APPENDIX K

Visual Sampling Plan Reports

This page intentionally left blank.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.968 Height/Width)
Semi-major axis length of target area of concern	32.2795 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	32.2795 meters
s	0.968
θ	Random
Output	
P	1.00

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.968 Height/Width)
Semi-major axis length of target area of concern	105.904 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.99 (99% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	105.904 feet
s	0.968
θ	Random
Output	
P	0.99

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

Trial Size	Transect Spacing feet	IA Size Acres	IA Shape	Shape Description	Score
10000	75	1	0.2	ellipse	100
10000	75	1	1	circle	100
10000	75	0.5	0.2	ellipse	99
10000	75	0.5	1	circle	100
10000	75	0.25	0.2	ellipse	97
10000	75	0.25	1	circle	95
10000	75	0.1	0.2	ellipse	91
10000	75	0.1	1	circle	86
10000	150	1	0.2	ellipse	99
10000	150	1	1	circle	100
10000	150	0.5	0.2	ellipse	97
10000	150	0.5	1	circle	99
10000	150	0.25	0.2	ellipse	92
10000	150	0.25	1	circle	89
10000	150	0.1	0.2	ellipse	79
10000	150	0.1	1	circle	67

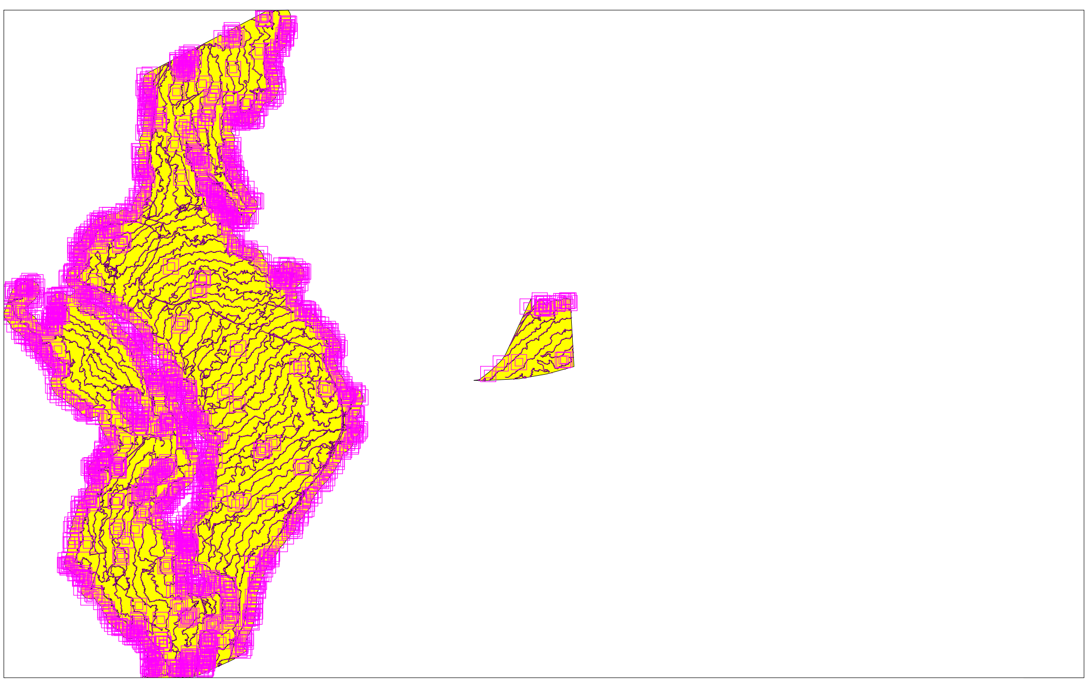
Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	11.3497 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	0.86 (86% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.86 (86% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	11.3497 meters
Output	
P	0.86

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

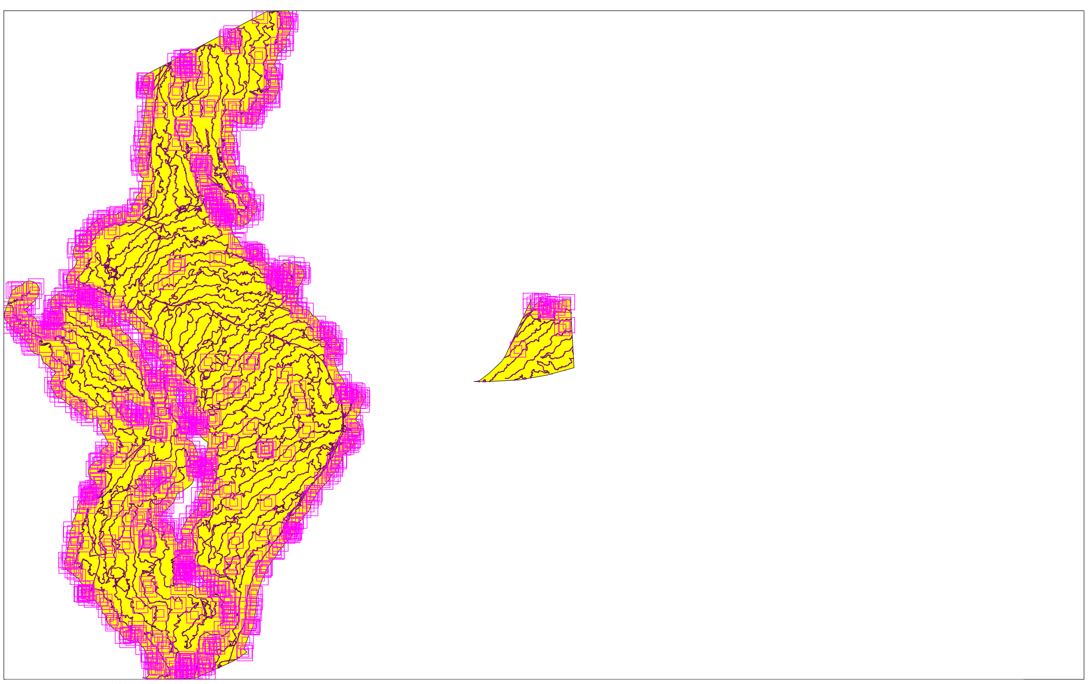
Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	25.3787 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.91 (91% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.91 (91% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	25.3787 meters
s	0.2
θ	Random
Output	
P	0.91

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	35.8909 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	35.8909 meters
Output	
P	1.00

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	80.2544 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	80.2544 meters
s	0.2
θ	Random
Output	
P	1.00

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	25.3787 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	25.3787 meters
Output	
P	1.00

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

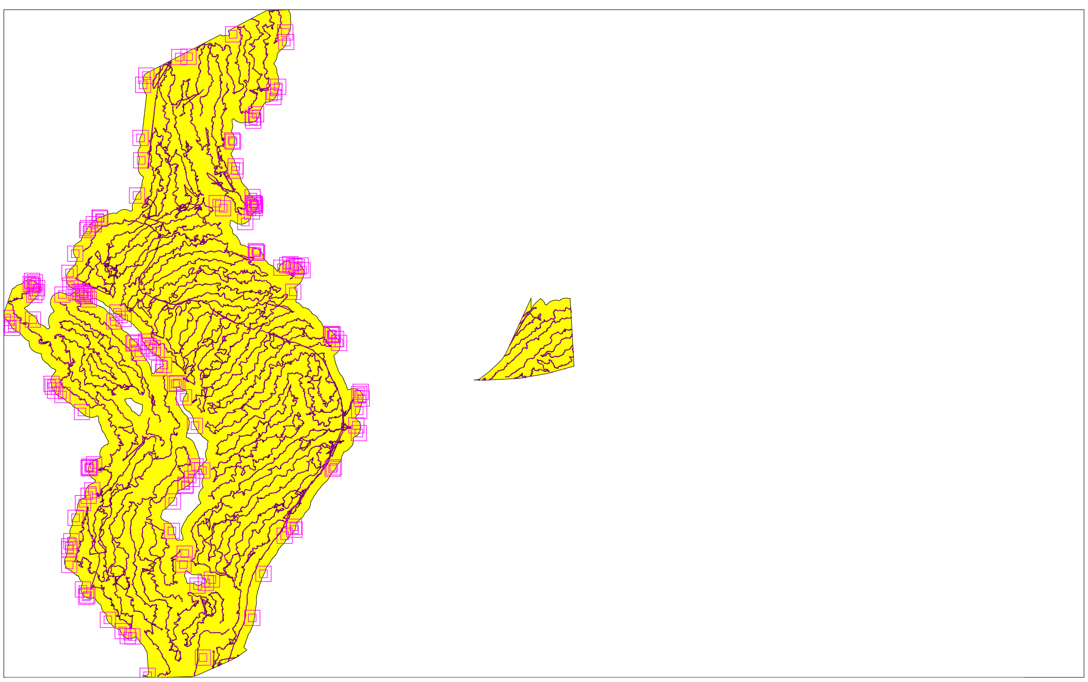
Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	56.7484 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.


Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.99 (99% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	56.7484 meters
s	0.2
θ	Random
Output	
P	0.99

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

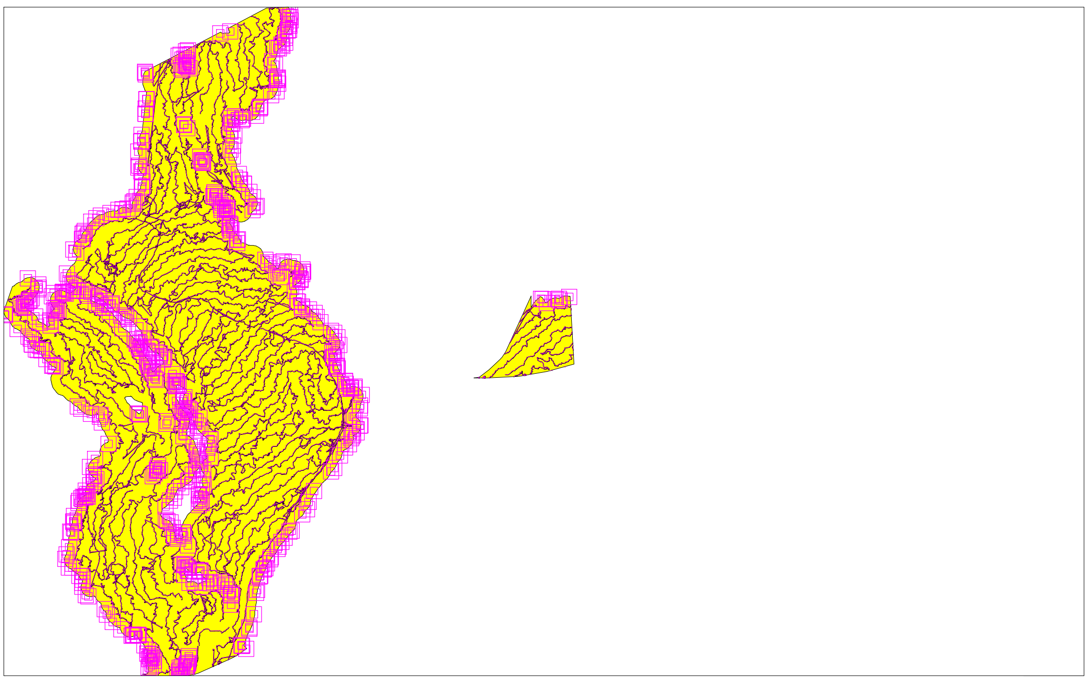
Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	17.9454 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	0.95 (95% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.95 (95% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	17.9454 meters
Output	
P	0.95

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

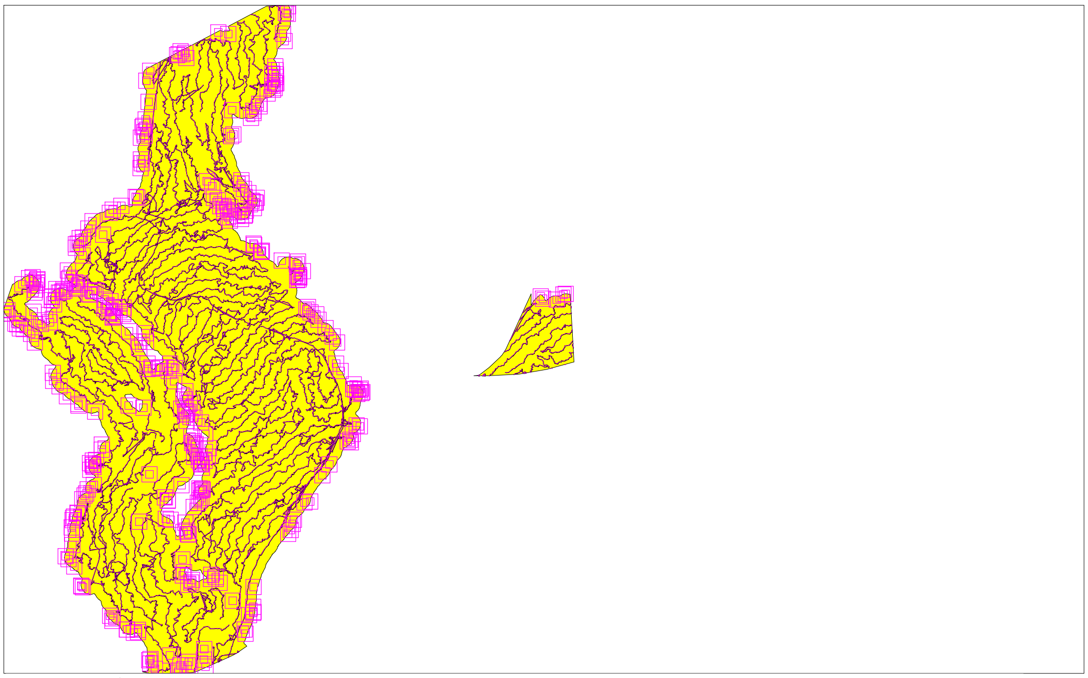
Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	40.1272 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.97 (97% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.97 (97% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	40.1272 meters
s	0.2
θ	Random
Output	
P	0.97

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	37.2365 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	0.67 (67% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.67 (67% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	37.2365 feet
Output	
P	0.67

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	83.2634 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.80 (80% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.8 (80% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	83.2634 feet
s	0.2
θ	Random
Output	
P	0.80

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	117.752 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective

The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	117.752 feet
Output	
P	1.00

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

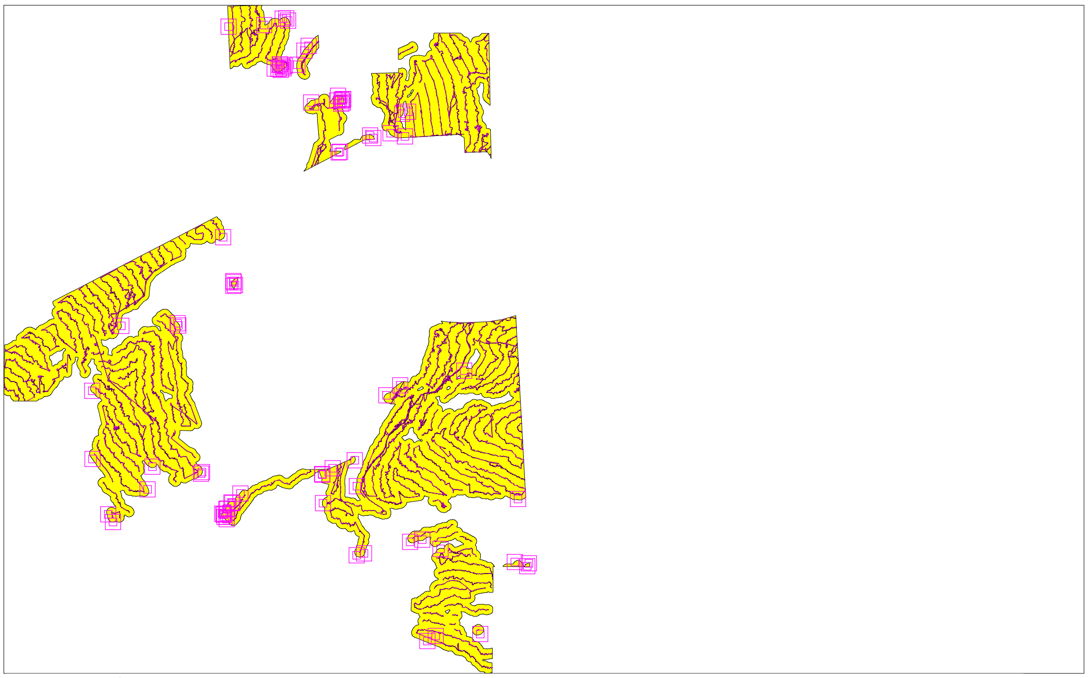
Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	263.302 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.99 (99% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	263.302 feet
s	0.2
θ	Random
Output	
P	0.99

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	83.2634 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.99 (99% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	83.2634 feet
Output	
P	0.99

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	186.183 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.97 (97% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.97 (97% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	186.183 feet
s	0.2
θ	Random
Output	
P	0.97

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

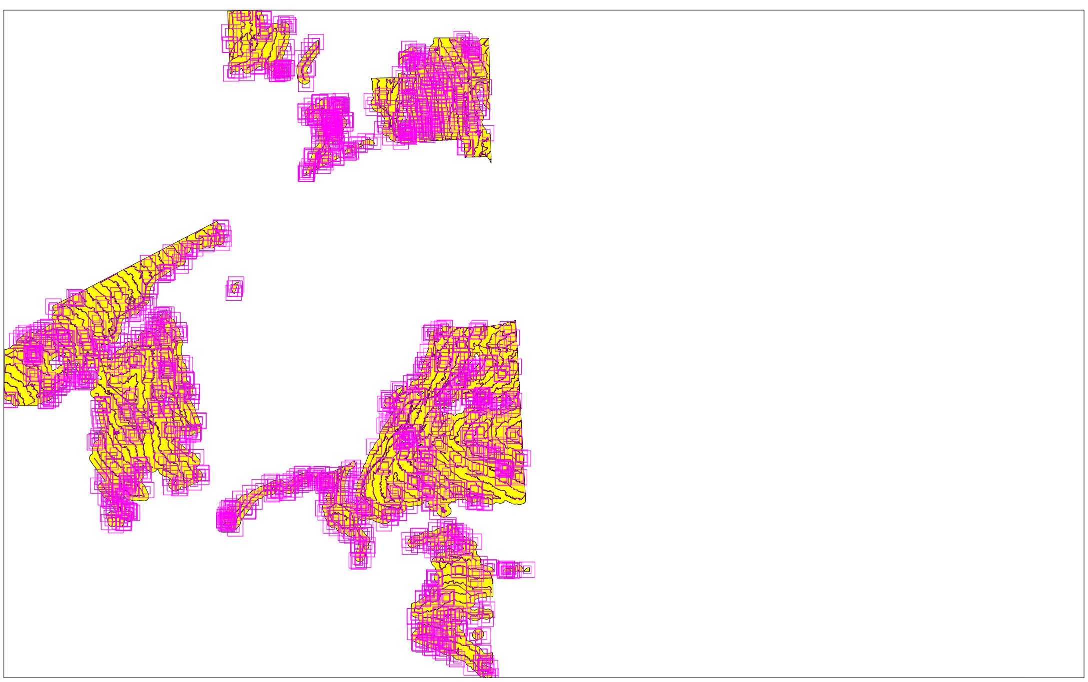
Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	58.8761 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	0.89 (89% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.


Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.89 (89% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	**Value**
Inputs	
n	10000
r	58.8761 feet
Output	
P	0.89

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary
This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	131.651 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.92 (92% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.92 (92% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the n trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	131.651 feet
s	0.2
θ	Random
Output	
P	0.92

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

This report was automatically produced* by Visual Sample Plan (VSP) software version 6.5.
Software and documentation available at http://vsp.pnnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

This page intentionally left blank.

APPENDIX L

Munitions and Explosives of Concern Hazard Assessment Tables

This page intentionally left blank.

MEC HA Summary Information

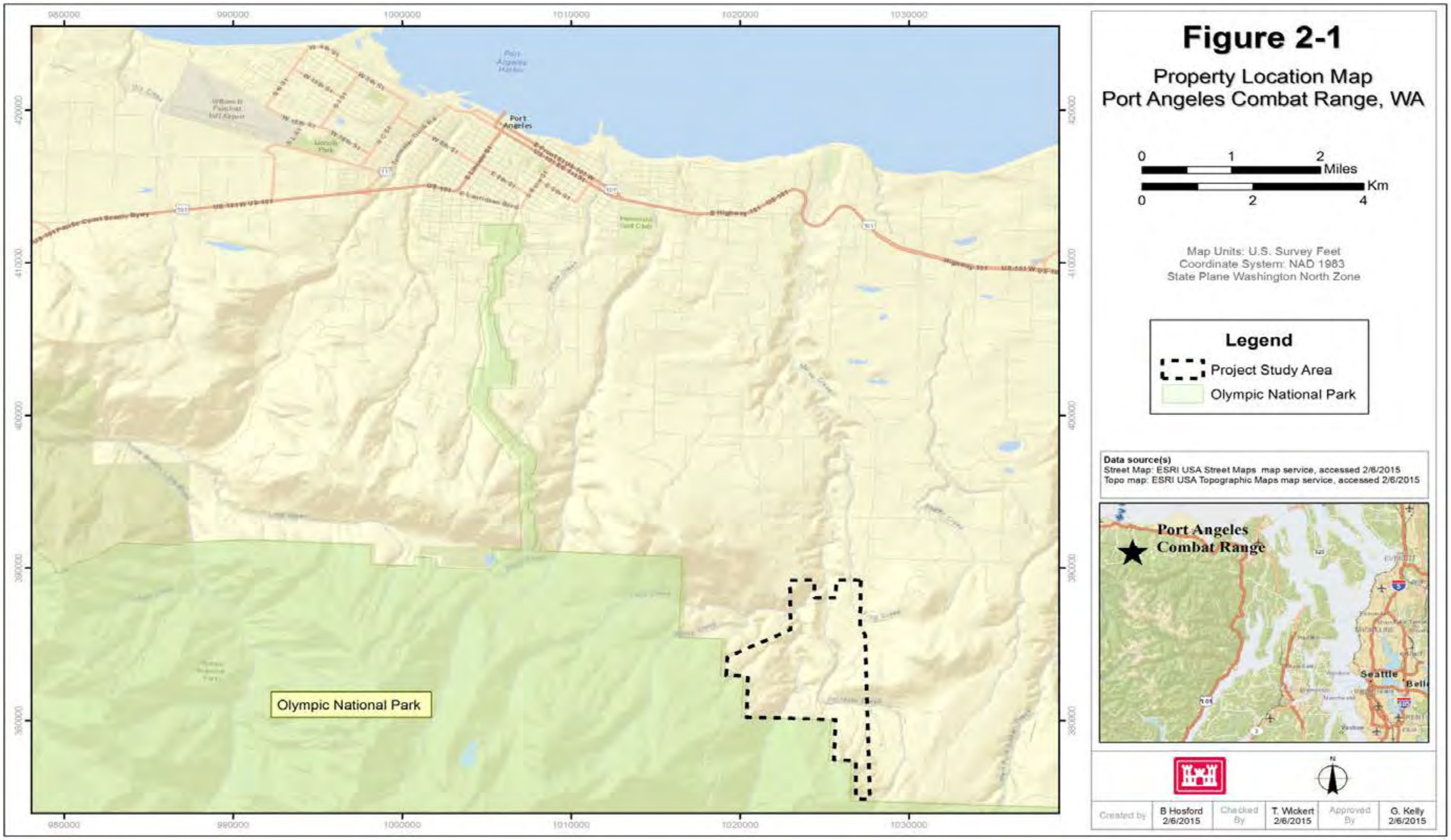
					Comments
Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**				Prepared by: Celeste Marsh, HDR, Inc.
Date:	2/6/2015				Reviewed by: N. Luke, J. Rogalla, HDR, Inc.
Port Angeles Combat Range - Range Complex No. 1 MRS					
Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.					
A. Enter a unique identifier for the site:					
Port Angeles Combat Range - **Range Complex No. 1** MRS					
Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.					
Ref. No.	Title (include version, publication date)				
1	Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013				
2	Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996				
3	Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009				
4	Inventory Project Report - Port Angeles Combat Range, USACE, 1993				
5	Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.				
6	Preliminary Assessment, Port Angeles Combat Range, USACE, Seattle District, 1993				Cannot locate actual PA; may have been an informal process or incorporated into the SI
7	Port Angeles Combat Range, Range Clearance Technology Assessment, U.S. Navy (NEODFC,1986)				
8	Data Collection Report, EM61-MK2 Data Collection and Analysis at the Port Angeles Combat Range, Port Angeles, WA, Environmental Security Technology Certification Program (ESTCP), September, 2011				
9	FDRF-75 mm HE Mk I DB Revision 4/6/13, DDESB				From ESP, HDR, 2013
10	FDRF-81mm M45, DB Revision 4/6/13, DDESB				From ESP, HDR, 2013
11	Explosives Site Plan, HDR, Inc., July 2013				
12	Port Angeles Combat Range RI/FS, HDR Inc., 2015				

				Comments
B. Briefly describe the site:				Another smaller area (north end) was not investigated during the RI (no ROE)
1. Area (include units):	**105.7 acres**			The area within the Olympic National Park was not investigated during the RI (no Right-of-Entry, (ROE))
2. Past munitions-related use:				Ground-to-ground combat range; weapons practice including small arms
Firing Points				

3. Current land-use activities (list all that occur):			
Forest resource management, recreation, limited farming, hunting, perhaps limited fishing, year-round human occupancy, possible wildlife conservation habitat			T&E species critical habitat nearby but not within the PACR
4. Are changes to the future land-use planned?		No	None known
5. What is the basis for the site boundaries?			
The overall site boundaries are the MRS boundaries established at the conclusion of the SI.			There are a number of private inholdings including the City of Port Angeles which maintains the area as a municipal watershed
6. How certain are the site boundaries?			
The reported total area of Range Complex No.1 MRS (2,629 acres) exceeds the total area of the seven sub-ranges combined (2,519 acres). This discrepancy is due to the area of the Impact/Buffer Area extending beyond the FUDS property boundary in the northern portion of the PACR MRS.			For more detail pertaining to the seven subranges, refer to **Table 2-2**, Draft Final Port Angeles Combat Range RI Work Plan
Reference(s) for Part B:			
Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013 **Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996** **Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009** **Inventory Project Report - Port Angeles Combat Range, USACE, 1993** **Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.** **Preliminary Assessment, Port Angeles Combat Range, USACE, Seattle District, 1993** **Port Angeles Combat Range RI/FS, HDR Inc., 2015**	[redacted]		

C. Historical Clearances					
1. Have there been any historical clearances at the site?			Yes, surface clearance		
2. If a clearance occurred:					
	a. What year was the clearance performed?			1949, 1952, 1955, 1956, 1957, 2011, 2013	
	b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):				
	October 1948 to January 1949 - a range clearance was conducted consisting of an inspection and dedudding program for approximately 775 acres thought to be contaminated. The work consisted of using mine detectors to sweep all open fields and known impact/target areas. Trees that were thought to contain projectiles were cut down (PACR SI Report, 2009). **May 7, 1949** - certificate of clearance (Docs. E-5 to E-9) issued noting approx. 775 ac cleared of dangerous/explosive material (USACE, 1996). **September 1952** -personnel from the bomb disposal team swept a 10-acre parcel (Peterson property) in the contaminated area that had been reportedly missed during the 1948-1949 work. No explosives were found. Despite no ordnance or scrap being found, “surface use only” was recommended to remain in place. **September 1956** - A subsurface sweep (max.12-inch depth); the 0.71-acre parcel was carried out by 411 Fort Lewis personnel Sept. 17-21. Considerable scrap metal from a target tank was collected as well as various items of expended ordnance. Items recovered included twenty-six 37mm, M51 rounds; one 37mm, M63 high explosive round; four 414 rusted bodies, M51 fuze type; and three rusted fin fragments, 81mm mortar. **March 1957** - A final clearance certificate indicated that further actions toward clearing the area would not achieve a completely “free and clear” determination. Items recovered were identified as “dangerous &/or explosive materials.” **1986** - Range Clearance Technology Assessment was completed for the PACR (US Navy, 1986). The report concluded that access to virtually all the range is extremely limited due to terrain and vegetation and “Additional mechanical clearance of the range is environmentally, technically, and economically unfeasible at this time or in the foreseeable future”. **2011** - Geophysical investigation, DGM recovered one (1) 37 mm projectile for a 31 ac. parcel survey (ESTCP Report). **2013** – Remedial Investigation/Feasibility Study – conducted DGM, assisted visual surveys on over 700 acres (remainder unsurveyable due to no ROE obtained or steep terrain) ; recovered 5 MEC items (37 mm M63 HE projectiles and considerable MD (HDR, 2014)				
Reference(s) for Part C:					
Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013 **Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996** **Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009** **Inventory Project Report - Port Angeles Combat Range, USACE, 1993** **Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.** **Preliminary Assessment, Port Angeles Combat Range, USACE, Seattle District, 1993** **Port Angeles Combat Range, Range Clearance Technology Assessment, U.S. Navy (NEODFC,1986)** **Data Collection Report, EM61-MK2 Data Collection and Analysis at the Port Angeles Combat Range, Port Angeles, WA, Environmental Security Technology Certification Program (ESTCP), September, 2011** **FDRF-75 mm HE Mk I DB Revision 4/6/13, DDESB** **FDRF-81mm M45, DB Revision 4/6/13, DDESB** **Explosives Site Plan, HDR, Inc., July 2013**			[redacted]		

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)



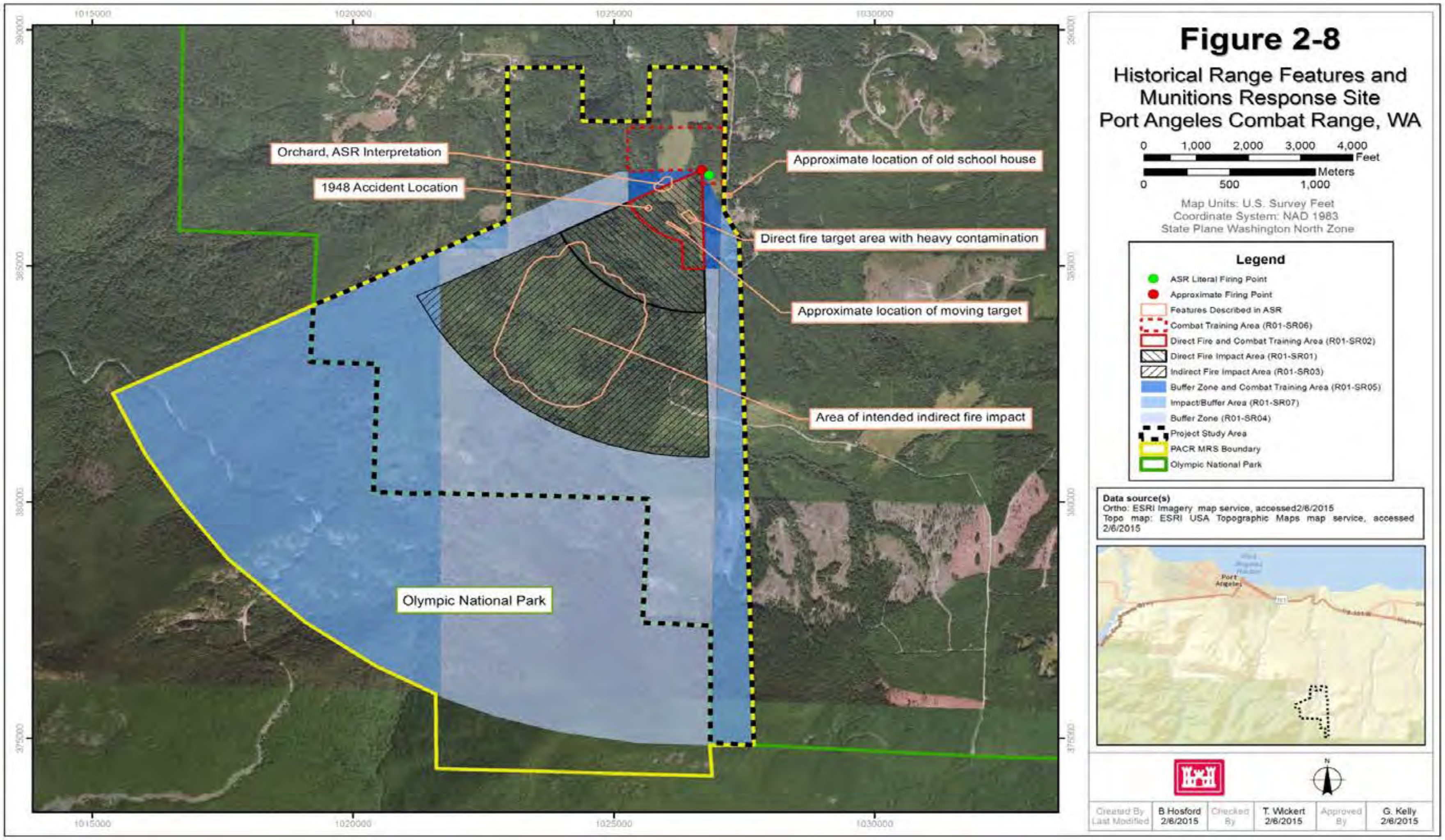
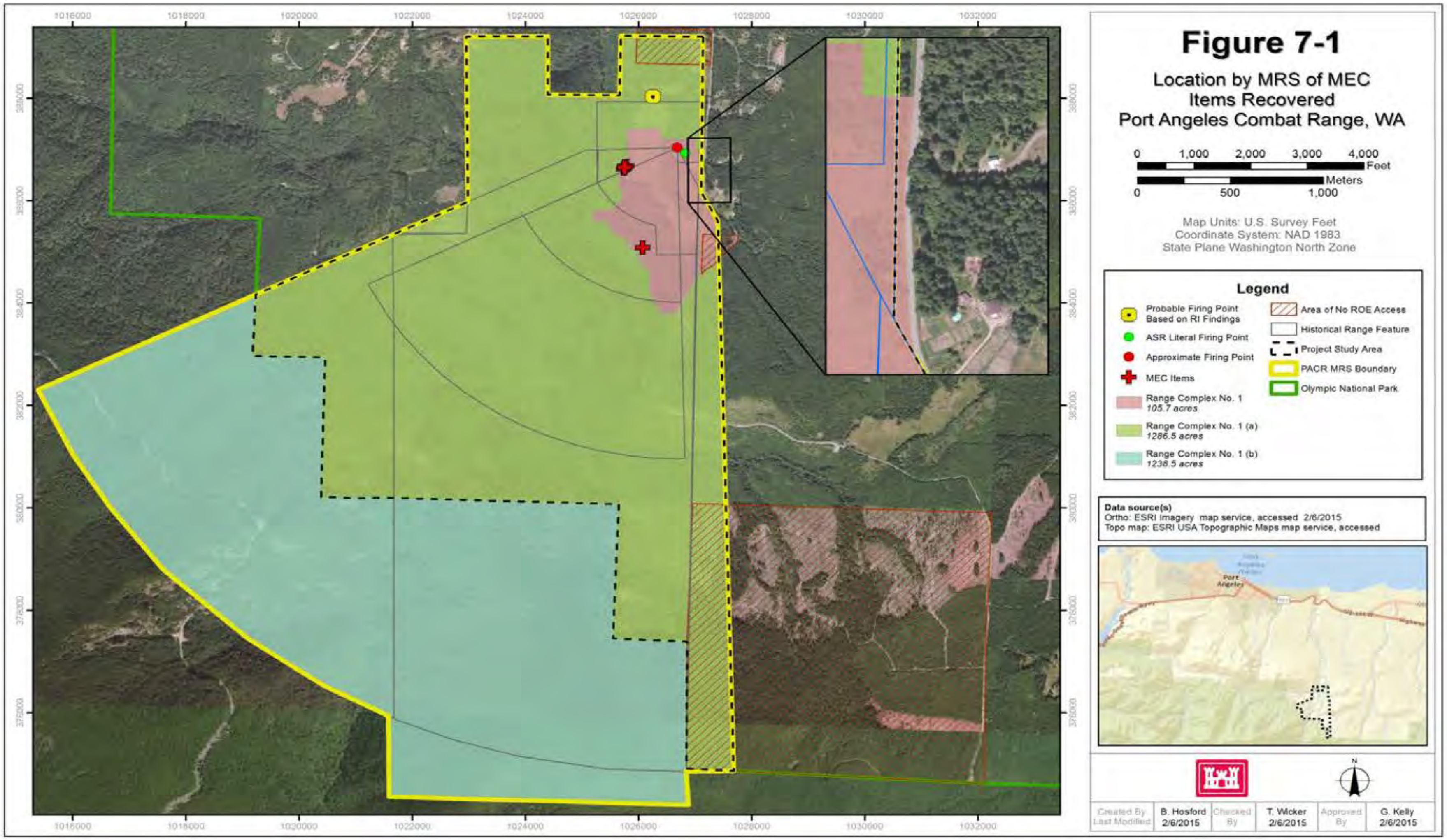


Figure 2-8
Historical Range Features and Munitions Response Site
Port Angeles Combat Range, WA
0 1,000 2,000 3,000 4,000 Feet
0 500 1,000 Meters
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
Legend
ASR Literal Firing Point
Approximate Firing Point
Features Described in ASR
Combat Training Area (R01-SR06)
Direct Fire and Combat Training Area (R01-SR02)
Direct Fire Impact Area (R01-SR01)
Indirect Fire Impact Area (R01-SR03)
Buffer Zone and Combat Training Area (R01-SR05)
Impact/Buffer Area (R01-SR07)
Buffer Zone (R01-SR04)
Project Study Area
PACR MRS Boundary
Olympic National Park
Data source(s)
Ortho: ESRI Imagery map service, accessed2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Orchard, ASR Interpretation
1948 Accident Location
Approximate location of old school house
Direct fire target area with heavy contamination
Approximate location of moving target
Area of intended indirect fire impact
Olympic National Park
Created By Last Modified
B Hosford 2/6/2015
Checked By
T. Wickert 2/6/2015
Approved By
G. Kelly 2/6/2015



Summary Info Worksheet

Site ID: **Port Angeles Combat Range FUDS Property No. F10WA00330**
Date: **2/6/2015**
Port Angeles Combat Range - Range Complex No. 1 MRS

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Mortars	81	mm	M45	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	item suspected - used this listed item from the ESP per R. Irons (2/27/14); not actually found during the 2013 RI
2	Mortars	37	mm	M63	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	MEC -Five (5) projectiles; shallow subsurface; 4 found in K-03 grid, 1 found in M-11 grid
3	Artillery	75	mm	Mk I	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	based on MD only; assumed armed
4	Mortars	81	mm	M57	White Phosphorus	Yes	Impact	Armed	0.5	Surface and Subsurface	based on MD only; assumed armed
5	Mortars	81	mm	M43	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	based on MD only; assumed armed

Reference(s) for table above:

[redacted]

Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013
Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996
Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009
Inventory Project Report - Port Angeles Combat Range, USACE, 1993
Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.
Port Angeles Combat Range, Range Clearance Technology Assessment, U.S. Navy (NEODFC,1986)
Data Collection Report, EM61-MK2 Data Collection and Analysis at the Port Angeles Combat Range, Port Angeles, WA, Environmental Security Technology Certification Program (ESTCP), September, 2011
FDRF-75 mm HE Mk I DB Revision 4/6/13, DDESB
FDRF-81mm M45, DB Revision 4/6/13, DDESB
Explosives Site Plan, HDR, Inc., July 2013
Port Angeles Combat Range RI/FS, HDR Inc., 2014

Site ID: **Port Angeles Combat Range FUDS Property No. F10WA00330**
Date: **2/6/2015**

Port Angeles Combat Range - Range Complex No. 1 MRS

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Outdoor Recreation	10	36	**360**	0.5	Does not include area within Olympic National Park; no recreationalists observed during 2013 Field Season; assumes pairs of persons hiking, day use only; 6 hr/day @1 weekend/month (i.e., 2 days) * 3 months/yr (height of summer season, Jun-Aug)
2	Forest Resource Management	5	240	**1,200**	5	Not all of the PACR MRS is available for timber removal; logged areas observed; no equipment or personnel observed during 2013 field season; 8 hr/day * 30 days/yr
3	Limited Farming	4	360	**1,440**	1.5	Based on field observations and contact with few residents, farming is limited to small private gardens; no hay collection observed during 2013 field season; 4 hr/day * 90 days/yr (height of summer season, Jun-Aug)
4	Limited Fishing	2	40	**80**	0	Streams run through the area; considerable water and habitat; no fishing observed during 2013 field season; 4 hr/day * 10 day/yr
5	Hunting	4	192	**768**	0.5	Private landholders may or may not grant access; hunters present as many deer carcasses observed; in many cases, there are trespassers; 6 hr/day * 8 day/month (4 weekends/month) * 4 months/yr (two seasons / year both in the fall)

Total Potential Contact Time (receptor hrs/yr): **3,848**

Maximum intrusive depth at site (ft): **5**

[redacted]

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330
Date:	2/6/2015

Port Angeles Combat Range - Range Complex No. 1 MRS

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1	Institutional Controls	0	Moderate Accessibility	No	No MEC cleanup	assume no land use change
2	Surface Removal	0	Moderate Accessibility	No	cleanup of MEC located on the surface only	assume no land use change
3	Subsurface Removal	1	Moderate Accessibility	No	cleanup of MEC located both on the surface and subsurface	assume no land use change
4	Tree Survey/Removal	1	Moderate Accessibility	No	cleanup of MECs located both on the surface and subsurface	assume no land use change

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Site ID: **Port Angeles Combat Range FUDS Property No. F10WA00330**
Date: **2/6/2015**
Port Angeles Combat Range - Range Complex No. 1 MRS
This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: Institutional Controls

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:

Land Use Activities Planned After Response Alternative #2: Surface Removal

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:

Land Use Activities Planned After Response Alternative #3: Subsurface Removal

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #4: Tree Survey/Removal

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #5:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #6:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**
Date:	**2/6/2015**

Port Angeles Combat Range - Range Complex No. 1 MRS

Energetic Material Type Input Factor Categories						**Comments**	
The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.							
	Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**				
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100				
White Phosphorus	70	70	70				
Pyrotechnic	60	60	60				
Propellant	50	50	50				
Spotting Charge	40	40	40				
Incendiary	30	30	30				
The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.				***Score***			High Explosive and Low Explosive Filler in Fragmenting Rounds
Baseline Conditions:				**100**			
Surface Cleanup:				**100**			
Subsurface Cleanup:				**100**			

Location of Additional Human Receptors Input Factor Categories							
1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS?				242	feet	based on HFD for 81 mm M45 per R.Irons (2/27/14)	
2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc?				Yes			
3. Please describe the facility or feature.						**see Figure 2-1**	
One home at south end of MRS next to Deer Park Road						also, to the East across Deer Park Road, 2 residences, some outbuildings (Grid S-11)	
MEC Item(s) used to calculate the ESQD for current use activities				81 mm M45		based on HFD for 81 mm M45 per R.Irons (2/27/14)	
Item #5. Mortars (81mm, High Explosive)				[redacted]		based on HFD for 81 mm M45 per R.Irons (2/27/14)	
The following table is used to determine scores associated with the location of additional human receptors (current use activities):							
	Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**				
Inside the MRS or inside the ESQD arc	30	30	30				
Outside of the ESQD arc	0	0	0				

4. Current use activities are 'Inside the MRS or inside the ESQD arc', based on Question 2.'					***Score***			Inside the MRS or inside the ESQD arc
Baseline Conditions:					**30**			
Surface Cleanup:					**30**			
Subsurface Cleanup:					**30**			
Site Accessibility Input Factor Categories					[redacted]			
The following table is used to determine scores associated with site accessibility:								
	Description	**Baseline Conditions**	**Surface Cleanup**	**Subsurface Cleanup**				
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80				
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55				
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15				
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5				
Current Use Activities					***Score***			
Select the category that best describes the site accessibility under the current use scenario:								
Moderate Accessibility								
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 1: Institutional Controls					[redacted]			
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 2: Surface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 3: Subsurface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 4: Tree Survey/Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			

Potential Contact Hours Input Factor Categories								
The following table is used to determine scores associated with the total potential contact time:								
	Description	**Baseline Conditions**	**Surface Cleanup**	**Subsurface Cleanup**				
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30				
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20				
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10				
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5				
Current Use Activities :								
Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is:					**3,848**	receptor hrs/yr		**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to a input factor score for baseline conditions of:					**15**	***Score***		
Response Alternative No. 1: Institutional Controls								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			
Response Alternative No. 2: Surface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			
Response Alternative No. 3: Subsurface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			
Response Alternative No. 4: Tree Survey/Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC:	***Score***
Target Area	
Baseline Conditions:	**180**
Surface Cleanup:	**120**
Subsurface Cleanup:	**30**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities							
The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet:				0.5	ft		
The deepest intrusive depth:				5	ft		
The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:							
	Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**				
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95				
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25				
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95				
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25				

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.' For 'Current Use Activities', only Baseline Conditions are considered.						**150**	***Score***		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
Future Use Activities									
Deepest intrusive depth:							ft		
Not enough information has been entered to determine the input factor category.							***Score***		
Response Alternative No. 1: Institutional Controls									
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet):						**0**	ft		
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.									
Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)						**5**	ft		
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.'									Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
						Score			
Baseline Conditions:						**150**			
Surface Cleanup:									
Subsurface Cleanup:									
Response Alternative No. 2: Surface Removal									
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet):						**0**	ft		
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this									
Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see						**5**	ft		
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.'									Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
						Score			
Baseline Conditions:									
Surface Cleanup:						**N/A**			
Subsurface Cleanup:									
Response Alternative No. 3: Subsurface Removal									
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet):						**1**	ft		
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.									
Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)						**5**	ft		
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.'									Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
						Score			
Baseline Conditions:									
Surface Cleanup:									
Subsurface Cleanup:						**95**			

Migration Potential Input Factor Categories							
Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items?				Yes		observed steep terrain, significant precipitation	
If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).							
MEC items located on edge of the mesa (See Figure) could potentially be translocated down the ravine based on heavy rainfall							
The following table is used to determine scores associated with the migration potential:							
	Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**				
Possible	30	30	10				
Unlikely	10	10	10				
Based on the question above, migration potential is 'Possible.'				***Score***			
Baseline Conditions:				**30**			
Surface Cleanup:				**30**			
Subsurface Cleanup:				**10**			
Reference(s) for above information:							
MEC Classification Input Factor Categories				[redacted]			
Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MEC for this MRS.							No
The 'Amount of MEC' category is 'Target Area'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.							No
Has a technical assessment shown that MEC in the OB/OD Area is DMM?							
Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet:				Yes		mortars, projectiles	
· Submunitions							
· Rifle-propelled 40mm projectiles (often called 40mm grenades)							
· Munitions with white phosphorus filler							
· High explosive anti-tank (HEAT) rounds							
· Hand grenades							
· Fuzes							
· Mortars							
At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.							Yes
The following table is used to determine scores associated with MEC classification categories:							
UXO Special Case	**Baseline Conditions**	**Surface Cleanup**	**Subsurface Cleanup**				
UXO Special Case	180	180	180				
UXO	110	110	110				
Fuzed DMM Special Case	105	105	105				
Fuzed DMM	55	55	55				
Unfuzed DMM	45	45	45				
Bulk Explosives	45	45	45				
Based on your answers above, the MEC classification is 'UXO Special Case'.				***Score***			
Baseline Conditions:				**180**			
Surface Cleanup:				**180**			
Subsurface Cleanup:				**180**			

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup				
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40				
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0				
Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is:					Small			Small
					Score			
Baseline Conditions:					**40**			
Surface Cleanup:					**40**			
Subsurface Cleanup:					**40**			

Scoring Summary

Port Angeles Combat Range - Range Complex No. 1 MRS

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330	**a. Scoring Summary for Current Use Activities**	
Date:	**2/6/2015**	**Response Action Cleanup:**	**No Response Action**
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**780**
		Hazard Level Category	**2**

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330	**b. Scoring Summary for Response Alternative 1: Institutional Controls**	
Date:	**2/6/2015**	**Response Action Cleanup:**	**No MEC cleanup**
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**780**
		Hazard Level Category	**2**

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330	c. Scoring Summary for Response Alternative 2: Surface Removal	
Date:	2/6/2015	Response Action Cleanup:	cleanup of MEC located on the surface only
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	10
V. Amount of MEC		Target Area	120
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	N/A
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	565
		Hazard Level Category	3

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330	d. Scoring Summary for Response Alternative 3: Subsurface Removal	
Date:	2/6/2015	Response Action Cleanup:	cleanup of MEC located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		Target Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	545
		Hazard Level Category	3

Site ID:	Port Angeles Combat Range FUDS Pro	e. Scoring Summary for Response Alternative 4: Tree Survey/Removal	
Date:	2/6/2015	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		Target Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	545
		Hazard Level Category	3

Site ID:	Port Angeles Combat Range FUDS Pro	g. Scoring Summary for Response Alternative 5:	
Date:	2/6/2015	Response Action Cleanup:	
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Target Area	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		UXO Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

Site ID:	Port Angeles Combat Range FUDS Pro	h. Scoring Summary for Response Alternative 6:	
Date:	2/6/2015	Response Action Cleanup:	
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Target Area	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		UXO Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

This page intentionally left blank.

APPENDIX M

Munitions Response Site Prioritization Protocol Tables

This page intentionally left blank.

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Range Complex No 1

Component: USACE FUDS/Omaha District (NWO)

Installation/Property Name: Port Angeles Combat Range

Location (City, County, State): Port Angeles, Clallam County, WA

Site Name/Project Name (Project No.): Port Angeles Combat Range

Date Information Entered/Updated: 2/18/2014 4:54:12 AM

Point of Contact (Name/Phone): Adam Plack/(402) 995-2755

Project Phase (check only one):

☐ PA	☐ SI	■ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ RA-O	☐ RC	☐ LTM

Media Evaluated (check all that apply):

☐ Groundwater	☐ Sediment (human receptor)
☐ Surface soil	☐ Surface Water (ecological receptor)
☐ Sediment (ecological receptor)	☐ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. In April and May 1944, the range was declared excess and all leases and permits were canceled. Two young boys were killed in August 1948, when a 37mm shell exploded while they were cutting downed timber.

This MRS includes 105.7 acres. 3.9 acres of parcel 47501 are included within this MRS. These 3.9 acres were not investigated as an ROE was not obtained for this phase of work. Assisted visual surveys, DGM, and magnetometer (mag) and dig investigations were conducted.

Evidence of MEC and MD items were observed including:
Five M63 37mm HE projectiles
Thirteen M51 37mm AP projectiles
One M48 point detonating fuze for 75mm projectile (expended)
One M44 81mm practice mortar
Three M43A1 81mm HE mortar pieces
Three M57 81mm White Phosphorus mortar bodies
Four 81mm mortar tail fin pieces
One 81mm motor tail fin
One 75mm practice projectile, and one half of a 75mm projectile

The EHE module was assigned a score of 3/B. There was evidence of MEC and MD identified within the MRS.

The CHE Module was assigned the alternative rating of No Known or Suspected CWM Hazard. There were no Port Angeles Combat Range MRSs suspected of containing CWM.

The HHE Module was assigned a score of "evaluation pending". No environmental media sampling was conducted during the RI.

This RI was intended only to determine the nature and extent of areas impacted by munitions related activities. Additional MEC items may be present in the subsurface soils of the MRS. The condition of the MEC cannot be know. If compromised MEC is found at a later date, MC sampling may be required.

Throughout the MRSPP, the following references are made:
Reference to "RI/FS Report", refers to the " Remedial Investigation/Feasibility Study
Final Report", dated February 2015.
Reference to "SI Report" refers to the Final Site Inspection Report, dated June 2009.

Description of Pathways for Human and Ecological Receptors:

MEC was discovered during the RI; consequently the exposure pathway for contact with MEC in surface soil (0 – 6 inches deep) is considered complete for all human receptors. The exposure pathway for contact with MEC in subsurface (> 6 inches deep) soil is potentially complete.

Because there is no way to ensure 100% removal of MEC at the PACR, there is always the potential for human receptors to encounter both MEC and possibly MC in compromised munitions. If MEC are present in damaged condition, MC could potentially be released to the environment; however, based on historical investigations and the results of the RI, the potential for human and ecological exposure to MC is likely very low. There is some degree of uncertainty associated with potential MEC items which could remain buried; however, all current information suggests that the soil exposure pathway for MC is likely incomplete or likely insignificant (RI/FS, Section 5.1/5.2).

Description of Receptors (Human and Ecological):

Potential human receptors include current and future recreational users, current and future outdoor workers, current and future trespassers, and current and future residents.

The MRS includes transient habitat used by at least at least three federally/state-listed threatened species - Bull Trout, Northern Spotted Owl, and Marbled Murrelet (RI/FS, Section 2.2.11.1).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms practice munitions, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	*25*
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrothechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*25*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

Five M63 37mm HE projectiles were found within the MRS. All of these MEC items were found in the Direct Fire Impact Area and the Buffer Zone and Combat Training Area (sub-ranges SR-01 and SR-05). Mag and dig investigations were conducted in 10% of each 200-foot x 200-foot grid. The location of MD within this MRS is the driver defining possible subsurface MEC locations. MD observed within the MRS included:

- Thirteen M51 37mm AP projectiles
- One M48 point detonating fuze for 75mm projectile (expended)
- One M44 81mm practice mortar
- Three M43A1 81mm HE mortar pieces
- Three M57 81mm WP mortar bodies
- Four 81mm mortar tail fin pieces
- One 81mm motor tail fin
- One 75mm practice projectile, and one half of 75mm projectile (empty) (RI/FS Report, Section 5.1.1.3)

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms former range, practice munitions, small arms range, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	*10*
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	*10*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. The range was intended to be used for tactical firing problems and short-range known distance firing (200-300 yards). The range was used for weapons practice with 37mm and 75mm projectiles, and 60mm and 81mm mortars (RI/FS, Section 2.3.1).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms confirmed, surface, subsurface, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS,and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	*20*
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	*20*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

Five M63 37mm HE projectiles were found within the MRS. The MEC items were found at depths of 6-12 inches bgs. All of these MEC items were found in the Direct Fire Impact Area and the Buffer Zone and Combat Training Area (sub-ranges SR-01 and SR-05). Mag and dig investigations were conducted in 10% of of each 200-foot x 200-foot grid. The location of MD within this MRS is the driver defining possible subsurface MEC locations. MD observed within the MRS included:

- Thirteen M51 37mm AP projectiles
- One M48 point detonating fuze for 75mm projectile (expended)
- One M44 81mm practice mortar
- Three M43A1 81mm HE mortar pieces
- Three M57 81mm WP mortar bodies
- Four 81mm mortar tail fin pieces
- One 81mm motor tail fin
- One 75mm practice projectile, and one half of 75mm projectile (empty) (RI/FS Report, Section 5.1.1.3)

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term barrier is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	*8*
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	*8*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classifications in the space provided.

The MRS is accessible to the general public from Deer Park Road on the east side of the MRS. During the RI field investigation in 2013, barbed wire fencing was observed along the Deer Park Road. The fencing was in poor condition and was propped up in places. A few remaining signs warning of munitions hazards are still present. In addition, approximately 3.4 acres of the MRS were unsurveyable due to steep treacherous slopes and dense vegetation (RI/FS Report, Section 2.2.3/2.2.4).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	*5*
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*5*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classifications in the space provided.

Property within Range Complex No. 1 MRS is owned by the City of Port Angeles and maintained as a protected watershed. According to the ASR, no land in the PACR is owned by any DoD or other federal agency. 3.9 acres of parcel 47501 are included within this MRS. These 3.9 acres were not investigated as a ROE was not obtained for this phase of work (RI/FS Report, Section 2.2.3/2.2.4).

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Note: Use the U.S. Census Bureau tract data available to capture the highest population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	*3*
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*3*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classifications in the space provided.

The Census Block Group closest to the northern boundary of the PACR has a population density of 126 persons per square mile. Estimated population within a two-mile radius of the PACR property boundary is 1,064. The estimated number of households within a two-mile radius of the PACR property boundary is 496. The 2010 population density for Clallum County is approximately 40.4 persons per square mile (RI/FS Report, Section 2.2.3).

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and select the score that corresponds with the number of inhabited structures.

Note: The term inhabited structures is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	*5*
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*5*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classifications in the space provided.

The estimated numbers of households within a two-mile radius of the PACR property boundary is 496 (RI/FS Report, Section 2.2.3).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present withinn two miles of the MRS and circle the scores that correspond with **all** the activities/structures classifications at the MRS.

Note: The term inhabited structure is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	*5*
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	*4*
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	*3*
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	***5***

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

The parcels within Range Complex No. 1 MRS are owned by the City of Port Angeles and are primarily maintained as a protected watershed. There is one private residence located within parcel 47501. No ROE was granted for parcel 47501 during the RI.

There are no schools or other critical assets located within a two-mile radius of the MRS.

During the hunting season, the field team saw evidence of deer hunting while conducting the field investigation. The field team also saw and heard occasional evidence of recreational target shooting (e.g. improvised targets).

Manke Timber Corporation and Green Crow Corporation manage adjacent parcels for commercial timber (RI/FS Report, Section 2.2.3).

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms ecological resources and cultural resources are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	5
Ecological resources present	◆ There are ecological resources present on the MRS.	*3*
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	*0*
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*3*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classifications in the space provided.

The parcels within Range Complex No. 1 MRS are owned by the City of Port Angeles and primarily maintained as a protected watershed for the city . An identified sensitive ecosystem (wetland) is present within Range Complex No. 1; however, the wetland was not investigated, as it is within parcel 47501 where an ROE was not obtained during the RI.

No federally designated critical habitat is located on the PACR; however, there is federally designated critical habitat within one mile of the PACR for the following T & E species:

1. Bull Trout
2. Marbled Murrelet
3. Northern Spotted Owl (RI/FS Report, Section 2.2.11.1)

No cultural resources were identified within the MRS (RI/FS Report, Section 2.2.11.2).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	25	35
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	20	33
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	3	16
Population Near Hazard	Table 7	5	
Types of Activities/ Structures	Table 8	5	
Ecological and /or Cultural Resources	Table 9	3	
		EHE MODULE TOTAL	*84*

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	*B*
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	*B*

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond to **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms CWM/UXO, CWM/DMM, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	*0*
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

There were no Port Angeles Combat Range MRSs suspected of containing CWM (RI/FS Report, Section 2.3.1).

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			*0*

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and display the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Groundwater MC Hazard ☐

Table 21 Comments: No groundwater samples were collected from the MRS during the RI.

"Evaluation Pending" based upon probable MEC.

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☐

Table 22 Comments: No surface water samples were collected from the MRS during the RI.

'Evalulation Pending' is selected based on probable MEC.

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☐

Table 23 Comments: No sediment samples were collected from the MRS during the RI.

"Evaluation Pending" based upon probable MEC.

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☐

Table 24 Comments: No surface water samples were collected from the MRS during the RI.

'Evalulation Pending' is selected based on probable MEC.

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Table 25 Comments: No sediment samples were collected from the MRS during the RI.

'Evalulation Pending' is selected based on probable MEC.

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L

RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ☐

Table 26 Comments: No surface soil samples were collected from the MRS during the RI.

All recovered MEC items were intact and in good condition. MC sampling for energetics and explosives residue was not conducted because a release would not have occurred. All recovered MEC items functioned as designed (complete detonation). MC sampling for energetics and explosives residue was not conducted because all explosives associated with the munitions were consumed during detonation (RI/FS Report, Section 5.2.2).

This RI was intended only to determine the nature and extent of areas impacted by muntions related activites within the MRS. Additional MEC items may be present in the subsurface soils of the MRS. The condition of the subsruface MEC cannot be known. If compromised MEC is found at a later date, MC sampling may be required.

"Evaluation Pending" was selected based upon probable MEC.

In-situ XRF screening was conducted to analyze for lead in soils where natural features (e.g., natural berm feature) or small arms debris was identified. XRF screening was utilized for information only and to assist the field investigation team determine sampling locations for laboratory analysis. A conservative in-situ XRF screening level of 125 mg/kg (compared to the State of Washington soil cleanup level of 250 mg/kg) was utilized. In-situ XRF screening for lead in soil was conducted in two locations where natural features (e.g., natural berm feature) where found, and in one location where small arms debris was found. A total of 113 in-situ XRF screening samples were analyzed from the three locations. All in-situ XRF sample results for lead were below 125 mg/kg (RI/FS - Appendix L). Thus, no soil samples were collected for laboratory analysis (RI/FS Report, Section 5.2.1).

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the media in which these contaminants are present. Then record all contaminants, their maximum concentrations and their comparison values (from Appendix B of the Primer) in the table below. Calculate and record the ratio for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF for each medium on the appropri

Note: Dissolved, rather than total, metals analyses are used when both are available.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the Contaminant Hazard, Migration Pathway, and Receptor Factors for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the Three-Letter Combination boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the HHE Ratings provided below, determine each media's rating (A-G) and record the letter in the corresponding Media Rating box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)					
Surface Water/Human Endpoint (Table 22)					
Sediment/Human Endpoint (Table 23)					
Surface Water/Ecological Endpoint (Table 24)					
Sediment/Ecological Endpoint (Table 25)					
Surface Soil (Table 26)					

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the HHE Module Rating box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	*Evaluation Pending*

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	*Evaluation Pending*
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Prioriy or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	*3*	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		***Evaluation Pending***	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		*No Known or Suspected CWM Hazard*		No Known or Suspected MC Hazard	
MRS PRIORITY or ALTERNATIVE MRS RATING				*3*	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Range Complex No 1 a

Component: USACE FUDS/Omaha District (NWO)

Installation/Property Name: Port Angeles Combat Range

Location (City, County, State): Port Angeles, Clallam County, WA

Site Name/Project Name (Project No.): Port Angeles Combat Range

Date Information Entered/Updated: 2/18/2014 4:29:20 AM

Point of Contact (Name/Phone): Adam Plack/(402) 995-2755

Project Phase (check only one):

☐ PA	☐ SI	■ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ RA-O	☐ RC	☐ LTM

Media Evaluated (check all that apply):

☐ Groundwater	☐ Sediment (human receptor)
☐ Surface soil	☐ Surface Water (ecological receptor)
☐ Sediment (ecological receptor)	☐ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. In April and May 1944, the range was declared excess and all leases and permits were canceled. This MRS includes 1286.5 acres. 0.24 acres of parcel 47501, 14.5 acres of parcel 47404, and 87.2 acres of parcel 47730 are included within this MRS. These 102 acres were not investigated because a ROE was not obtained for this phase of work. No evidence of MEC or MD was observed so MC samples were not collected. No impact areas were indentified. The EHE module was assigned the alternative rating of No Know or Suspected Explosive Hazard. There was no evidence of MEC or MD identified within the MRS. The CHE Module was assigned the alternative rating of No Known or Suspected CWM Hazard. There were no Port Angeles Combat Range MRSs suspected of containing CWM. The HHE Module was assigned the alternative rating of No Known or Suspected MC Hazard. There was no evidence of MEC or MD, so MC samples were not collected (RI/FS Report, Section 5.1). Throughout the MRSPP, the following reference is made: Reference to "RI/FS Report", refers to the Remedial Investigation/Feasibility Study Final Report, dated February 2015.
Description of Pathways for Human and Ecological Receptors:
No MEC or MD was found within this MRS. Because there is no way to ensure 100% removal of MEC at the PACR, there is always the potential for human receptors to encounter both MEC and possibly MC in compromised munitions. If MEC are present in damaged condition, MC could potentially be released to the environment; however, based on historical investigations and the 2014 RI, the potential for human and ecological exposure to MC is likely very low. There is some degree of uncertainty associated with potential MEC items which could remain buried; however, all current information suggests that the soil exposure pathway for MC is likely incomplete or likely insignificant (RI/FS Report, Section 5.2).
Description of Receptors (Human and Ecological):
Potential human receptors include current and future recreational users, current and future outdoor workers, current and future trespassers, and current and future residents. The MRS includes transient habitat used by at least at least three federally/state-listed threatened species - Bull Trout, Northern Spotted Owl, and Marbled Murrelet (RI/FS Report, Section 2.2.11.1).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms practice munitions, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrothechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	*0*
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

No evidence of MEC or MD were observed. No impact areas were identified (RI/FS Report, Section 5.1/8.5.1).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	0	0
Source of Hazard	Table 2		
Accessibility Factor Data Elements			
Location of Munitions	Table 3		0
Ease of Access	Table 4		
Status of Property	Table 5		
Receptor Factor Data Elements			
Population Density	Table 6		0
Population Near Hazard	Table 7		
Types of Activities/ Structures	Table 8		
Ecological and /or Cultural Resources	Table 9		
EHE MODULE TOTAL			*0*

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	***No Known or Suspected Explosive Hazard***

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			*0*

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			*0*

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and display the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	
	No Known or Suspected Groundwater MC Hazard	■

Table 21 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L

RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ■

Table 22 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Human Endpoint) MC Hazard ■

Table 23 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard	■

Table 24 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ■

Table 25 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ■

Table 26 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the Contaminant Hazard, Migration Pathway, and Receptor Factors for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the Three-Letter Combination boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the HHE Ratings provided below, determine each media's rating (A-G) and record the letter in the corresponding Media Rating box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)					
Surface Water/Human Endpoint (Table 22)					
Sediment/Human Endpoint (Table 23)					
Surface Water/Ecological Endpoint (Table 24)					
Sediment/Ecological Endpoint (Table 25)					
Surface Soil (Table 26)					

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the HHE Module Rating box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	***No Known or Suspected MC Hazard***

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29

MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Prioriy or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		*No Known or Suspected CWM Hazard*		*No Known or Suspected MC Hazard*	
MRS PRIORITY or ALTERNATIVE MRS RATING				***No Known Or Suspected Hazard***	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Range Complex No 1 b

Component: USACE FUDS/Omaha District (NWO)

Installation/Property Name: Port Angeles Combat Range

Location (City, County, State): Port Angeles, Clallam County, WA

Site Name/Project Name (Project No.): Port Angeles Combat Range

Date Information Entered/Updated: 2/18/2014 3:15:01 AM

Point of Contact (Name/Phone): Adam Plack/(402) 995-2755

Project Phase (check only one):

☐ PA	☐ SI	■ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ RA-O	☐ RC	☐ LTM

Media Evaluated (check all that apply):

☐ Groundwater	☐ Sediment (human receptor)
☐ Surface soil	☐ Surface Water (ecological receptor)
☐ Sediment (ecological receptor)	☐ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. In April and May 1944, the range was declared excess and all leases and permits were canceled.

This MRS includes 1238.5 acres. This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the National Park Service (NPS) and the DoD does not exist.

The area within the Olympic National Park (ONP) is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions identified during the RI there is a low probability that munitions are present with the ONP.

The EHE module was assigned the alternative rating of No Known or Suspected Explosive Hazard. There was no evidence of MEC or MD identified within the MRS that borders the ONP to the north (Range Complex No 1 [a]). There is little likelihood that any impact areas or other significant features are located within the ONP.

The CHE Module was assigned the alternative rating of No Known or Suspected CWM Hazards. There were no Port Angeles Combat Range MRSs suspected of containing CWM.

The HHE Module was assigned the alternative rating of No Known or Suspected Explosive Hazard. There was no evidence of MEC or MD identified within the MRS that borders the ONP to the north (Range Complex No 1 [a]). There is little likelihood that any impact areas or other significant features are located within the ONP.

Throughout the MRSPP, the following reference is made: Reference to RI/FS Report, refers to the Remedial Investigation/Feasibility Study Final Report, dated February 2015.

Description of Pathways for Human and Ecological Receptors:

Due to the lack of ROE, Range Complex No. 1 (b) was not investigated during the RI. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Description of Receptors (Human and Ecological):

Due to the lack of ROE, Range Complex No. 1 (b) was not investigated during the RI. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms practice munitions, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered “sensitive.” ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrothechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	*0*
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	0	0
Source of Hazard	Table 2		
Accessibility Factor Data Elements			
Location of Munitions	Table 3		0
Ease of Access	Table 4		
Status of Property	Table 5		
Receptor Factor Data Elements			
Population Density	Table 6		0
Population Near Hazard	Table 7		
Types of Activities/ Structures	Table 8		
Ecological and /or Cultural Resources	Table 9		
EHE MODULE TOTAL			*0*

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	***No Known or Suspected Explosive Hazard***

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond to **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms CWM/UXO, CWM/DMM, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	*0*
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

There were no Port Angeles Combat Range MRSs suspected of containing CWM (RI/FS Report, Section 2.3.1).

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			*0*

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and display the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	
	No Known or Suspected Groundwater MC Hazard	■

Table 21 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist.The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ■

Table 22 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftey buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	
	No Known or Suspected Sediment (Human Endpoint) MC Hazard	■

Table 23 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L

RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard	■

Table 24 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftey buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	
	No Known or Suspected Sediment (Ecological Endpoint) MC Hazard	■

Table 25 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftey buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ■

Table 26 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the Contaminant Hazard, Migration Pathway, and Receptor Factors for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the Three-Letter Combination boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the HHE Ratings provided below, determine each media's rating (A-G) and record the letter in the corresponding Media Rating box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)					
Surface Water/Human Endpoint (Table 22)					
Sediment/Human Endpoint (Table 23)					
Surface Water/Ecological Endpoint (Table 24)					
Sediment/Ecological Endpoint (Table 25)					
Surface Soil (Table 26)					

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the HHE Module Rating box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	***No Known or Suspected MC Hazard***

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Prioriy or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		*No Known or Suspected CWM Hazard*		*No Known or Suspected MC Hazard*	
MRS PRIORITY or ALTERNATIVE MRS RATING				***No Known Or Suspected Hazard***	