester (i.e. gathers wild foods)
- $\overline{|X|}$ Subsistence consumer (i.e. eats wild foods)
- \boxtimes Trespasser $\overline{\times}$ Recreational user
- ⊠ Farmer

□ Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
DRO and naphthalene are present in soil (between 0 and 15 feet bgs), th complete.	nerefore this pathway is	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil (Contamination at deeper depths may require evaluation on a s	between 0 and 15 feet below ite specific basis.)	v the ground surface?
Can the soil contaminants permeate the skin (see Appendix B i	in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Direct contact by dermal absorption of contaminants from soil is a consi pathway due to the presence of naphthalene between 0 and 15 feet bgs Appendix B of the ADEC Guidance document as a compound that can p	idered a complete exposure s. Naphthalene is listed in ermeate the skin.	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be de or are contaminants expected to migrate to groundwater in the	etected in the groundwater, future?	X
Could the potentially affected groundwater be used as a curren source? Please note, only leave the box unchecked if DEC has water is not a currently or reasonably expected future source of to 18 AAC 75.350.	t or future drinking water determined the ground- f drinking water according	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	-
Comments:	-	
Groundwater is present at this feature on average at 11 feet bgs and is n drinking water source, however groundwater at this feature has the pot drinking water in the future. Ingestion of groundwater pathway is consid	not currently being used as a ential to be used as a source of dered a complete exposure	

pathway for future receptors.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods?

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature B-DA-005 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per Appendix C are not present at this feature. Therefore, ingestion of wild foods is considered a complete exposure pathway that poses insignificant risk to the

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered a complete exposure pathway with insignificant risk. Even though the volatile compound naphthalene, as listed in Appendix D, has been detected in the surface and subsurface soil at this feature; because of wind and limited exposure, it is unlikely to impact the current and future receptors.

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 $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile contaminant naphthalene has been detected above PALs at this feature.

 \overline{X}

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 11 feet bgs. DRO/RRO has been detected at this feature above ADEC 1/10th the groundwater cleanup levels. This exposure pathway is complete, but insignificant for exposure to contaminants in groundwater.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile contaminant naphthalene has been detected above PALs at this feature.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete exposure pathway as nonvolatile compounds have not been identified on the toe 2 cm of soil and all metal concentrations have been determined to be representative of background metals concentrations within this feature. This complete exposure pathway is insignificant.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC B- Feature B-DA-005 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Site visitors, trespasse or recreational users Construction workers Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c $\overline{\mathbf{A}}$ Direct release to surface soil check soil ✓ Migration to subsurface [check soi Surface Other ✓ Migration to groundwater [Soil check groundwater (0-2 ft bas) \checkmark Volatilization C/F C/F C/F C/F Runoff or erosion Incidental Soil Ingestion C/F C/F rface wai Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil C/F C/F C/F C/F C/F C/F $\overline{}$ Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface \checkmark Migration to groundwater check aroundwater Ingestion of Groundwater F F F F F F Soil Volatilization check air √ (2-15 ft bgs) F C/F C/F C/F C/F Dermal Absorption of Contaminants in Groundwater C/F Uptake by plants or animals check biota 🔽 groundwater Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 Direct release to groundwater \square check groundwater Volatilization check ail ✓ Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water F F F F ✓ Inhalation of Indoor Air \checkmark air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC C- Feature C-GS-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

🗵 USTs	⊠ Vehicles	
🗵 ASTs	□ Landfills	
⊠ Dispensers/fuel loading racks	Transformers	
⊠ Drums	□ Other:	
Release Mechanisms (check potential release mechanisms at the site)		
⊠ Spills	⊠ Direct discharge	
X Leaks	Burning	

Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
□ Subsurface soil (>2 feet bgs)	Surface water
Air	Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- Recreational user

 \boxtimes Site visitor

 \boxtimes Trespasser

🗵 Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
COCs were not detected in surface soil (between 0 and 15 feet bgs) at of the Under 40 Inch Zone, human health cleanup levels and PALs, the but insignificant.	this feature above ADEC 1/10th refore this pathway is complete	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil (Contamination at deeper depths may require evaluation on a	l between 0 and 15 feet below site specific basis.)	w the ground surface?
Can the soil contaminants permeate the skin (see Appendix B	in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Compounds that are known to permeate skin (Appendix B in the guida detected in surface soil at this feature, therefore this pathway is comple	ance document) have not been ete but insignificant .	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future?		\overline{X}
Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the ground-water is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.		$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	_
Comments:		
Groundwater is present at this feature on average at 12 feet bgs COCs PALs, therefore there is no reason to assume groundwater has been efficient to the set of the s	were not detected in soil above fected. This exposure pathway is	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Compounds that are known to have the potential to bioaccumulate (Appendix C in the guidance document) have not been detected in soil at this feature., therefore this pathway is complete yet insignificant.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Volatile COCs were not detected in surface soil (between 0 and 15 feet bgs) at this feature, therefore this pathway is complete but insignificant .

 $\overline{\times}$

 \square

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Volatile COCs were not detected at this feature, therefore this exposure pathway is complete but insignificant.

 \overline{X}

 \square

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete exposure pathway as nonvolatile compounds have not been identified on the toe 2 cm of soil and all metal concentrations have been determined to be representative of background metals concentrations within this feature. This complete exposure pathway is insignificant.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at the site, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC C- Feature C-GS-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespasse or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [check soi Surface Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion rface wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check air Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization check ail Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC C- Feature C-DB-001	
File Number:		
Completed by:	Ahtna Environmental, Inc.	

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	□ Vehicles			
ASTs	□ Landfills			
Dispensers/fuel loading racks	Transformers			
Drums	$\overline{\times}$ Other: Wood, metal, and battery debris.			
Release Mechanisms (check potential release mechanisms at the site)				
⊠ Spills	$\overline{\times}$ Direct discharge			
🗵 Leaks	Burning			

□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	🗌 Biota
□ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \boxtimes Trespasser \boxtimes Recreational user

 \boxtimes Site visitor

🗵 Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete en insignificant risk as no contamination has been identified at this featu	exposure pathway which poses ure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on	a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix)	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this featu	ure pathway which poses ure.
 i) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in the	e detected in the groundwater, he future?
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as
2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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 \square

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature. The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 \overline{X}

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete exposure pathway as nonvolatile compounds have not been identified on the toe 2 cm of soil and all metal concentrations have been determined to be representative of background metals concentrations within this feature. This complete exposure pathway is insignificant.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at the site, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC C- Feature C-DB-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespasse or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [check soi Surface Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion rface wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check air Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization check ail Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC C- Feature C-ST-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles
🗵 ASTs	□ Landfills
Dispensers/fuel loading racks	Transformers
⊠ Drums	Cother:
Release Mechanisms (check potential release mechan	nisms at the site)
⊠ Spills	⊠ Direct discharge
🗵 Leaks	☐ Burning

□ Other:

Impacted Media	(check potentially-impacted media	at the site)
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□ Surface soil (0-2 feet bgs*)	☐ Groundwater
Subsurface soil (>2 feet bgs)	Surface water
Air	🗌 Biota
☐ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \boxtimes Trespasser \boxtimes Recreational user

 \boxtimes Site visitor

🗵 Farmer

□ Other:

^{*} bgs - below ground surface

- 2. Exposure Pathways: (The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) \overline{X}

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is a complete exposure pa the presence of DRO above the PAL in the subsurface soil (between	athway at feature C-ST-001, due to 2 and 15 feet bgs).	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface s (Contamination at deeper depths may require evaluation on	soil between 0 and 15 feet below a site specific basis.)	v the ground surface? \boxtimes
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete]
Comments:		
Direct Contact by dermal absorption is a complete but insignificant listed in Appendix B of the ADEC Guidance document as a compour	exposure pathway since DRO is not nd that can permeate the skin.	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in	e detected in the groundwater, the future?	$\overline{\times}$
Could the potentially affected groundwater be used as a cur source? Please note, only leave the box unchecked if DEC water is not a currently or reasonably expected future source to 18 AAC 75.350.	rrent or future drinking water has determined the ground- ce of drinking water according	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Although no groundwater samples were collected at this feature, a from same boring below the depth interval which indicated DRO is delineation sample was collected from 7-8 feet bgs and all analytica the laboratory LOD. Additionally, based on data gathered at adjacer	confirmation sample was collected present above the PAL. The vertical al results were not detected above nt features, the depth to	

+

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods?

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature C-ST-001 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Volatile COCs (Appendix D in the guidance document) have not been detected in soil at this feature so this exposure pathway is complete but insignificant.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is a complete but insignificant exposure pathway because volatile contaminants were not detected in soil or groundwater at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Compounds that are known to permeate skin (Appendix B in the guidance document) have not been detected at this feature so the exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this feature is not currently being used for indoor household purposes and volatile COCs (Appendix D in the guidance document) have not been detected in groundwater. This exposure pathway is complete but insignificant.

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete but insignificant exposure pathway as the nonvolatile compound DRO has been identified on the top 2 cm of soil, but the site is covered by grass and moss and the generation of dust is unlikely.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at the site, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow AOC C- Feature C-ST-001		<u>Instructions</u> : Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.											
Completed By: Ahtna Environmen	tal, Inc.									(5)			
(1) Check the media that could be directly affected by the release. Check the media that could be directly affected (1) for each medium top arrow and ch (1) if the media a	(2) n identified in (1), follow the leck possible transport leck additional media under locts as a secondary source.	(3) Check all exposure media identified in) (2).	(4) Check all pathways that could be co <u>The pathways identified in this colu</u> agree with Sections 2 and 3 of the h <u>Health CSM Scoping Form</u> .	omplete. mn must Human	Iden expo "F" f futur C	tify the osure p or futu re rece Curre	e recep bathwa re rece ptors, o ent &	tors po y: Ente ptors, or "I" fo & Fu	(5) er "C" fo "C/F" f or insig	ly affec or curre or both inificant e Re / <u>8</u>	ted by ent reco currer t expos cept	each ptors it and ure. O rs
Media Transport	: Mechanisms check soil check soil r check groundwater check air	Exposure M	ledia	Exposure Pathway/F	Route	Residents (advine)	Commercial of Commercial of Commercial Comme	Site visitors, trees	Construction	Farmers or subs:	Subsistence	Other Consum	
Runoff or erosion	check surface water		✓ Incide	ental Soil Ingestion		C/F	C/F	C/F	C/F	C/F	C/F		
Uptake by plants or anin	nals <u>check biota</u>	🔽 soil	✓ Derm	al Absorption of Contaminants f	from Soil	1	I	Ι	Ι	Ι	Ι		
			Inhala	ation of Fugitive Dust			I	I	I	Ι	I		
✓ Unect release to subsurface Subsurface ✓ Soil Volatilization (2-15 ft bgs) Uptake by plants or anim Other (list): Other (list):	r check groundwater	groundwater	✓ Inges ✓ Derm	tion of Groundwater al Absorption of Contaminants i ation of Volatile Compounds in T	n Groundwater Гар Water	F I	F I	F I	F I	F	F		
Ground- water	r check groundwater check air ody check surface water check sediment nals check biota	air	Inhala	ation of Outdoor Air ation of Indoor Air ation of Fugitive Dust			 	 	 		 		
Surface	ter check surface water	surface wate	r Derm	tion of Surface Water al Absorption of Contaminants i	n Surface Water								
Water Sedimentation	check sediment nalscheck biota		Inhala	ation of Volatile Compounds in T	ap Water								
Direct release to sediment Sediment	check sediment	sediment		t Contact with Sediment									
Uptake by plants or anim	nals <u>check biota</u>	D biota	Inges	tion of Wild or Farmed Foods		Ι	Ι	Ι		Ι	Ι		

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC C- Feature C-LT-002
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

🗌 USTs	⊠ Vehicles
⊠ ASTs	□ Landfills
Dispensers/fuel loading racks	Transformers
⊠ Drums	Other: Latrine Plumbing
Deleger Markenstein (about a den die landen aus abo	(1, 1, 2, 2, 3, 4, 5, 3, 3, 4, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5,

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	□ Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	⊠ Groundwater
\boxtimes Subsurface soil (>2 feet bgs)	Surface water
Air	Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

🗵 Residents	(adult o	or child)
-------------	----------	-----------

- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
DRO, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, 1,2,4 1,3,5-trimethylbenzene, xylenes are present above the PALs in the sub feet bgs), therefore this pathway is complete.	-trimethylbenzene, surface soil (between 2 and 15	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soi (Contamination at deeper depths may require evaluation on a	l between 0 and 15 feet below site specific basis.)	w the ground surface?
Can the soil contaminants permeate the skin (see Appendix B	in the guidance document)?	X
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Compounds that are known to permeate skin (Appendix B in the guida detected in soil at this feature. Cumulative Risk calculations suggest th risk, therefore this pathway is complete for current and future receptor	ance document) have been at the COCs pose an acceptable rs but insignificant.	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be d or are contaminants expected to migrate to groundwater in the	letected in the groundwater, e future?	$\overline{\times}$
Could the potentially affected groundwater be used as a currer source? Please note, only leave the box unchecked if DEC has water is not a currently or reasonably expected future source to 18 AAC 75.350.	ent or future drinking water s determined the ground- of drinking water according	X
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Groundwater is present at this feature on average at 12 feet bgs, howe as a drinking water source. DRO, exceeded PALs the groundwater at the pathway is considered a complete exposure pathway as groundwater	ever it is not currently being used his feature during the Phase I, this could potentially be used as a	

future drinking water source.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature C-LT-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per Appendix C are not present at this feature. Therefore, ingestion of wild foods is considered a complete exposure pathway that poses insignificant risk to the

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is a complete but insignificant exposure pathway because, while volatile compounds 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene (Appendix D, ADEC, 2017b) have been detected in soil at this feature, it is unlikely to impact on-site visitors due to wind and limited exposure time. Non-bulk fuel COCs were

 $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile contaminants 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene have been detected in at this feature above PALs.

 \overline{X}

 \overline{X}

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

DRO/RRO have been detected in groundwater at this feature above ADEC 1/10th the groundwater cleanup levels. Groundwater is present at the site on average at 12 feet bgs. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this site is not currently being used for indoor household purposes and volatile compounds (Appendix D in the guidance document) have been detected in soil above PALs. Cumulative Risk calculations suggest that the contaminants pose an acceptable risk, therefore this pathway is complete for current and future receptors but insignificant.

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete exposure pathway as nonvolatile compounds have not been identified on the toe 2 cm of soil and all metal concentrations have been determined to be representative of background metals concentrations within this feature. This complete exposure pathway is insignificant.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at the site, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow AOC C- Feature C-LT-002		<u>Instructions</u> : Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.									
Completed By: Ahtna Environmental, Inc.											
(1) (2) Check the media that could be directly affected by the release For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under	(3) Check all exposure media identified in (2).	Check all pa <u>The pathway</u> agree with S	(4) athways that could be complete. <u>ys identified in this column must</u> Sections 2 and 3 of the Human	Ident expo "F" ft futur C	tify the osure p or futu re rece	e recep bathwa re rece ptors, c ent &	tors po y: Ente ptors, or "I" fo & Fu	(5) >tential >r "C" f "C/F" 1 >r insig Iture	lly affeo or curr for both ynifican e Re	cted by ent rec i currei it expo: cep i	r each eptors nt and sure. tors
(1) if the media acts as a secondary source. Media Transport Mechanisms Direct release to surface soil check soil Surface Migration to subsurface check soil Soil Migration to groundwater check groundwater (0-2 ft hos) Volatilization	Exposure Mec	Health CSM	Scoping Form. ure Pathway/Route	Residents advine_	Commercial of	Site visitors, tro	Construction users	Farmers or survey	Subsistence	Other	
Runoff or erosion <u>check surface water</u>		Incidental Soil Ing	jestion	C/F	C/F	C/F	C/F	C/F	C/F		:
Uptake by plants or animals check biota	🔽 soil	Dermal Absorption	n of Contaminants from Soil	I	Ι	I	I	Ι	Ι		
		Inhalation of Fugit	tive Dust	I	I	Ι	Ι	Ι			1
Image: Construct release to subsurface soil Check soil Subsurface Migration to groundwater Check groundwater Soil Volatilization Check air (2-15 ft bgs) Uptake by plants or animals Check biota Other (list): Other (list): Check biota	groundwater	 Ingestion of Group Dermal Absorption Inhalation of Volation 	ndwater n of Contaminants in Groundwater tile Compounds in Tap Water	F	F I I	F I I	F I	F	F		
Ground- water Flow to surface water body check surface water Uptake by plants or animals check biota Other (list):	air	 ✓ Inhalation of Outd ✓ Inhalation of Indo ✓ Inhalation of Fugit 	loor Air or Air tive Dust	I F I	I F I	I F I	l F I		 		
Direct release to surface water check surface water Surface Volatilization check air Water Sedimentation check sediment Uptake by plants or animals check biota	surface water	Ingestion of Surfa Dermal Absorption Inhalation of Volat	ce Water n of Contaminants in Surface Water tile Compounds in Tap Water								
Other (list): Direct release to sediment Check sediment Sediment Resuspension, runoff, or erosion Other (list): Other (list):	sediment	Direct Contact wit	h Sediment or Farmed Foods								

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC C- Feature C-QT-003
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

 \boxtimes Recreational user

 \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete ex insignificant risk as no contamination has been identified at this featu	exposure pathway which poses ure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on a	bil between 0 and 15 feet below the ground surface a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix)	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this featu	ure pathway which poses ure.
 i) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in the	detected in the groundwater, \boxtimes he future?
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Even though surface water was not sampled, the exposure pathway was de because there were no bodies of water that meet the Phase II RI UFP-QAPP body of more than 100 square feet located within 50 feet downgradient of	etermined to be incomplete 's definition of a "significant contaminated +
3. Ingestion of Wild and Farmed Foods	
Is the site in an area that is used or reasonably could be used for h harvesting of wild or farmed foods?	nunting, fishing, or
Do the site contaminants have the potential to bioaccumulate (see document)?	e Appendix C in the guidance
Are site contaminants located where they would have the potential biota? (i.e. soil within the root zone for plants or burrowing depth groundwater that could be connected to surface water, etc.)	al to be taken up into h for animals, in
If all of the boxes are checked, label this pathway complete:	Complete
Comments:	
The ingestion of wild foods is considered a complete exposure pathway whas no contamination has been identified at this feature.	nich poses insignificant risk
Inhalation- 1. Inhalation of Outdoor Air	
Are contaminants present or potentially present in surface soil be ground surface? (Contamination at deeper depths may require ev	tween 0 and 15 feet below the valuation on a site specific basis.)
Are the contaminants in soil volatile (see Appendix D in the gu	idance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 \square

 \square

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 \overline{X}

 \square

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at the site, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC C- Feature C-QT-003 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [check soi Surface Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion rface wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check air Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota groundwater Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization check ail Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC C- Feature C-ST-011
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles
🖂 ASTs	□ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	Other:
Release Mechanisms (check potential release mecha	nisms at the site)
⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning

□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
□ Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \boxtimes Trespasser \boxtimes Recreational user

 \boxtimes Site visitor

🗵 Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

Г

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete ex insignificant risk as no contamination has been identified at this featu	xposure pathway which poses ure.	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on a	bil between 0 and 15 feet below a site specific basis.)	v the ground surface?
Can the soil contaminants permeate the skin (see Appendix)	B in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this featu	ire pathway which poses ure.	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in the	detected in the groundwater, he future?	X
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water as determined the ground- e of drinking water according	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	
Comments:	-	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	y which poses insignificant risk as	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 $\overline{\times}$

 \square

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 \overline{X}

 \square

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is a complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is a complete but insignificant.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at the site, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow AOC C- Feature C-ST-011		Instructions: Follow the numbered consider contaminant concentration use controls when describing path	direc ons or	tions eng	inee	ow. ring	Do n /lanc	iot 1		
Completed By: Ahtna Environmental, Inc.			ways							
(1) (2) Check the media that could be directly affected by the release. For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.	(3) Check all exposure media identified in (2).	(4) Check all pathways that could be complete. <u>The pathways identified in this column must agree with Sections 2 and 3 of the Human <u>Health CSM Scoping Form</u>.</u>	Iden expo "F" fo futur C	tify the sure pa or future e recep URRE	recep athwa e rece otors, o nt &	tors po /: Ente ptors, pr "I" fc & Fu	(5) itential ir "C" fi "C/F" i or insig I ture	ly affe or curr or boti nificar e Re	cted by rent rec h curren it expo: CEP	each eptors, nt and sure. tors
Media Transport Mechanisms Direct release to surface soil check Surface Migration to subsurface check Soil Migration to groundwater check groundwater (0-2 ft bgs) Volatilization check	Soil Soil ater Gair	Exposure Pathway/Route	Residents (aduits	Commercial or industrictial or	Site visitors, trees	Construction	Farmers or sub-	Subsistens	Other	
Runoff or erosion check surface w		cidental Soil Ingestion	I	Ι	Ι	Ι	Ι	Ι		
Uptake by plants or animals <u>check b</u>		ermal Absorption of Contaminants from Soil	I	Ι	Ι	Ι		Ι		
Direct release to subsurface soil check		nalation of Fugitive Dust		Ι	I					
Soil Volatilization check		gestion of Groundwater	I	Ι	I	Ι	Ι	Ι		1
(2-15 ft bgs) Uptake by plants or animals check b	iota groundwater De	ermal Absorption of Contaminants in Groundwater	I	Ι	Ι	Ι	Ι	Ι		1
Direct release to groundwater check groundw		nalation of Volatile Compounds in Tap Water		Ι	Ι	Ι				
Ground- Volatilization check		nalation of Outdoor Air	I	Ι	Ι	Ι	Ι	Ι		
water Flow to surface water body check surface w	ater air Inf	nalation of Indoor Air	I	Ι	Ι	Ι				
Uptake by plants or animals <u>check b</u> Other (list):		nalation of Fugitive Dust	I	I	I	Ι	Ι	Ι		
Direct release to surface water check surface w		gestion of Surface Water								
Surface Volatilization <u>chec</u>	air surface water De	ermal Absorption of Contaminants in Surface Water								
Water Sedimentation <u>check sedim</u> Uptake by plants or animals <u>check b</u> Other (list):		nalation of Volatile Compounds in Tap Water								
Direct release to sediment check sedin Sediment Resuspension, runoff, or erosion check surface w	nent Dir	rect Contact with Sediment								
Uptake by plants or animals check b		gestion of Wild or Farmed Foods	Ι	I	I	I	Ι	Ι		

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC D- Feature D-TF-002
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	☐ Vehicles
🗵 ASTs	□ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	□ Other:
Release Mechanisms (check potential release mecha	nisms at the site)
⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	Other:
Impacted Media (check potentially-impacted media	at the site)
□ Surface soil (0-2 feet bgs*)	Groundwater
Subsurface soil (>2 feet bgs)	Surface water
Air	🗌 Biota
□ Sediment	□ Other:
Receptors (check receptors that could be affected by	contamination at the site)
Residents (adult or child)	⊠ Site visitor

- $\overline{|X|}$ Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- $\overline{\times}$ Recreational user $\overline{\times}$ Farmer

⊠ Trespasser

Othory

Other:

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is a complete exposure pa the presence of DRO above the PAL in the subsurface soil (between	athway at feature D-TF-002, due to 2 and 15 feet bgs).
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface s (Contamination at deeper depths may require evaluation on	to il between 0 and 15 feet below the ground surface a site specific basis.) \boxtimes
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Direct Contact by dermal absorption of contaminants is a complete since DRO in not listed in Appendix B as a compound that can permo	but insignificant exposure pathway eate the skin.
 b) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in t	e detected in the groundwater, \boxtimes the future?
Could the potentially affected groundwater be used as a cur source? Please note, only leave the box unchecked if DEC I water is not a currently or reasonably expected future sourc to 18 AAC 75.350.	rent or future drinking water has determined the ground- be of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Groundwater is present at this feature and is not currently being use therefore this exposure pathway is complete for current and future r	ed as a drinking water source, receptors.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Even though surface water was not sampled, the exposure pathway was determined to be incomplete because there were no bodies of water that meet the Phase II RI UFP-QAPP's definition of a 'significant body of more than 100 square feet located within 50 feet downgradient of contaminated 3. Ingestion of Wild and Farmed Foods Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) If all of the boxes are checked, label this pathway complete: Comments: Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is anilalation- 1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? <i>If both boxes are checked, label this pathway complete:</i> Complete	Comments:	
 3. Ingestion of Wild and Farmed Foods Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) If all of the boxes are checked, label this pathway complete: Complete Comments: Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is analation-1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? If both boxes are checked, label this pathway complete: Complete 	Even though surface water was not sampled, the exposure pathway was determined to be incomplete because there were no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated	
Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) <i>If all of the boxes are checked, label this pathway complete:</i> Comments: Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is analation-1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? <i>If both boxes are checked, label this pathway complete:</i> Complete: Comple	3. Ingestion of Wild and Farmed Foods	
Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) <i>If all of the boxes are checked, label this pathway complete:</i> Complete Comments: Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is an analytic control of the second terminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contaminants in soil volatile (see Appendix D in the guidance document)? <i>If both boxes are checked, label this pathway complete:</i> Complete	Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods?	
Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) If all of the boxes are checked, label this pathway complete: Comments: Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is nhalation- 1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? If both boxes are checked, label this pathway complete: Complete	Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?	e
If all of the boxes are checked, label this pathway complete: Complete Comments: Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature .Therefore, ingestion of wild foods is nhalation- 1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? If both boxes are checked, label this pathway complete: Complete	Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)	
Comments: Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature .Therefore, ingestion of wild foods is Inhalation- 1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? <i>If both boxes are checked, label this pathway complete:</i> Complete	<i>If all of the boxes are checked, label this pathway complete:</i> Complete	
Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature .Therefore, ingestion of wild foods is inhalation- 1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? <i>If both boxes are checked, label this pathway complete:</i>	Comments:	
Inhalation- 1. Inhalation of Outdoor Air Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? If both boxes are checked, label this pathway complete: Complete	Feature D-TF-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is	
Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) Are the contaminants in soil volatile (see Appendix D in the guidance document)? If both boxes are checked, label this pathway complete:	Inhalation- 1. Inhalation of Outdoor Air	
Are the contaminants in soil volatile (see Appendix D in the guidance document)?If both boxes are checked, label this pathway complete:Complete	Are contaminants present or potentially present in surface soil between 0 and 15 feet below th ground surface? (Contamination at deeper depths may require evaluation on a site specific ba	ne asis.)
If both boxes are checked, label this pathway complete: Complete	Are the contaminants in soil volatile (see Appendix D in the guidance document)?	
	If both boxes are checked, label this pathway complete:	
Comments:	Comments:	

Inhalation of outdoor air is a complete but insignificant exposure pathway because volatile compounds listed in Appendix D have not been detected at this feature.

 \square

 \square

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is a complete but insignificant exposure pathway because volatile contaminants were not detected in soil or groundwater at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Compounds that are known to permeate skin (Appendix B in the guidance document) have not been detected at this feature so the exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Although the groundwater within this feature could potentially be used for indoor household purposes in the future, the COCs at this feature listed is DRO and is not required to be evaluated for the indoor air inhalation pathway.

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Metal concentrations have been determined to be representative of background metals concentrations, therefore this pathway is incomplete.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

Sediment is not present at this feature therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow AOC D- Feature D-TF-002			<u>Instructions</u> : Follow the numbered consider contaminant concentration use controls when describing path	direc ons or ways	tion: r eng	s bel jinee	low. ering	Do r /lanc	not 1		
Completed By: Ahtna Environmental, Inc.								(5)			
(1) (2) Check the media that could be directly affected by the release. (2) For each medium identified in (1), follow the top arrow <u>and</u> check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.	(3) Check all exposure media identified in (2)	?).	(4) Check all pathways that could be complete. <u>The pathways identified in this column must</u> <u>agree with Sections 2 and 3 of the Human</u> <u>Health CSM Scoping Form</u> .	Iden expo "F" f futui	tify the psure p for future re rece Curre	e recep bathwa re rece ptors, ent &	otors po by: Ente optors, or "I" fo & Fu	otential er "C" f "C/F" i or insig Iture	lly affeo for curr for both nifican e Re	cted by ent rece o curren t expos cept	each ptors t and ure. OTS
Media Transport Mechanisms Direct release to surface soil check soil Surface Migration to subsurface check soil Soil Migration to groundwater check groundwater	Exposure Me	edia	Exposure Pathway/Route	sidents	mis or children)	e visitors, tro	ocreational users Instruction	Imers or surf	bsistence	her consum	
(0-2 ft bgs) Volatilization <u>check air</u> Runoff or erosion <u>check surface water</u>		✓ Incide	ntal Soil Ingestion	<u>ଜୁ</u> କୁ C/F	<u>දි/ පි</u> .දූ C/F	/ಸ್ ಕ C/F	/ ථ C/F	/ ድୁ C/F	C/F	/ ð /	
Uptake by plants or animals check biota	soil	Derma	A Absorption of Contaminants from Soil	1	1	1	1	Ι	1		
Other (list):		Inhala	tion of Fugitive Dust	1	1	1	I	Ι	Ι		
Image: Constraint of the second se	groundwater	 ✓ Ingest ✓ Derma ✓ Inhala 	ion of Groundwater Il Absorption of Contaminants in Groundwater tion of Volatile Compounds in Tap Water	F	C/F I	C/F I	C/F I	C/F I	C/F I		
Ground- water Flow to sediment <u>check surface water</u> Uptake by plants or animals <u>check biota</u>	air	Inhala	tion of Outdoor Air tion of Indoor Air tion of Fugitive Dust			 	 	1			
Direct release to surface water check surface water Surface Volatilization check air Water Sedimentation check sediment Uptake by plants or animals check biota	surface water	Derma	on of Surface Water I Absorption of Contaminants in Surface Water tion of Volatile Compounds in Tap Water								
Other (list): Direct release to sediment Check sediment Resuspension, runoff, or erosion Check surface water Uptake by plants or animals Check biota	sediment biota	Direct	Contact with Sediment								

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC E- Feature E-DS-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles
ASTs	⊠ Landfills
Dispensers/fuel loading racks	Transformers
⊠ Drums	Other:

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- $\overline{\boxtimes}$ Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

□ Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete ex insignificant risk as no contamination has been identified at this featu	exposure pathway which poses ure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on a	bil between 0 and 15 feet below the ground surface a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix)	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this featu	ure pathway which poses ure.
 b) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in the	detected in the groundwater, \boxtimes he future?
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

COCs have not been detected in groundwater above 1/10th the ADEC groundwater cleanup levels at this site. Surface water does not exist at this feature. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs (Appendix D in the guidance document) are not present in groundwater at this feature. This exposure pathway is is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

Sediment is not present at this feature therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC E- Feature E-DS-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespasse or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [check soi Surface Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion rface wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil L Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check air Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization check ail Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC E- Feature F-OT-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles			
🗵 ASTs	□ Landfills			
Dispensers/fuel loading racks	Transformers			
⊠ Drums	⊠ Other: Latrine plumbing			
Release Mechanisms (check potential release mechanisms at the site)				
⊠ Spills	⊠ Direct discharge			
🗵 Leaks	Burning			

C Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
□ Subsurface soil (>2 feet bgs)	Surface water
Air	🗌 Biota
□ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

Residents (adult or child)	Site visitor
Commercial or industrial worker	Trespasser
Construction worker	Recreational user
Subsistence harvester (i.e. gathers wild foods)	☐ Farmer

		Subsistence	harvester	(i.e.	gathers	wild	foods)
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- Subsistence consumer (i.e. eats wild foods)
- □ Other:

* bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

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If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete explicitly insignificant risk as no contamination has been identified at this featur	posure pathway which poses re.	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soi (Contamination at deeper depths may require evaluation on a	il between 0 and 15 feet below site specific basis.)	v the ground surface?
Can the soil contaminants permeate the skin (see Appendix B	in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete]
Comments:		
Dermal absorption of contaminants is considered a complete exposure insignificant risk as no contamination has been identified at this featur	e pathway which poses re.	
 a) Ingestion - 1. Ingestion of Groundwater 		
Have contaminants been detected or are they expected to be d or are contaminants expected to migrate to groundwater in the	detected in the groundwater, e future?	
Could the potentially affected groundwater be used as a curre source? Please note, only leave the box unchecked if DEC ha water is not a currently or reasonably expected future source to 18 AAC 75.350.	ent or future drinking water as determined the ground- of drinking water according	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Ingestion of groundwater is considered a complete exposure pathway no contamination has been identified at this feature.	which poses insignificant risk as	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 \square

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

It is highly unlikely that development of this feature will occur in the future due to the feature eroding into the ocean, so that eliminates exposure to groundwater during activities, such as construction and groundwater being used for household purposes. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this feature is not currently being used for indoor household purposes and it is unlikely that development of the feature will ever occur in the future due to the feature eroding into the ocean. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC F- Feature F-OT-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespasse or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [check soi Surface Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion rface wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check air Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 Т Direct release to groundwater \square check groundwater Volatilization check ail Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC J- Feature J-SP-002
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles	
🗵 ASTs		
Dispensers/fuel loading racks	Transformers	
⊠ Drums	□ Other:	
Release Mechanisms (check potential release mechanisms at the site)		
⊠ Spills	⊠ Direct discharge	
🗵 Leaks	Burning	

□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
\boxtimes Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \boxtimes Trespasser \boxtimes Recreational user

 \boxtimes Site visitor

🗵 Farmer

□ Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
DRO was detected in the subsurface soil (between 2 and 15 feet bgs) ab pathway is complete.	ove the PAL, therefore this	-
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil (Contamination at deeper depths may require evaluation on a s	between 0 and 15 feet below site specific basis.)	v the ground surface?
Can the soil contaminants permeate the skin (see Appendix B	in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Direct contact by dermal absorption of contaminants is considered a conposes an insignificant risk since DRO is not listed in Appendix B of the Al CSMs as a compound that can permeate the skin.	mplete exposure pathway that DEC Guidance on Developing	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be de or are contaminants expected to migrate to groundwater in the	etected in the groundwater, future?	$\overline{\times}$
Could the potentially affected groundwater be used as a curren source? Please note, only leave the box unchecked if DEC has water is not a currently or reasonably expected future source or to 18 AAC 75.350.	t or future drinking water determined the ground- f drinking water according	\boxtimes
If both boxes are checked, label this pathway complete:	Complete	
Comments:	,	
Ingestion of groundwater is considered a complete exposure pathway for DRO was detected in groundwater above PALs and it has the potential t source of drinking water.	or future receptors because to be used in the future as a	-

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods?

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Incomplete

+

Comments:

Compounds that are known to have the potential to bioaccumulate (Appendix C in the guidance document) have not been detected in soil at this feature. Therefore, ingestion of wild foods is considered a complete exposure pathway that poses insignificant risk to the current and future

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Volatile COCs were not detected in surface soil (between 0 and 15 feet bgs) at this feature, therefore this pathway is complete but insignificant.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Volatile COCs were not detected at this feature, therefore this exposure pathway is complete but insignificant.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Surface water is not present at the site. Groundwater is present at this feature on average at 11 feet bgs. DRO was detected in groundwater above the PAL. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete but insignificant exposure pathway as the nonvolatile compound DRO has been identified on the top 2 cm of soil, but the site is covered by grass and moss and the generation of dust is unlikely.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC J- Feature J-SP-002 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [check soi Surface Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization C/F C/F C/F C/FC/F C/F Runoff or erosion Incidental Soil Ingestion rface wai Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil $\overline{}$ Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface Migration to groundwater check aroundwater 1 F Ingestion of Groundwater F F F F Soil check air Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 Direct release to groundwater \square check groundwater Volatilization check ail Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC J- Feature J-WH-002
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles		
⊠ ASTs	☐ Landfills		
⊠ Dispensers/fuel loading racks	Transformers		
⊠ Drums	Other:		
Release Mechanisms (check potential release mechanisms at the site)			
⊠ Spills	⊠ Direct discharge		
🗵 Leaks	Burning		
	Other:		

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
Subsurface soil (>2 feet bgs)	Surface water
🖂 Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- $\overline{\boxtimes}$ Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- $\overline{\times}$ Recreational user
- $\overline{\times}$ Farmer

□ Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete exposure naphthalene, and 3,3-dichlorobenzidine being present in the subsurface soi bgs) at concentrations above the PALs, therefore this pathway is complete.	e pathway due to DRO, RRO, l (between 2 and 15 feet	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil betw (Contamination at deeper depths may require evaluation on a site s	ween 0 and 15 feet below specific basis.)	w the ground surface?
Can the soil contaminants permeate the skin (see Appendix B in th	ne guidance document)?	\overline{X}
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Compounds that are known to permeate skin (Appendix B in the guidance of detected above PALs (naphthalene and 3,3-dichlorobenzidine) in soil betwee feature so the exposure pathway is complete.	document) have been en 2 and 15 feet bgs at this	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be detect or are contaminants expected to migrate to groundwater in the future	ted in the groundwater, are?	X
Could the potentially affected groundwater be used as a current or source? Please note, only leave the box unchecked if DEC has dete water is not a currently or reasonably expected future source of dri to 18 AAC 75.350.	future drinking water ermined the ground- inking water according	\boxtimes
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Ingestion of groundwater is considered a complete exposure pathway for fu feature. Groundwater is not currently being used as a drinking water source used in the future, therefore this exposure pathway is considered complete	iture receptors at this but has the potential to be but insignificant.	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods?

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature J-WH-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C, are not present at this feature. Therefore, ingestion of wild foods is considered a

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered a complete exposure pathway with insignificant risk. Even though the volatile compounds (naphthalene) (as listed in Appendix D of the Guidance on Developing Conceptual Site Models) have been detected in the subsurface soil at this feature; because of wind and limited exposure, it is unlikely to impact the current and future recentors.

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 $\overline{\times}$

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile compound, naphthalene was detected above PALS in subsurface soil at this feature.

 \overline{X}

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Dermal exposure to contaminants in groundwater is considered a complete exposure pathway for future receptors at this feature. Groundwater is not currently being used as a drinking water source but has the potential to be used in the future.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this site is not currently being used for indoor household purposes and volatile COCs (Appendix D in the guidance document) have not been detected in groundwater at this feature. This exposure pathway is complete but insignificant.

 \square

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk, as the nonvolatile compounds DRO, RRO, and 3,3-dichlorobenzidine were not detected above PAL in the top 2 cm of soil.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC J- Feature J-WH-002 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Site visitors, trespasse or recreational users Construction workers Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [check soi Surface Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization C/F C/F C/F C/F Runoff or erosion Incidental Soil Ingestion C/F C/F rface wai Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil C/F C/F C/F C/F C/F C/F $\overline{}$ Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface \checkmark Migration to groundwater check aroundwater Ingestion of Groundwater Soil check air √ Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization check ail ✓ Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water F F F F ✓ Inhalation of Indoor Air \checkmark air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sediment Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC J- Feature J-WH-003
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles	
🗵 ASTs	□ Landfills	
⊠ Dispensers/fuel loading racks	Transformers	
⊠ Drums	Conter:	
Release Mechanisms (check potential release mechanisms at the site)		
⊠ Spills	⊠ Direct discharge	
$\overline{ X }$ Leaks	☐ Burning	

 \Box Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
□ Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ☑ Trespasser☑ Recreational user

 \boxtimes Site visitor

🗵 Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

Г

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete explicitly insignificant risk as no contamination has been identified at this featur	posure pathway which poses re.	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soi (Contamination at deeper depths may require evaluation on a	il between 0 and 15 feet below site specific basis.)	v the ground surface?
Can the soil contaminants permeate the skin (see Appendix B	in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete]
Comments:		
Dermal absorption of contaminants is considered a complete exposure insignificant risk as no contamination has been identified at this featur	e pathway which poses re.	
 a) Ingestion - 1. Ingestion of Groundwater 		
Have contaminants been detected or are they expected to be d or are contaminants expected to migrate to groundwater in the	detected in the groundwater, e future?	
Could the potentially affected groundwater be used as a curre source? Please note, only leave the box unchecked if DEC ha water is not a currently or reasonably expected future source to 18 AAC 75.350.	ent or future drinking water as determined the ground- of drinking water according	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Ingestion of groundwater is considered a complete exposure pathway no contamination has been identified at this feature.	which poses insignificant risk as	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 $\overline{\times}$

 \square

 \square

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 \square

 \square

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Dermal exposure of contaminants in groundwater is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this site is not currently being used for indoor household purposes and volatile compounds (Appendix D in the guidance document) have not been detected in groundwater at this feature. This exposure pathway is complete but insignificant.

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow AOC J- Feature J-WH-003				<u>Instructions</u> : Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways										
Completed By: <u>4</u> Date Completed	Ahtna Environmental, Inc. gJanuary 2019		(5)											
(1)(2)Check the media that could be directly affected by the release.For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.		(3) Check all exposure media identified in (.	2).	(4) Check all pathways that could be complete. <u>The pathways identified in this column must</u> agree with Sections 2 and 3 of the Human Health CSM Scoping Form.	Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure. Current & Future Receptors									
Media Surface Soil	Transport Mechanisms	Exposure M	edia	Exposure Pathway/Route	Residents (aduits	Commercial of	Site visitors, tro	Construction users	Farmers or subor	Subsistence	Other			
	Runoff or erosion check surface water	N	Incide	ntal Soil Ingestion	I	I	I	I	Ι	Ι				
	Uptake by plants or animals <u>check biota</u>	D soil		al Absorption of Contaminants from Soil	I	Ι	Ι	Ι	Ι	Ι				
		V V	🗌 Inhala	alation of Fugitive Dust	1	Ι	Ι	Ι	Ι	Ι				
Subsurface Soil (2-15 ft bgs)	Migration to groundwater check groundwater Volatilization check air Uptake by plants or animals check biota Other (list):	N ☐ groundwater V	Ingest Derma Inhala	tion of Groundwater al Absorption of Contaminants in Groundwater tion of Volatile Compounds in Tap Water	 	 	 	 						
Ground- water	Direct release to groundwater check groundwater Volatilization check air Flow to surface water body check surface water Flow to sediment check sediment Uptake by plants or animals check biota Other (list):	air	Inhala	ation of Outdoor Air ation of Indoor Air ation of Fugitive Dust		 	 	 						
	Direct release to surface water check surface water		Ingest	tion of Surface Water										
Surface	Volatilization check air	surface water	Derma	al Absorption of Contaminants in Surface Water										
	Uptake by plants or animals <u>check biota</u>		L Inhala	tion of Volatile Compounds in Tap Water										
Sediment	Direct release to sediment check sediment Resuspension, runoff, or erosion check surface water	sediment	Direct	Contact with Sediment										
	Uptake by plants or animals <u>check biota</u> Other (list):	D biota	Inges	tion of Wild or Farmed Foods	I	I	Ι	I	Ι					

Revised, 10/01/2010
Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-TF-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If t	he box is checked, label this pathway complete:	Complete	
Con	nments:		
Direo bein	t contact by incidental soil ingestion is considered a complete exposure r g present in the subsurface soil (between 2 and 15 feet bgs) at concentrat	oathway, due to DRO ions above PALs.	
2. D	ermal Absorption of Contaminants from Soil		
Are (Con	contaminants present or potentially present in surface soil betwee tamination at deeper depths may require evaluation on a site sp	een 0 and 15 feet belov ecific basis.)	w the ground surface? \boxtimes
Can	the soil contaminants permeate the skin (see Appendix B in the	guidance document)?	
If l	ooth boxes are checked, label this pathway complete:	Complete	
Con	nments:		
Direc insig Conc	t Contact by dermal absorption of contaminants is considered a complete nificant risk since DRO in not listed in Appendix B of the ADEC Guidance c eptual Site Models (ADEC, 2017b) as a compound that can permeate the	e exposure pathway with on Developing skin.	
b) Inges 1. Ir	tion - Igestion of Groundwater		
Have or ar	contaminants been detected or are they expected to be detected e contaminants expected to migrate to groundwater in the future	d in the groundwater, e?	$\overline{\times}$
Coul source wate to 18	d the potentially affected groundwater be used as a current or fuce? Please note, only leave the box unchecked if DEC has deter r is not a currently or reasonably expected future source of drin AAC 75.350.	uture drinking water mined the ground- king water according	$\overline{\times}$
If l	ooth boxes are checked, label this pathway complete:	Complete	
Con	nments:		_
Inge rece used	stion of groundwater is considered a complete exposure pathway at this f otors. Groundwater is not currently being used as a drinking water source in the future.	feature for future but could potentially be	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature M-TF-001 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per Appendix C are not present at this feature. Therefore, ingestion of wild foods is considered a complete exposure pathway that poses insignificant risk to the

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered complete exposure pathway that poses insignificant risk because volatile compounds (Appendix D) have not been detected in soil at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air complete exposure pathway that poses insignificant risk because volatile compounds listed in Appendix D have not been detected at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

DRO/RRO has been detected in groundwater above ADEC 1/10th the groundwater cleanup levels. Groundwater is present at the site on average at 12 feet bgs. This pathway is complete but insignificant

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this site is not currently being used for indoor household purposes and volatile COCs (Appendix D in the guidance document) have not been detected in groundwater at this feature. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is complete exposure pathway that poses insignificant risk because nonvolatile compounds have not been identified in the top 2 cm of soil.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-TF-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Residents (adults or children) Site visitors, trespar or recreational user Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization C/F C/F C/F C/F C/F C/F Runoff or erosion Incidental Soil Ingestion face wa Uptake by plants or animals check biota $\overline{}$ soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface Migration to groundwater check aroundwater 1 F F Ingestion of Groundwater F F F F Soil check ai Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check biota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-SH-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	□ Vehicles	
ASTs	□ Landfills	
Dispensers/fuel loading racks	Transformers	
Drums	⊠ Other: lead batteries	
Release Mechanisms (check potential release mechanisms at the site)		
⊠ Spills	\boxtimes Direct discharge	
🗵 Leaks	Burning	

Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
□ Air	Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \boxtimes Trespasser \boxtimes Recreational user

 \boxtimes Site visitor

 \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete e insignificant risk as no contamination has been identified at this featu	exposure pathway which poses ure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on	oil between 0 and 15 feet below the ground surface? a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this featu	ure pathway which poses ure.
 b) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in t	e detected in the groundwater, he future?
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-SH-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion face wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check ai Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔲 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check biota Other (list):_ **Direct Contact with Sediment** sediment Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-PR-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete exposur 1-methylnaphthalene, and 2- methylnaphthalene being present in the subs 15 feet bgs) at concentrations that exceed PALs.	re pathway, due to DRO, surface soil (between 2 and	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil bet (Contamination at deeper depths may require evaluation on a site	tween 0 and 15 feet below specific basis.)	v the ground surface?
Can the soil contaminants permeate the skin (see Appendix B in t	he guidance document)?	X
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Direct contact by dermal absorption of contaminants from soil is considered pathway due to the presence of 1-methylnaphthalene and 2-methylnaphth bgs. 1-methylnaphthalene and 2-methylnaphthalene in Appendix B as com the skin.	d a complete exposure nalene between 2 and 15 feet npounds that can permeate	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be detect or are contaminants expected to migrate to groundwater in the fut	eted in the groundwater, ure?	$\overline{\mathbf{X}}$
Could the potentially affected groundwater be used as a current of source? Please note, only leave the box unchecked if DEC has det water is not a currently or reasonably expected future source of dr to 18 AAC 75.350.	r future drinking water termined the ground- rinking water according	\boxtimes
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Ingestion of groundwater is considered a complete exposure pathway at th receptors. Groundwater is not currently being used as a drinking water sour used as a future drinking water source at this feature.	is feature for future rce but could potentially be	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature M-PR-001 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per Appendix C, are not present at this feature. Therefore, ingestion of wild foods is considered a complete exposure pathway that poses insignificant risk to the

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered a complete exposure pathway with insignificant risk. Even though the volatile compounds 1-methylnaphthalene and 2-methylnaphthalene, as listed in Appendix D of the Guidance on Developing Conceptual Site Models (ADEC, 2017b), have been detected in the subsurface soil at this feature above PALs: because of wind and limited exposure, it is unlikely to impact

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile contaminants 1-methylnaphthalene and 2-methylnaphthalene have been detected above PALs in at this feature.

 \overline{X}

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Compounds that are known to permeate skin (Appendix B in the guidance document) have not been detected at this feature so the exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this feature is not currently being used for indoor household purposes and volatile COCs (Appendix D in the guidance document) have not been detected in groundwater. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk, as no nonvolatile compound have been identified on the top 2 cm of soil at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-PR-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization C/F C/F C/F C/F C/F Runoff or erosion ✓ Incidental Soil Ingestion C/F face wa Uptake by plants or animals check biota $\overline{}$ soil Dermal Absorption of Contaminants from Soil C/F C/F C/F C/F C/F C/F Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface 1 Migration to groundwater check aroundwater F Ingestion of Groundwater F C/F F F F Soil Volatilization check ai \checkmark (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Direct release to groundwater \square check groundwater Volatilization ✓ Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water F F F F \checkmark air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-PH-001
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \boxtimes Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete e insignificant risk as no contamination has been identified at this feat	exposure pathway which poses ture.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on	oil between 0 and 15 feet below the ground surfacea site specific basis.)
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete expose insignificant risk as no contamination has been identified at this feat	ure pathway which poses ture.
 i) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in t	e detected in the groundwater,
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 $\overline{\times}$

 \square

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

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 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete but insignificant exposure pathway as all metal concentrations have been determined to be representative of background metals concentrations within this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.
4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-PH-001 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion face wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check ai Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔲 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check biota Other (list):_ **Direct Contact with Sediment** sediment Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-UN-002
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
🗵 Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	⊠ Groundwater
⊠ Subsurface soil (>2 feet bgs)	Surface water
Air	Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete contaminants being present in the subsurface soil (between 2 and 1 detected at concentrations above PALs. The cumulative risk calculat concentrations of naphthalene and 2-methylnaphthalene detected	exposure pathway, due to 15 feet bgs). Naphthalene and DRO tions suggest that the onsite pose an acceptable risk.	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface s (Contamination at deeper depths may require evaluation on	soil between 0 and 15 feet below t a site specific basis.)	he ground surface? \boxtimes
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?	X
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Dermal absorption of contaminants is considered a complete exposions insignificant risk. Although naphthalene was detected at the site at been identified as a contaminant that can permeate the skin (Apper suggest that the concentrations of naphthalene and 2-methylnapht	sure pathway that poses concentrations above PALs and has ndix B), cumulative risk calculations thalene detected on-site pose an	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in	e detected in the groundwater, the future?	X
Could the potentially affected groundwater be used as a cur source? Please note, only leave the box unchecked if DEC water is not a currently or reasonably expected future source to 18 AAC 75.350.	rrent or future drinking water has determined the ground- ce of drinking water according	X
If both boxes are checked, label this pathway complete:	Complete	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature M-UN-002 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered a complete exposure pathway that poses insignificant risk. Although naphthalene and 2-methylnaphthalene were detected at the site at concentrations above PALs and has been identified as a volatile compound (Appendix D), cumulative risk calculations suggest that the concentrations of naphthalene detected on-site pose an accentable risk $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway that poses insignificant risk. Although naphthalene and 2-methylnaphthalene were detected at the site at concentrations above the PAL and has been identified as a volatile compound (Appendix D), cumulative risk calculations suggest that the concentrations of naphthalene detected onsite pose an accentable risk

 $\overline{\times}$

 \overline{X}

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Naphthalene is a compound that is known to permeate skin (Appendix B in the guidance document) that has been detected in soil and groundwater at this feature so the exposure pathway is complete for current and future receptors.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this site is not currently being used for indoor household purposes. Naphthalene is a volatile compound (Appendix D in the guidance document) that has been detected in soil and water at this feature above PALs, therefore this exposure pathway is complete for future receptors.

 \times

revised January 2017

 \times

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is complete exposure pathway that poses insignificant risk because nonvolatile compounds have not been identified in the top 2 cm of soil.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow AOC M- Feature M-UN-002				 <u>Instructions</u>: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways. 								
Completed By: Date Complete	Antna Environmental, Inc. d: January 2019				Ider	ntify the	e recep	otors po	(5) otentia	lly affe	cted by	each
(1) (2) Check the media that could be directly affected by the release. Check the media that (1) follow the top arrow <u>and</u> check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.		(3) Check all exposure media identified in (2).		(4) Check all pathways that could be complete. <u>The pathways identified in this column must</u> agree with Sections 2 and 3 of the Human Health CSM Scoping Form.	exposure pathway: Enter "C" for current recepto "F" for future receptors, "C/F" for both current ar future receptors, or "I" for insignificant exposure Current & Future Receptor						tors, nt and sure. tors	
Media Surface Soil (0-2 ft bas)	Transport Mechanisms Direct release to surface soil Migration to subsurface Migration to groundwater Check groundwater Volatilization	Exposure M	edia	Exposure Pathway/Route	Residents	Commercial Commercial	Site visitors +	Construction user	Farmers or suit	Subsistence	Other	
	Runoff or erosion check surface water	1	✓ Incide	ental Soil Ingestion	C/F	C/F	C/F	C/F	C/F	C/F		
	Uptake by plants or animals <u>check biota</u>	🔽 soil	Derm	al Absorption of Contaminants from Soil	I	Ι	Ι	Ι	Ι	Ι		
		'	Inhala	ation of Fugitive Dust		I	Ι	Ι	I	Ι		
Subsurface Soil (2-15 ft bgs)	Direct release to subsurface soil Check soil Migration to groundwater Check groundwater Volatilization check air Uptake by plants or animals Check biota Other (list):	groundwater	 ✓ Inges ✓ Derm ✓ Inhala 	ation of Groundwater al Absorption of Contaminants in Groundwater ation of Volatile Compounds in Tap Water	F F F	C/F C/F F	F F F	F F F	F	F		
Ground- water	Direct release to groundwater check groundwater Volatilization check air Flow to surface water body check surface water Flow to sediment check sediment Uptake by plants or animals check biota Other (list):	<mark>∕ air</mark>	 ✓ Inhala ✓ Inhala ✓ Inhala 	ation of Outdoor Air ation of Indoor Air ation of Fugitive Dust	C/F	C/F I	C/F I	C/F I	C/F	C/F		
Surface Water	Direct release to surface water check surface water Volatilization check air Sedimentation check sediment Uptake by plants or animals check biota	surface water	Derm	tion of Surface Water al Absorption of Contaminants in Surface Water ation of Volatile Compounds in Tap Water								
Sediment	Other (IIST): Direct release to sediment Check sediment Resuspension, runoff, or erosion Check surface water Uptake by plants or animals Check biota	sediment		t Contact with Sediment	1							
L	Other (list):		/				1	1		4		

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-DA-003
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	□ Biota
□ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete e insignificant risk as no contamination has been identified at this featu	exposure pathway which poses ure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on	oil between 0 and 15 feet below the ground surface? a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this feat	ure pathway which poses ure.
 b) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in t	e detected in the groundwater, he future?
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow AOC M- Feature M-DA-003 AOC M- Feature M-DA-003				<u>Instructions</u> : Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.								
Completed By: <u>I</u> Date Completed	January 2019								(5)			
(1) Check the media that could be directly affect by the release.	(2) For each medium identified in (1), follow the top arrow <u>and</u> check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.	(3) Check all exposure media identified in ((2).	(4) Check all pathways that could be complete. <u>The pathways identified in this column must</u> <u>agree with Sections 2 and 3 of the Human</u> <u>Health CSM Scoping Form</u> .	Iden expo "F" f futur	ntify the osure µ for futu re rece Curr (e recep pathwa ire rece ptors, ent &	otors po by: Ente optors, or "I" fo & Fu	otentia er "C" f "C/F" i or insig	lly affer for curr for both inificar e Re	cted by rent rec h curren nt expos cept	each eptors, nt and sure. tors
Media	Transport Mechanisms	Exposure M	edia	Exposure Pathway/Route	/	dren)	kers	l users	Worker,	usiste	unsuo;	
Surface Soil	irect release to surface soil check soil Migration to subsurface Migration to groundwater Check ground				Residents	Commercial	Site visitors	Construction	Farmers or su	Subsistence	Other	
	Runoff or erosion check surface water		Incide	ntal Soil Ingestion	I	I	I	I	1	I		
	Uptake by plants or animals <u>check biota</u>	soil		al Absorption of Contaminants from Soil	I	Ι	Ι	Ι	Ι	I		
		"	🗌 Inhala	tion of Fugitive Dust		Ι	Ι	Ι	Ι	Ι		
Subsurface Soil (2-15 ft bgs)	Interference in the subsurface soil Check soil Migration to groundwater Check groundwater Volatilization Check air Uptake by plants or animals Check blota Other (list):	groundwater	Derma	tion of Groundwater al Absorption of Contaminants in Groundwater tion of Volatile Compounds in Tap Water	 	 	 	 		1		
Ground- water	Volatilization check groundwater check groundwater check groundwater check groundwater check air check air check sufface water body check but to sediment check bota of the check biota of the check b	air	Inhala	tion of Outdoor Air tion of Indoor Air tion of Fugitive Dust	 	 		 	1			
	Direct release to surface water check surface water		Ingest	tion of Surface Water								
Surface	Volatilization check air	surface water	r 🗌 Derma	al Absorption of Contaminants in Surface Water								
	Uptake by plants or animals check biota		Inhala	tion of Volatile Compounds in Tap Water								
Sediment	Direct release to sediment check sediment Resuspension, runoff, or erosion check surface water	sediment	Direct	Contact with Sediment								
	Uptake by plants or animals <u>check biota</u> Other (list):	biota		tion of Wild or Farmed Foods	I	Ι	Ι	Ι		I		

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-WH-004
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	□ Biota
□ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- $\overline{\boxtimes}$ Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \square Trespasser \square P

 \boxtimes Site visitor

- Recreational user
- 🗵 Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete e insignificant risk as no contamination has been identified at this featu	exposure pathway which poses ure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on	oil between 0 and 15 feet below the ground surface? a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this featu	ure pathway which poses ure.
 b) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in t	e detected in the groundwater, he future?
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. Contaminants were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile compounds were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-WH-004 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion face wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check ai Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔲 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check biota Other (list):_ **Direct Contact with Sediment** sediment Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-PR-005
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- $\overline{\boxtimes}$ Commercial or industrial worker
- $\overline{\times}$ Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- \square Trespasser

 \boxtimes Site visitor

- Recreational user
- 🗵 Farmer

Other:

^{*} bgs - below ground surface

- 2. Exposure Pathways: (The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete e insignificant risk as no contamination has been identified at this feat	exposure pathway which poses cure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on	oil between 0 and 15 feet below the ground surface? a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposi insignificant risk as no contamination has been identified at this feat	ure pathway which poses cure.
 i) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in t	e detected in the groundwater,
Could the potentially affected groundwater be used as a cur source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwan no contamination has been identified at this feature.	ay which poses insignificant risk as
2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

COCs have not been detected in groundwater at this site above the PALs. Groundwater is present at the site on average at 12 feet bgs. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

This pathway is complete but insignificant for future receptors. The groundwater at this site is not currently being used for indoor household purposes and COCs are non volatile.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-PR-005 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion face wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check ai Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔲 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check biota Other (list):_ **Direct Contact with Sediment** sediment Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-QT-055
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

	⊠ Vehicles	
🖂 ASTs		
⊠ Dispensers/fuel loading racks	Transformers	_
⊠ Drums	□ Other:	
Delease Mechanisms (check notantial velocies mechanisms at the site)		

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
⊠ Subsurface soil (>2 feet bgs)	Surface water
Air	Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- $\overline{\times}$ Commercial or industrial worker
- $\overline{\times}$ Construction worker
- Subsistence harvester (i.e. gathers wild foods)
- $\overline{|X|}$ Subsistence consumer (i.e. eats wild foods)
- \boxtimes Site visitor \boxtimes Trespasser
- $\overline{\times}$ Recreational user
- $\overline{\times}$ Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete expo naphthalene being present in the subsurface soil (between 2 and 15 feet exceed PALs.	sure pathway, due to DRO and bgs) at concentrations that	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil b (Contamination at deeper depths may require evaluation on a si	between 0 and 15 feet below ite specific basis.)	w the ground surface? $\boxed{\boxtimes}$
Can the soil contaminants permeate the skin (see Appendix B in	n the guidance document)?	X
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Direct contact by dermal absorption of contaminants from soil is consider pathway due to the presence of naphthalene in the subsurface (2-15 feet exceed PALs. Naphthalene is listed in Appendix B as compounds that car	ered a complete exposure t bgs) at concentrations that n permeate the skin.	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be det or are contaminants expected to migrate to groundwater in the f	tected in the groundwater, future?	$\overline{\times}$
Could the potentially affected groundwater be used as a current source? Please note, only leave the box unchecked if DEC has a water is not a currently or reasonably expected future source of to 18 AAC 75.350.	t or future drinking water determined the ground- drinking water according	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Ingestion of groundwater is considered a complete exposure pathway for Groundwater is not currently being used as a drinking water source but of future.	or future receptors. could potentially be used in the	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature M-ST-006 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per Appendix C are not present at this feature. Therefore, ingestion of wild foods is considered a complete exposure pathway that poses insignificant risk to the

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered a complete exposure pathway with insignificant risk. Even though the volatile compounds, naphthalene, as listed in Appendix D of the Guidance on Developing Conceptual Site Models (ADEC, 2017b), have been detected in the subsurface soil at this feature; because of wind and limited exposure, it is unlikely to impact the current and future recentors.

 $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile contaminant, naphthalene, was detected in the subsurface soil at concentrations above the PAL.

 $\overline{\times}$

 \overline{X}

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Dermal exposure to contaminants in groundwater is considered a complete exposure pathway for future receptors. Groundwater is not currently being used as a drinking water source but could potentially be used in the future.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this site is not currently being used for indoor household purposes and volatile COCs (Appendix D in the guidance document) have not been detected in groundwater at this feature. This exposure pathway is complete but insignificant.

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk, as the nonvolatile compound DRO has been identified on the top 2 cm of soil, but the site is covered by grass and moss and the generation of dust is unlikely.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-ST-006 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization C/F C/F C/F C/F C/F Runoff or erosion ✓ Incidental Soil Ingestion C/F face wa Uptake by plants or animals check biota $\overline{}$ soil Dermal Absorption of Contaminants from Soil C/F C/F C/F C/F C/F C/F Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface 1 Migration to groundwater check aroundwater F F Ingestion of Groundwater F F F F Soil Volatilization check ai \checkmark (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization ✓ Inhalation of Outdoor Air Ground-Flow to surface water body check surface wat water \checkmark air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-DA-006
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	□ Biota
□ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

Г

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete ex insignificant risk as no contamination has been identified at this featu	xposure pathway which poses ire.	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on a	il between 0 and 15 feet below a site specific basis.)	the ground surface?
Can the soil contaminants permeate the skin (see Appendix I	B in the guidance document)?	
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Dermal absorption of contaminants is considered a complete exposur insignificant risk as no contamination has been identified at this featu	re pathway which poses ire.	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in th	detected in the groundwater, ne future?	\overline{X}
Could the potentially affected groundwater be used as a curre source? Please note, only leave the box unchecked if DEC has water is not a currently or reasonably expected future source to 18 AAC 75.350.	ent or future drinking water as determined the ground- of drinking water according	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Ingestion of groundwater is considered a complete exposure pathway no contamination has been identified at this feature.	y which poses insignificant risk as	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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 $\overline{\times}$

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

 $\overline{\times}$

 \square

3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in soil, therefore there is no reason to assume groundwater has been effected. This exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

 \square

 \square

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-DA-006 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion face wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check ai Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔲 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check biota Other (list):_ **Direct Contact with Sediment** sediment Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

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Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-DA-023
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	⊠ Vehicles
🖂 ASTs	□ Landfills
Dispensers/fuel loading racks	Transformers
⊠ Drums	□ Other:
	• • • • • • •

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
⊠ Subsurface soil (>2 feet bgs)	Surface water
Air	Biota
Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

\boxtimes Residents	(adult or	child)
-----------------------	-----------	--------

- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- \boxtimes Recreational user
- 🖂 Farmer

Other:

^{*} bgs - below ground surface

- 2. Exposure Pathways: (The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) \overline{X}

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is a complete exposure part methylnaphthalene, and 2-methylnaphthalene being present in sul bgs). at concentrations above PALs. The cumulative risk calculations contaminants present at this feature pose an acceptable risk, however	athway, due to DRO, naphthalene, 1- bsurface soil (between 2 and 15 feet s suggest that the non-bulk fuel ver DRO is also present, there for th T	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface s (Contamination at deeper depths may require evaluation or	soil between 0 and 15 feet below th a site specific basis.)	the ground surface? \boxtimes
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Contaminants (naphthalene, 1- methylnaphthalene, and 2-methyln skin (Appendix B) were detected in the subsurface soil between 2 and calculations suggest that the non-bulk fuel contaminants present arrisk, however DRO is also present at concentrations above the PAL,	aphthalene) that can permeate the nd 15 feet bgs. The cumulative risk t this feature pose an acceptable as such direct contact by dermal	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to b or are contaminants expected to migrate to groundwater in	e detected in the groundwater, the future?	X
Could the potentially affected groundwater be used as a cursource? Please note, only leave the box unchecked if DEC water is not a currently or reasonably expected future source to 18 AAC 75.350.	rrent or future drinking water has determined the ground- ce of drinking water according	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Groundwater at this feature is located at approximately 21 feet, con from approximately 5-10 feet bgs. At this time, contamination does groundwater is not currently being used as a drinking water source bulk fuels, suggest that the contaminants identified on site pose an	ntaminated was identified onsite not reach groundwater and the . Cumulative risk calculations for non acceptable risk, however DRO is	

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2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Compounds that are known to have the potential to bioaccumulate (Appendix C in the guidance document) have not been detected in soil at this feature., therefore this pathway is complete yet insignificant.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered a complete exposure pathway with insignificant risk. Even though the volatile compounds 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene, as listed in Appendix D of the Guidance on Developing Conceptual Site Models (ADEC, 2017b), have been detected in the subsurface soil at this feature: because of wind and limited exposure, it is unlikely to

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a completed exposure pathway for future receptors because the 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene, as listed in Appendix D, have been detected in the subsurface soil at this feature

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater is present at this feature on average at 12 feet bgs. COCs were not detected in groundwater	ater at
this feature.	

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Volatile COCs were not detected in groundwater at this feature, and groundwater at this site is not currently being used for indoor household purposes. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete exposure pathway that poses insignificant risk, as nonvolatile compounds have not been identified on the top 2 cm of soil and all metal concentrations have been determined to be representative of background metals concentrations within this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-DA-023 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization C/F C/F C/F C/F C/F Runoff or erosion ✓ Incidental Soil Ingestion C/F face wa Uptake by plants or animals check biota $\overline{}$ soil Dermal Absorption of Contaminants from Soil C/F C/F C/F C/F C/F C/F Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface 1 Migration to groundwater check aroundwater C/F C/F C/F C/F Ingestion of Groundwater F C/F Soil Volatilization check ai \checkmark (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization ✓ Inhalation of Outdoor Air Ground-Flow to surface water body check surface wat water F F F F \checkmark air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-GS-043
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

USTs	☐ Vehicles	
ASTs		
Dispensers/fuel loading racks	Transformers	
Drums	⊠ Other: buried debris	
Release Mechanisms (check potential release mechanisms at the site)		
⊠ Spills	⊠ Direct discharge	
🗵 Leaks	□ Burning	
	□ Other:	

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	☐ Groundwater
☐ Subsurface soil (>2 feet bgs)	Surface water
Air	□ Biota
□ Sediment	□ Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- ⊠ Trespasser

 \boxtimes Site visitor

- Recreational user
- 🗵 Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -
 - 1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete
Comments:	
Direct contact by incidental soil ingestion is considered a complete e insignificant risk as no contamination has been identified at this featu	exposure pathway which poses ure.
2. Dermal Absorption of Contaminants from Soil	
Are contaminants present or potentially present in surface so (Contamination at deeper depths may require evaluation on	oil between 0 and 15 feet below the ground surface? a site specific basis.)
Can the soil contaminants permeate the skin (see Appendix	B in the guidance document)?
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Dermal absorption of contaminants is considered a complete exposu insignificant risk as no contamination has been identified at this feat	ure pathway which poses ure.
 b) Ingestion - 1. Ingestion of Groundwater 	
Have contaminants been detected or are they expected to be or are contaminants expected to migrate to groundwater in t	e detected in the groundwater, he future?
Could the potentially affected groundwater be used as a curr source? Please note, only leave the box unchecked if DEC h water is not a currently or reasonably expected future source to 18 AAC 75.350.	rent or future drinking water has determined the ground- e of drinking water according
If both boxes are checked, label this pathway complete:	Complete
Comments:	
Ingestion of groundwater is considered a complete exposure pathwa no contamination has been identified at this feature.	ay which poses insignificant risk as

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

The ingestion of wild foods is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of indoor air, or vapor intrusion, considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

COCs have not been detected in groundwater at this feature, therefore this exposure pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

Groundwater at this site is not currently being used for indoor household purposes and volatile compounds (Appendix D in the guidance document) have not been detected in groundwater at this feature. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is considered a complete exposure pathway which poses insignificant risk as no contamination has been identified at this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-GS-043 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization Runoff or erosion Incidental Soil Ingestion face wa Uptake by plants or animals check biota soil Dermal Absorption of Contaminants from Soil Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil check soil П Subsurface Migration to groundwater check aroundwater Ingestion of Groundwater Soil check ai Volatilization (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔲 groundwater Т Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Т Direct release to groundwater \square check groundwater Volatilization Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check biota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:	Fort Morrow AOC M- Feature M-QT-055
File Number:	
Completed by:	Ahtna Environmental, Inc.

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources (check potential sources at the site)

⊠ USTs	⊠ Vehicles
⊠ ASTs	⊠ Landfills
⊠ Dispensers/fuel loading racks	Transformers
⊠ Drums	⊠ Other: Latrine Plumbing

Release Mechanisms (check potential release mechanisms at the site)

⊠ Spills	⊠ Direct discharge
🗵 Leaks	Burning
	□ Other:

Impacted Media (check potentially-impacted media at the site)

□ Surface soil (0-2 feet bgs*)	Groundwater
Subsurface soil (>2 feet bgs)	Surface water
Air	☐ Biota
□ Sediment	Other:

Receptors (check receptors that could be affected by contamination at the site)

- \boxtimes Residents (adult or child)
- \boxtimes Commercial or industrial worker
- \boxtimes Construction worker
- \boxtimes Subsistence harvester (i.e. gathers wild foods)
- \boxtimes Subsistence consumer (i.e. eats wild foods)
- Trespasser

 \boxtimes Site visitor

- Recreational user
- \boxtimes Farmer

Other:

^{*} bgs - below ground surface

- **2. Exposure Pathways:** (*The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".*)
- a) Direct Contact -

b)

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.)

If the box is checked, label this pathway complete:	Complete	
Comments:		
Direct contact by incidental soil ingestion is considered a complete exposure presence of DRO, 1,3-Dinitrobenzene, 1-methylnaphthalene and 2-methylna subsurface soil (between 2 and 15 feet bgs) at concentrations above PALs. No detected at concentrations that exceeded 1/10 the ADEC Table B1, Method T	pathway, due to the phthalene in the phthalene in the ph-bulk fuel analytes were wo, Under 40 Inch Zone,	
2. Dermal Absorption of Contaminants from Soil		
Are contaminants present or potentially present in surface soil betw (Contamination at deeper depths may require evaluation on a site sp	veen 0 and 15 feet below pecific basis.)	v the ground surface? \boxtimes
Can the soil contaminants permeate the skin (see Appendix B in the	e guidance document)?	$\overline{\times}$
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Direct contact by dermal absorption of contaminants from soil is considered pathway since contaminants that can permeate the skin (3-Dinitrobenzene, 1 2-methylnaphthalene, Appendix B, ADEC, 2017b) were detected in the subsu 15 feet bgs. Non-bulk fuel analytes were detected at concentrations that exce	a complete exposure I-methylnaphthalene and Irface soil between 2 and eeded 1/0 the ADEC Table	
Ingestion - 1. Ingestion of Groundwater		
Have contaminants been detected or are they expected to be detected or are contaminants expected to migrate to groundwater in the future	ed in the groundwater, re?	
Could the potentially affected groundwater be used as a current or source? Please note, only leave the box unchecked if DEC has dete water is not a currently or reasonably expected future source of drin to 18 AAC 75.350.	future drinking water rmined the ground- nking water according	X
If both boxes are checked, label this pathway complete:	Complete	
Comments:		
Ingestion of groundwater is considered a complete exposure pathway for fut Groundwater is not currently being used as a drinking water source but could future. No COPCs were detected above the PALs in groundwater samples col Subsurface soil contamination was detected from 3-7.5 feet bgs. Depth to gro	ture receptors. I potentially be used in the lected from this feature. oundwater is between 12	

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

The ingestion of surface water exposure pathway was determined to be incomplete because there are no bodies of water that meet the Phase II RI UFP-QAPP's definition of a "significant body of more than 100 square feet located within 50 feet downgradient of contaminated groundwater" (North Wind,

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or	
harvesting of wild or farmed foods?	

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

If all of the boxes are checked, label this pathway complete:

Complete

Comments:

Feature M-QT-055 is located in an area that could be used by subsistence consumers, however, contaminants determined to bioaccumulate per ADEC's Guidance on Developing Conceptual Site Models Appendix C (ADEC, 2017b), are not present at this feature. Therefore, ingestion of wild foods is

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Inhalation of outdoor air is considered a complete exposure pathway with insignificant risk. Even though the volatile compounds 1-methylnaphthalene and 2-methylnaphthalene, as listed in Appendix D, have been detected in the subsurface soil at this feature above PALs; because of wind and limited exposure, it is unlikely to impact the current and future receptors.

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2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

If both boxes are checked, label this pathway complete:

Complete

Comments:

Currently, no buildings exist within 30 feet of this feature, although the feature could be the site of a building in the future. Inhalation of indoor air, or vapor intrusion, is considered a complete exposure pathway for future receptors because the volatile contaminants 1-methylnaphthalene and 2-methylnaphthalene have been detected in at this feature at above PALs.

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3. Additional Exposure Pathways: (Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

Comments:

RRO has been detected in groundwater above ADEC 1/10th the groundwater cleanup level. Groundwater is present at the site on average at 12 feet bgs. This pathway is complete but insignificant.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The groundwater at this site is not currently being used for indoor household purposes and volatile COCs (Appendix D in the guidance document) have not been detected in groundwater at this feature. This exposure pathway is complete but insignificant.

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Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

Comments:

The inhalation of fugitive dust is a complete but insignificant exposure pathway as nonvolatile compounds have not been identified on the top 2 cm of soil and all metal concentrations have been determined to be representative of background metals concentrations within this feature.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

Comments:

No sediment is present at this feature, therefore, this pathway is incomplete.

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Fort Morrow Instructions: Follow the numbered directions below. Do not AOC M- Feature M-QT-055 consider contaminant concentrations or engineering/land use controls when describing pathways. Completed By: Ahtna Environmental, Inc. Date Completed: January 2019 (5) Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors "F" for future receptors, "C/F" for both current and (1) (2) (4) (3)future receptors, or "I" for insignificant exposure. Check the media that For each medium identified in (1), follow the Check all pathways that could be complete. Check all exposure **Current & Future Receptors** could be directly affected top arrow and check possible transport media identified in (2). The pathways identified in this column must by the release. mechanisms. Check additional media under agree with Sections 2 and 3 of the Human Farmers or subsistence Health CSM Scoping Form. (1) if the media acts as a secondary source. ^{, consumers} Construction workers Site visitors, trespass or recreational users Residents (adults or children) Commercial or industrial workers **Transport Mechanisms Exposure Pathway/Route** Media **Exposure Media** Subsistence _c Direct release to surface soil check soil Migration to subsurface [Surface check soi Other Migration to groundwater Soil check groundwater (0-2 ft bgs) Volatilization C/F C/F C/F C/F C/F Runoff or erosion ✓ Incidental Soil Ingestion C/F face wa Uptake by plants or animals check biota $\overline{}$ soil Dermal Absorption of Contaminants from Soil C/F C/F C/F C/F C/F C/F Other (list): Inhalation of Fugitive Dust Direct release to subsurface soil \checkmark check soil Subsurface 1 Migration to groundwater check aroundwater F Ingestion of Groundwater F C/F F F F Soil Volatilization check ai \checkmark (2-15 ft bgs) Dermal Absorption of Contaminants in Groundwater Uptake by plants or animals check biota 🔽 groundwater Other (list):_ Inhalation of Volatile Compounds in Tap Water 1 1 Direct release to groundwater \square check groundwater Volatilization ✓ Inhalation of Outdoor Air Ground-Flow to surface water body check surface wate water F F F F \checkmark air Inhalation of Indoor Air Flow to sediment Inhalation of Fugitive Dust Uptake by plants or animals check biota Other (list): Ingestion of Surface Water Direct release to surface water check surface water Volatilization check air Dermal Absorption of Contaminants in Surface Water surface water Surface Sedimentation check sediment Water Inhalation of Volatile Compounds in Tap Water Uptake by plants or animals check hiota Other (list):_ **Direct Contact with Sediment** sediment П Direct release to sediment check sedimen Resuspension, runoff, or erosion check surface wate Sediment Uptake by plants or animals check biota biota Ingestion of Wild or Farmed Foods Other (list):_

Revised, 10/01/2010

ECOSCOPING FORMS

Feature B-DA-003 and B-DA-004 Ecoscoping Form

Site Name: Fort Morrow AOC B- Feature B-DA-003 and B-DA-004 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.
- Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).
- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Х	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqu	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site.

Additionally, the total area od POL contaminated surface soil does not exceed one-half acres.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

The low molecular weight PAHs (2-methylnaphthalene and naphthalene) exceed the EPA benchmark values for soil invertebrates (29 mg/kg) but do not exceed the mammalian criteria (100 mg/kg). 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene exceeded the EPA benchmarks for soil invertebrates (0.09 mg/kg and 0.16 mg/kg respectively); no benchmark is available for other ecological terrestrial receptors for these compounds. Contamination was found at the highest levels in subsurface soil (2-3 feet bgs), deeper than the biologically relevant soil depth of 25-30 cm (or approximately 1-foot bgs) (EPA, 2015).



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature B-DA-003/B-DA-004

Feature B-DA-005 Ecoscoping Form

Site Name: Fort Morrow AOC B- Feature B-DA-005 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.	
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).	
	Other site-specific exposure pathways.	
Aquatic Exposure Routes		
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.	
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.	
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.	
	Deposition into sediments from upwelling of contaminated groundwater.	
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.	
	Aquatic plants rooted in contaminated sediments.	
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.	
	Other site-specific exposure pathways.	

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature B-DA-005
Feature C-DB-001 Ecoscoping Form

Site Name: Fort Morrow AOC C - Feature C-DB-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Agu	uotia Exposura Doutos
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contamination has been idenitied at this site.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature C-DB-001

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Feature C-GS-001 Ecoscoping Form

Site Name: Fort Morrow AOC C- Feature C-GS-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature C-GS-001

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Feature C-ST-001 Ecoscoping Form

Site Name: Fort Morrow AOC C- Feature C-ST-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature C-ST-001

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Feature C-LT-002 Ecoscoping Form

Site Name: Fort Morrow AOC C- Feature C-LT-002 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
Other site-specific exposure pathways.
uatic Exposure Routes
Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
Deposition into sediments from upwelling of contaminated groundwater.
Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
Aquatic plants rooted in contaminated sediments.
Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

X Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site.

5. Toxicity Determination

Check all that apply.



Bioaccumulative chemicals are present (see *Policy Guidance on Developing* Conceptual Site Models).

X Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Since contamination was found at the highest levels in subsurface soil (6-7.5 feet bgs), deeper than the biologically relevant soil depth of 25-30 cm (or approximately 1-foot bgs), only minor exposure pathways are present, therefore no further ecological evaluation is necessary.



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature C-LT-002

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Feature C-QT-003 Ecoscoping Form

Site Name: Fort Morrow AOC C- Feature C-QT-003 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.

Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature C-QT-003

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Feature C-ST-011 Ecoscoping Form

Site Name: Fort Morrow AOC C- Feature C-ST-011 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature C-ST-011

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Feature D-TF-002 Ecoscoping Form

Site Name: Fort Morrow AOC D- Feature D-TF-002 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC D- Feature D-TF-002

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Feature E-DS-001 Ecoscoping Form

Site Name: Fort Morrow AOC E- Feature E-DS-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature E-DS-001

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Feature F-OT-001 Ecoscoping Form

Site Name: Fort Morrow AOC F- Feature F-OT-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Χ	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
<u>Aqı</u>	latic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

X Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing* Conceptual Site Models).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature F-OT-001

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Feature J-SP-002 Ecoscoping Form

Site Name: Fort Morrow AOC J- Feature J-SP-002 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature J-SP-002

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Feature J-WH-002 Ecoscoping Form

Site Name: Fort Morrow AOC J- Feature J-WH-002 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Х	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqu	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

X Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing* Conceptual Site Models).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

 \fbox{X} OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Since contamination was found at the highest levels in subsurface soil (2-3 feet bgs), deeper than the biologically relevant soil depth of 25-30 cm (or approximately 1-foot bgs), only minor exposure pathways are present, therefore no further ecological evaluation is necessary.



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature J-WH-002

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Feature J-WH-003 Ecoscoping Form

Site Name: Fort Morrow AOC J- Feature J-WH-003 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with
contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.

Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC C- Feature J-WH-003

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Feature M-PH-001 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-PH-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below. \land

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-PH-001

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Feature M-PR-001 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-PR-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.

- Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqι	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
\square	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

1-Methylnaphthalene and 2-Methylnaphthalene were detected in soils from 3-6 feet bgs. Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

 \overline{X} Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site. Additionally, the total area of POL contaminated surface soil does not exceed one-half acre.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

The maximum detection values do not exceed the EPA benchmark value for total lowmolecular weight PAHs, however, 1-methylnaphthalene and 2-methylnaphthalene exceed the individual benchmark values. Contamination was found at the highest levels in subsurface soil (3-6 ft bgs), deeper than the biologically relevant soil depth of 25-30 cm (or approximately 1-foot bgs) (EPA, 2015).



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-PR-001

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Appendix C: Blank Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-SH-001 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.
- Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).
- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Х	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqu	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Lead is present at the site, however, the total area of the feature is less than one-half acre.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although the soil concentrations of lead in three replicate samples at M-SH-001 exceed the ESV set forth by EPA Region 4, upon further investigation this value is based on exposure to insectivore birds potentially present at the site. The site soil concentrations do not exceed ESVs for soil invertebrates, mammals, or plants, or other avian receptors. M-SH-001 represents just a small fraction of the home or foraging range for the representative species of insectivore birds. When adjusting the ESV to assume M-SH-001 represents 25% of the total foraging area, no site concentration exceeds this value. This indicates the lead concentration in soil does not pose an unacceptable risk to any ecological receptor potentially present at M-SH-001 and further evaluation through an ecological risk assessment is not warranted.



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-SH-001

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Feature M-QT-055 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-QT-055 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-TF-001

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Feature M-UN-002 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-UN-002 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.
- Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).
- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Х	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqu	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

X Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing* Conceptual Site Models).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

 \fbox{X} OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

The maximum detection value for naphthalene and 2-methylnaphthalene do not exceed the benchmark value, as such there is no indicated ecological risk at this site.



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-UN-002

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Feature M-DA-003 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-DA-003 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-DA-003

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Feature M-WH-004 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-WH-004 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-WH-004

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Feature M-PR-005 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-PR-005 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-PR-005

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Feature M-DA-006 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-DA-006 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-DA-006

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Feature M-ST-006 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-ST-006 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.
- Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).
- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Х	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqu	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

X Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing* Conceptual Site Models).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

 \fbox{X} OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

The COPC identified AOC М for feature M-ST-006. benchmarks obtained Napthalene, did not exceed the ecological from EPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018), yet further characterization may be needed.



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-PR-001

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Feature M-DA-023 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-DA-023 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Х	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqu	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site. Additionally, the total area of POL contaminated surface soil does not exceed one-half acre.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

 \fbox{X} OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

The maximum detection values do not exceed the EPA benchmark value for total low-molecular weight PAHs, however, 1-methylnaphthalene and 2-methylnaphthalene exceed the individual benchmark values. Contamination was found at the highest levels in subsurface soil (5-6 ft bgs), deeper than the biologically relevant soil depth of 25-30 cm (or approximately 1-foot bgs) (EPA, 2015).



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-DA-023

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Feature M-GS-043 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-GS-043 Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

Exposure to water-borne contaminants as a result of wading or swimming in
contaminated waters or ingesting contaminated water.

Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
 - Particulates deposited on plants directly or from rain splash.

Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Ααι	uatic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contaminants identified in the UFP-QAPP for ecological soil screening evaluation were detected at this feature.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-GS-043

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Feature M-SH-002 Ecoscoping Form

Site Name: Fort Morrow AOC M- Feature M-QT-055 (M-SH-002) Completed by: Ahtna **Date:** December 2019

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? Check the appropriate box.



Yes – Describe observations below and evaluate all of the remaining sections without taking any off-ramps.

X No – Go to next section.

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

- Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
- Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

- X Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
- A Particulates deposited on plants directly or from rain splash.
- X Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

Х	Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
	Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the <i>Policy Guidance on Developing Conceptual Site Models</i>).
	Other site-specific exposure pathways.
Aqu	atic Exposure Routes
	Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
	Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
	Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
	Deposition into sediments from upwelling of contaminated groundwater.
	Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
	Aquatic plants rooted in contaminated sediments.
	Bioaccumulatives (see the <i>Policy Guidance on Developing Conceptual Site Models</i>) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
	Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No freshwater or marine aquatic exposure.

Terrestrial exposure through soil pathways is possible.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).

Critical habitat or anadromous stream in an area that could be affected by the contamination.

Habitat that is important to the region that could be affected by the contamination.

Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Although some areas of the FUDS do not currently contain the highest quality ecological habitat as a result of historic uses, future land use is assumed to allow for habitat, and use by ecological receptors.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

Endangered or threatened species are present.

The aquatic environment is or could be affected.

Non-petroleum contaminants may be present, or the total area of petroleumcontaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☑ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Threatened or endangered animal and plant species may be present in the vicinity of the FUDS property; however, there is no evidence that threatened or endangered species are or have been utilizing habitat at the site. Additinally, the total ares of POL contaminated surface soil does not exceed one-half acre.

5. Toxicity Determination

Check all that apply.

Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models) and submit it with the form to your DEC project manager.

If neither box is checked, check the box below and submit this form to your DEC project manager.

X OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

The maximum detection values do not exceed the EPA benchmark value for total lowmolecular weight PAHs, however, 1-methylnaphthalene and 2-methylnaphthalene exceed the individual benchmark values. Contamination was found at the highest levels in subsurface soil (3-5 ft bgs), deeper than the biologically relevant soil depth of 25-30 cm (or approximately 1-foot bgs) (EPA, 2015).



Ecological Risk Assessment Conceptual Model - Fort Morrow AOC M- Feature M-QT-055

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ECOLOGICAL SCREENING

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MEMORANDUM

Date: January 31, 2020

То:	Ashley Olson, Ahtna Engineering Services
From:	Stephanie Buss, SPB Consulting
Subject:	Ecological Screening at M-SH-001, Fort Morrow FUDS

Background and Purpose

The only non-bulk fuel contaminant of concern detected at feature M-SH-001 at the Fort Morrow Formerly Used Defense Site (FUDS) at levels that exceeded the site Project Action Level (PAL) was lead, a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) contaminant.

Three incremental sampling methodology (ISM) surface soil replicates were obtained from the feature. Lead was detected at a maximum value of 28.4 milligrams per kilogram (mg/kg) at 0-2 feet below ground surface (bgs). The three lead ISM replicate results in surface soil exceed the background value of 3.1 mg/kg as determined by Geosyntec in their memorandum dated January 6, 2020 (Geosyntec, 2020).

The concentration of lead at M-SH-001 was compared to the ecological screening values (ESV) listed in Table 3 of the United States Environmental Protection Agency (EPA) *Region 4 Ecological Risk Assessment Supplemental Guidance Report* (EPA, 2018). Lead concentrations in all three replicates at M-SH-001 exceed the EPA ESV for avian receptors (11 mg/kg), but do not exceed ecological benchmarks for soil invertebrates, mammals, or plants (Table 1).

Table 1.	Comparison	of Lead Results	to Background a	and Ecological	Screening Values
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Feature	Lead Replicates (0-2 feet bgs)	Ecological Screening Values ^a				
	(mg/kg)	Avian (mg/kg)	Mammalian (mg/kg)	Soil Invertebrate (mg/kg)	Plants (mg/kg)	
AOC M SH-001	12.4 18.1 28.4	11	56	1,700	120g	
Note: a – Table 3 of EPA's Region 4 Ecological Risk Assessment Supplemental Guidance Report (EPA, 2018) Bolded result indicates site ISM replicate concentrations exceeded the ecological screening value. AOC = area of concern bgs = below ground surface mg/kg = milligrams per kilogram						

The purpose of this memorandum is to further evaluate the exceedance of the avian ESV for lead at M-SH-001.

Evaluation of Ecological Screening Values for Lead

The representative avian species selected for each feeding guild at the Fort Morrow FUDS were selected based on the *User's Guide for Selection and Application of Default Assessment Endpoints and Indicator Species in Alaskan Ecoregions* (ADEC, 2008), and are as follows:

- Herbivorous birds represented by the dark-eyed junco (*Junco hyemalis*)
- Invertivorous birds represented by the American robin (Turdus migratorius)
- Carnivorous birds represented by the northern shrike (*Lanius excubitor*)

The avian ESV from Region 4 is based off the EPA's *Ecological Soil Screening Level for Lead* (Eco-SSL; EPA, 2005) for avian ground insectivores, represented by the woodcock. Eco-SSL by avian receptor group are presented in Table 5.2 of the EPA guidance and are shown in Table 2 below. Concentrations of lead at M-SH-001 exceed the ESV for avian ground insectivores but no other avian receptors.

Surrogate Receptor Group	TRV for Lead (mg dw/kg bw/d) ¹	Food Ingestion Rate (FIR) ² (kg dw/kg bw/d)	Soil Ingestion as Proportion of Diet (Ps) ²	Concentration of Lead in Biota Type (i) ^{2,3} (B _i) (mg/kg dw)	Eco-SSL (mg/kg dw) ⁴
Avian herbivore (dove)	1.63	0.190	0.139	$ln(B_i) = 0.561 * ln(Soil_i) - 1.328 where i = plants$	46
Avian ground insectivore (woodcock)	1.63	$\begin{array}{c} 0.214 \\ 0.164 \\ 0.164 \\ 0.164 \\ 0.164 \\ 0.164 \\ 0.100 \\ 0.807 \\$		$ln(B_i) = 0.807 *$ ln(Soil _j) - 0.218 where i = earthworms	11
Avian carnivore (hawk)	1.63	0.0353	0.057	$ln(B_i) = 0.4422 * ln(Soil_j) + 0.0761 where i = mammals$	510

Table 2. Calculation of the Avian Eco-SSLs for Lead

¹ The process for derivation of wildlife TRVs is described in Attachment 4-5 of EPA (2003).

² Parameters (FIR, Ps, Bi values, regressions) are provided in EPA (2003) Attachment 4-1 (revised February 2005).

 ${}^{3}B_{i}$ = Concentration in biota type (i) which represents 100% of the diet for the respective receptor.

⁴ HQ = FIR * (Soil_j * $P_s + B_i$) / TRV) solved for HQ=1 where Soil_j = Eco-SSL (Equation 4-2; EPA, 2003).

Bi = small mammal tissue concentrations

Eco-SSL = ecological soil screening level

FIR = food ingestion rate

i = biota or food type

kg dw/kg bw/d = kilograms dry weight per kilograms bodyweight per day

mg dw/kg bw/d = milligrams dry weight per kilograms bodyweight per day

mg/ kg dw = milligrams per kilogram dry weight

NA = Not Applicable

Ps = soil ingestion as proportion of diet

TRV = toxicity reference values

Source: Table 5.2 of EPA (2005).

The Eco-SSLs were developed assuming an area use factor (AUF) of 100 percent (EPA, 2005), meaning that all the diet for the receptor is from the contaminated area. This happens when the home or foraging range of each receptor is equal to or smaller than the source area being evaluated. However, M-SH-001 is a relatively small source area encompassing approximately 0.08 acres with ISM replicates taken over a one-quarter acre size decision unit.

The home ranges, obtained from the EPA Wildlife Exposure Factors Handbook (EPA, 1993), for representative avian insectivores, including the representative species at the Fort Morrow FUDS and the species used to develop the Eco-SSL, are as follows:

•	American robin	home range = 0.81 hectares (2 acres)
•	American woodcock	home range = 3.1 hectares (7.7 acres)

M-SH-001 represents no more than 12.5 percent of the home range of the representative avian species at Fort Morrow (exposure area [0.25 acres] divided by home range [2 acres and 7.7 acres]).

Since the home range of the representative species is much smaller than M-SH-001, the ESV for the avian insectivore was recalculated assuming only a portion of the bird's diet comes from the site. For the purposes of uncertainty analysis, an AUF of 25 percent was applied to the ecological screening level to provide a more reasonable evaluation when the source area represents such a small portion of the receptor home range. The original and adjusted ESVs are presented in Table 3.

Surrogate Receptor Group	Maximum Site Concentration (mg/kg)	ESV @ AUF=100% (mg/kg dw)	ESV @ AUF=25% (mg/kg dw)			
Avian ground insectivore (woodcock)	28.4	11	55			
Note: Bolded result indicates site ISM replicate concentrations exceeded the ecological screening value. % = percent AUF = area use factor dw = dry weight ESV = ecological screening value mg/kg = milligrams per kilogram						

Table 3. Adjusted Avian ESV for Lead

Conclusions and Recommendations

Although the concentrations of lead in three replicate surface soil samples at M-SH-001 exceed the ESV set forth by EPA Region 4, this value is based on exposure to insectivore birds potentially present at the site. The site soil concentrations do not exceed ESVs for soil invertebrates, mammals, plants, or other avian receptors. M-SH-001 represents just a small fraction of the home or foraging range for the representative species of insectivore birds. When adjusting the ESV to assume M-SH-001 represents 25% of the total foraging area, no site concentration exceeds this adjusted ESV value. This indicates the lead concentration in soil does not pose an unacceptable risk to any ecological receptor potentially present at M-SH-001, and further evaluation through an ecological risk assessment is not warranted.

References

Alaska Department of Environmental Conservation (ADEC), 2008. User's Guide for Selection and Application of Default Assessment Endpoints and Indicator Species in Alaskan Ecoregions.

Geosyntec, 2020. Memorandum: *Background Values for Lead and Hexavalent Chromium from Incremental Sampling Methodology Background Results*. January 6.

United States Environmental Protection Agency (EPA), 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187. December.

EPA, 2005. *Ecological Soil Screening Levels for Lead, Interim Final*. OSWER Directive 9285.7-70. March.

EPA, 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March.

APPENDIX K

REGULATORY APPROVAL