Pebble Project

Wetland Mapping Report
Project Alternatives 2 and 3

PREPARED FOR
Pebble Limited Partnership, LLC.

PREPARED BY

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ACRONYMS AND ABBREVIATIONS

3PP	Three Parameters Plus, Inc.
BBMP	Bristol Bay Management Plan
DEIS	Draft Environmental Impact Statement
ENWI	Enhanced National Wetlands Inventory
FA	Functional Assessment
GIS	Geographic Information System
HDR	HDR Engineering, Inc.
HGM	Hydrogeomorphic
LIDAR	Light Detection and Ranging
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PJD	Preliminary Jurisdictional Determination Report
PLP	Pebble Limited Partnership
PP	Representative Photo Point
QC	Quality Control
RDI	Resource Data, Inc.
RU	Representative Upland
RW	Representative Wetland
SC	Stream Crossing
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WB	Waterbody
WD	Wetland Determination

1. Introduction

The Pebble Limited Partnership (PLP) is proposing to develop the Pebble Deposit (Project) located in southwest Alaska, approximately 200 miles southwest of Anchorage (Appendix A, Figure 1). This work requires authorization by the U.S. Army Corps of Engineers (USACE) for placement of fill into wetlands and other waters of the U.S. To support engineering design and permitting, PLP has contracted HDR Engineering, Inc. (HDR), to map wetlands and waterbodies that may be affected by the proposed Project or Project alternatives.

The Pebble Project Preliminary Jurisdictional Determination Report – Revision 3 (PJD [HDR 2019]) and associated wetland and waterbody mapping were completed in November 2019 covering areas potentially affected by the proposed Project and Alternative 1, as defined by USACE's Draft Environmental Impact Statement (USACE 2019) and design modifications incorporated following publication of the Draft Environmental Impact Statement. The PJD outlines the methods used for the field sampling and wetland and waterbody mapping previously completed, documents the results of the field sampling efforts, and describes the wetlands, waterbodies, and vegetation types found within the PJD study area covering approximately 33,900 acres. This report supplements the PJD with approximately 16,670 acres of additional mapping produced using similar methods, and provides coverage for areas potentially affected by components of Alternatives 2 and 3 that were not covered by the PJD.

Impact areas from potential development within the mine area are generally common among all three alternatives; however, a few minor differences are present and are covered in this report. The major components of Alternatives 2 and 3 covered in this report include:

- Transportation and pipeline corridor from Eagle Bay to Cook Inlet
- Pile Bay access roads
- Natural gas pipeline corridor from Cottonwood Bay to Ursus Cove
- Kokhanok east ferry terminal and associated transportation corridor south of Iliamna Lake

Existing Project mapping was previously produced for much of the transportation and pipeline corridor from Eagle Bay to Cook Inlet; however, the mapping contained several wetland and upland mosaics, and the method used to determine the percent composition of wetland within those polygons was not documented in existing project data sources. During summer 2019, HDR conducted field work to verify the status of previously mapped mosaics and to verify preliminary mapping for the previously unmapped Pile Bay access roads, the natural gas pipeline corridor from Cottonwood Bay to Ursus Cove, and the Kokhanok east ferry terminal and transportation corridor.

2. Study Area Description

While extensive acreage in the area has been studied as part of this Project over the past 15 years, this study area (Appendix A, Figures 1 and 2) is approximately 16,670 acres and is limited to areas of potential development and areas of potential secondary impacts from development associated with Alternatives 2 and 3. The study area includes a roughly 48-mile-long, 2,000-foot-wide transportation and pipeline corridor generally paralleling the north shore of Iliamna Lake from Eagle Bay to Cook Inlet, three 1,000-foot-wide access road corridors to Pile Bay, a 200-foot-wide pipeline corridor from Cottonwood Bay to Ursus Cove, a 1,000-foot-wide Kokhanok east ferry terminal and transportation corridor south of Iliamna Lake, and three minor areas adjacent to the mine area and north ferry terminal. The study area is located in the townships, ranges, and sections listed in Table 1.

Table 1. Townships, Ranges, and Sections for the Study Area

Township	Range	Section(s) [a]
3 South	36 West	25, 33
4 South	26 West	31
4 South	27 West	20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35, 36
4 South	28 West	19, 20, 21, 25, 28, 29, 30, 33, 34, 35, 36
4 South	29 West	17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
4 South	30 West	13, 14, 15, 18, 19, 20, 21, 22, 23, 24
4 South	31 West	13, 20, 21, 22, 23, 24, 26, 27, 28, 29
5 South	26 West	28, 29, 30, 32, 33, 34, 35
5 South	27 West	2, 3, 4, 5, 8, 9, 10, 11, 14, 15, 22, 23, 24, 25
5 South	28 West	2, 3, 4
6 South	26 West	1, 2, 3, 4, 12, 13, 22, 23, 24, 25, 27, 34
6 South	25 West	19, 30
6 South	35 West	13, 14
7 South	26 West	3, 9, 10, 16, 21, 28, 33
8 South	26 west	3, 4, 10, 11, 12
8 South	31 West	31, 32
8 South	32 West	31, 32
8 South	33 West	5, 6, 8, 9, 15, 16, 22, 23, 25, 26, 36
9 South	32 West	1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 24, 25, 36
9 South	33 West	1

[a] Located in the Seward Meridian.

The transportation corridor, north of Iliamna Lake, crosses both the Bristol Bay drainage and the Cook Inlet drainage, from an area with a continental climate characteristic of interior Alaska to a maritime climate, and from relatively gentle topography to steep mountain terrain. The majority of the corridor, from Eagle Bay to the head of Pile Bay, is forested with birch, white spruce, and mixed birch-white spruce forests situated on steep hillsides with valley bottoms that drain larger streams into Iliamna Lake. Steeper slopes may support dense stands of alder or mixed willow and alder shrubs. The floodplains of the Pile and Iliamna Rivers are complex mosaics of vegetation in flood channels, bars, and abandoned channels, dominated by willows, forests, and marsh. The remainder of the corridor, from the head of Pile Bay to the Cook Inlet drainage divide, is mountainous shrubland and encompasses steep slopes and relatively flat valley bottoms. Alders dominate the slopes interspersed with meadows in some areas; with willows, low and dwarf shrub types; and with wet meadows along riparian corridors in valley bottoms.

The Cook Inlet portion of the corridor is strongly affected by steep mountains and the maritime climate of lower Cook Inlet. Mudflat areas are common along the coast, and bedrock outcrops form cliffs in some areas. Salt-tolerant vegetation occupies relatively protected areas in the upper intertidal zone along the coast. Mountain slopes support alder thickets, interspersed with herb meadows in some areas.

The Kokhanok east ferry terminal and transportation corridor south of Iliamna Lake is within the Bristol Bay drainage and extends from the south shore of Iliamna Lake to just north of Gibraltar Lake. Topography is relatively flat to rolling near Iliamna Lake and transitions to steeper terrain near Gibraltar Lake; shallow bedrock is present at higher elevation. The climate transitions from a continental climate characteristic of interior Alaska to a maritime climate near the coast. Lower to mid-elevations are generally forested with white spruce and white spruce-birch mixed forests, while upper elevations are typically dominated by dwarf shrubs and alder.

3. Methods

3.1 Background Data

Existing data were compiled to create project-specific Geographic Information System (GIS) layers of the study area. In addition, PLP commissioned several captures of aerial imagery. The following data sets were compiled by Resource Data, Inc. (RDI), and PLP for digital presentation and review for this mapping effort:

- National Wetlands Inventory (NWI) mapping (U.S. Fish and Wildlife Service [USFWS]), ortho-rectified and digitized from paper maps by RDI.
- U.S. Geological Survey (USGS) topographic mapping.
- Earth Resources Observation System land cover mapping and vegetation and land cover types from the USGS associated with the Bristol Bay Management Plan (BBMP).
- Vegetation mapping and cover classes prepared for the National Park Service Lake Clark National Park and Preserve.
- Exploratory soil survey data (U.S. Department of Agriculture Natural Resources Conservation Service [NRCS]).
- Land ownership information from the Alaska Department of Natural Resources, with contributions from the Bureau of Land Management and the U.S. Census Bureau.
- Color infrared photography from the National Aeronautics and Space Administration ortho-rectified by Aero-Metric, Inc. (now Quantum Spatial, Inc.), at a photo scale of 1:60,000. Dates of the imagery are August 1978 and August 1982, depending on the location.
- Aerial photography acquired by Aero-Metric, Inc., in October 2004 and in 2005, 2008, and 2013 captured at a scale of 1:8,000. This aerial photography was ortho-rectified at a scale of 1.5-foot pixels and used for analysis and interpretation in GIS.
- Color aerial photography acquired by Eagle Mapping at 1:20,000. This aerial photography was ortho-rectified at a scale of 1.5-foot pixels.
- Light Detection and Ranging (LIDAR) imagery acquired in October 2004, October 2005, and August 2008 used to produce a layer of 4-foot contour lines for the study area. The Eagle Mapping data also included 2-foot-interval LIDAR imagery.
- Fall season aerial photography acquired in September 2008. The aerial photography (1:20,000) was ortho-rectified by Dudley Thompson Mapping Corporation, Inc., at a scale of 1-foot pixels. A more detailed version was also produced (1:4,800 at a scale of 0.25-foot pixels) for the southern portion of the mine study area to aid scientists in identifying willow and alder shrub communities prevalent along Upper Talarik Creek.
- Aerial imagery and LIDAR acquired by Aero-Metric, Inc., in summer 2012 and 2013 for a portion of the Kokhanok east ferry terminal transportation route and Ursus Cove Pipeline and Cottonwood Bay study areas with a pixel ground resolution of 1 foot.
- Aerial imagery and LIDAR acquired by Quantum Spatial, Inc., in July 2017 for the majority of the Kokhanok east ferry terminal and transportation corridor study area with a pixel ground resolution of 1 foot.

A GIS database was constructed from the above sources. The 2004, 2005, 2012, 2013, and 2017 ortho-photography comprised the base map used for this mapping.

3.2 Field Data Collection

3.2.1 Background

Wetland scientists from HDR and Three Parameters Plus, Inc. (3PP), conducted extensive field surveys for wetlands and waterbodies and vegetation types between 2004 and 2019, as shown in Table 2. Similar to the field efforts completed for the PJD study area, field studies have been conducted on varying study areas over time, which resulted in some data being collected outside of the study area. Only data collected within the study area are presented here and were used as the principal basis for the mapping. Data collected outside of the study area were available to wetland scientists as an additional reference dataset to assist in the study area mapping. During summer 2019, HDR conducted field work within approximately 10 percent of the total number of previously mapped mosaic polygons to verify their status as either wetland or upland, and extrapolated the results to mosaic polygons not visited in the field using similar methods described in the PJD. Field work was also conducted to verify preliminary mapping completed for previously unmapped areas.

Table 2. Field Survey Summary

Field Year	Month	Number of WDs	Number of PPs	Wetland Scientists [a]
2004	July	61	36	Anne Leggett, Brandy Bland, Jen Sivils, Mike Witter
	August	51	29	Anne Leggett, Brandy Bland, Jen Sivils
	September	7	5	Anne Leggett, Brandy Bland
2005	July	6	2	Anne Leggett, Mac Salway
	August	2	22	Anne Leggett, Mac Salway
2010	July	40	48	Anne Leggett, Leandra Cleveland
	August	12	35	Chris Wrobel, Leandra Cleveland
2012	August	5	13	Chris Wrobel, Mike Wallace
2013	July	1	1	Mike Wallace
2019	June	2	1	Mike Witter, Zach Halstead
	July	55	99	Alena Gerlek, Mac Salway, Mike Witter, Zach Halstead
	August	36	17	Mac Salway, Zach Halstead
	September	11	16	Alena Gerlek, Mike Witter
	Total	**289**	**324**	

Note: WD = Wetland Determination Plot; PP = Representative Photo Point.

[a] Only wetland scientist field leads are shown.

3.2.2 Field Data Collection Types

At each sample site, wetland scientists determined the appropriate field data to be collected using the protocols described in the following list of study plots:

- Wetland Determination (WD) Plots
- Functional Assessment (FA) Plots
- Representative Upland and Wetland Photo Points (RU and RW)
- Waterbodies (WB) and Stream Crossings (SC)

Descriptions of each type of study plot and type of data collected plot type are described further in the PJD.

3.3 Vegetation Type

Scientists assigned Field Vegetation Types to each plot based on two existing classification systems: the *Alaska Vegetation Classification* (Viereck et al. 1992) and the BBMP (Wibbenmeyer et al. 1982). Full descriptions of all vegetation types within the study area are provided in the *Pebble Project Vegetation Type Photo Signature Guide, Draft Report* (3PP 2008). A list of plant species observed with the study area that were not observed in the PJD study area is provided in Appendix B and includes the wetland indicator status for each field season. Table 3 summarizes the vegetation types identified in the study area and whether each type occurs predominantly in wetlands or uplands.

Table 3. Summary of Vegetation Types in the Study Area

Vegetation Code	Abbreviation	Occurs Predominantly in Wetlands or Uplands
Forest (≥ 10% cover of trees more than 10 feet in height)		
Closed White Spruce Forest	CWSF	Upland
Open White Spruce Forest	OWSF	Upland
White Spruce Woodland	WSW	Upland
Broadleaf Woodland	BW	Upland
Closed Broadleaf Forest	CBF	Upland
Open Broadleaf Forest	OBF	Upland
Closed Mixed Forest	CMF	Upland
Open Mixed Forest	OMF	Upland
Mixed Forest Woodland	MFW	Upland
Scrub (< 10% cover of trees more than 10 feet in height, > 25% shrub cover)		
Dwarf White Spruce Scrub	DWSS	Upland
Closed Willow Tall Shrub	CWTS	Upland
Closed Alder Tall Shrub	CATS	Upland
Closed Alder-Willow Tall Shrub	CAWTS	Upland
Open Alder Tall Shrub	OATS	Upland
Open Alder-Willow Tall Shrub	OAWTS	Upland
Open Willow Tall Shrub	OWTS	Upland
Open Dwarf Birch Scrub	ODBS	Upland
Closed Willow Low Shrub	CWLS	Wetland/Upland
Closed Alder-Willow Low Shrub	CAWLS	Wetland/Upland
Closed Alder Low Shrub	CALS	Upland
Open Sweetgale-Graminoid Bog	OSGB	Wetland
Open Mixed Shrub-Sedge Tussock	OMSST	Wetland

Table 3. Summary of Vegetation Types in the Study Area

Vegetation Code	Abbreviation	Occurs Predominantly in Wetlands or Uplands
Open Dwarf Birch-Ericaceous Shrub Bog	ODBESB	Wetland
Ericaceous Shrub Bog	ESB	Wetland
Low Ericaceous Shrub Tundra	LEST	Upland
Shrub Birch-Willow	SBW	Upland
Open Willow Low Shrub	OWLS	Wetland/Upland
Open Willow Low Shrub Fen	OWLSF	Wetland
Open Alder-Willow Low Shrub	OAWLS	Wetland/Upland
Open Alder Low Shrub	OALS	Upland
Dwarf Ericaceous Shrub Tundra	DEST	Upland
Dwarf Ericaceous Shrub Tundra - Hummocks	DEST-H	Upland
Dwarf Ericaceous Shrub Tundra - *Equisetum*	DEST-EQ	Upland
Dwarf Ericaceous Shrub Tundra - *Carex*	DEST-C	Wetland/Upland
Dwarf Ericaceous Shrub-Lichen Tundra	DESLT	Upland
Herbaceous (< 10% of tree cover and < 25% of shrub cover)		
Bluejoint Tall Grass	BTG	Upland
Bluejoint-Herb	BH	Upland
Subarctic Sedge-Moss Wet Meadow	SSMWM	Wetland
Fresh Herb Marsh	FHM	Wetland
Fresh Sedge Marsh	FSM	Wetland
Mesic Herb	MH	Upland
Aquatic Herbaceous	AH	Wetland
Halophytic Dry Graminoid	HDG	Wetland/Upland
Halophytic Graminoid Wet Meadow	HGWM	Wetland
Other		
Partially Vegetated	PV	Upland
Barren	BARE	Upland
Open Water	OW	Waters

Source: Modified from 3PP 2008

3.4 Wetlands and Waterbodies

Wetlands and waterbodies analysis and mapping involved an evaluation of existing data, field work, data entry, digital mapping (line work and coding), characterization of wetlands in the study area, and Quality Control (QC) review. The identification and aerial photography-based delineation of wetlands required interpretation of the three parameters used for wetland determinations: vegetation type, soil type, and hydrologic characteristics. Where problematic parameters were observed, additional data and analysis were considered before a final wetland determination was made.

Wetland scientists used the *Corps of Engineers Wetland Delineation Manual* (USACE 1987), *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (USACE 2006), and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (2007 Alaska Regional Supplement; USACE 2007) for specific field seasons, as described in the PJD. Field data within this study area were also collected during an additional field season (2012) using the same manuals as the data collected in 2010, with the exception of the use of the updated *National Wetland Plant List: 2012* (Lichvar 2012).

3.4.1 Enhanced National Wetlands Inventory Code

As part of the data collection and mapping inventory, waters of the U.S., including wetlands and uplands, were classified by an appropriate Enhanced National Wetlands Inventory (ENWI) classification code based on the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) and NWI Mapping Conventions (USFWS 1995). ENWI classification codes differ from NWI conventions by acknowledging non-wetland inclusions in predominantly wetland mapping units. Mosaics dominated by non-wetlands (uplands [U]) are coded U:x, where x is the ENWI classification code for the wetland inclusions, while mosaics dominated by wetlands are coded x:U. Investigators used procedures identified in Chapter 5 of the 2007 Alaska Regional Supplement (USACE 2007) to identify mosaics, described further in the PJD. Based on the 2019 field work, only nine remaining polygons were attributed with mosaic codes in the study area, represented as mosaics of uplands and seasonal freshwater ponds (U:PUSC, U:PUBF). ENWI classification codes observed in the study area are listed in Table 4.

Table 4. Enhanced National Wetland Inventory Classification Codes Observed in the Study Area [a]

ENWI Group	ENWI Code	Description
Deciduous Forests	PFO1	Palustrine broad-leaved deciduous forested wetland
	PFO1/4	Palustrine broad-leaved deciduous forested/needle-leaved evergreen forested wetland
	PFO1/SS1	Palustrine broad-leaved deciduous forested/broad-leaved deciduous shrub wetland
Evergreen Forests	PFO4	Palustrine needle-leaved evergreen forested wetland
	PFO4/EM1	Palustrine needle-leaved evergreen/persistent emergent wetland
	PFO4/SS1	Palustrine needle-leaved evergreen forested/broad-leaved deciduous shrub wetland
	PFO4/SS3	Palustrine needle-leaved evergreen forested/broad-leaved evergreen shrub wetland
Shrubs	PSS1	Palustrine broad-leaved deciduous shrub wetland
	PSS1/3	Palustrine broad-leaved deciduous shrub/broad-leaved evergreen shrub wetland

Table 4. Enhanced National Wetland Inventory Classification Codes Observed in the Study Area [a]

ENWI Group	ENWI Code	Description
	PSS1/4	Palustrine broad-leaved deciduous shrub/needle-leaved evergreen shrub wetland
	PSS1/EM1	Palustrine broad-leaved deciduous shrub/persistent emergent wetland
	PSS1/EM2	Palustrine broad-leaved deciduous shrub/non-persistent emergent wetland
	PSS1/US	Palustrine broad-leaved deciduous shrub/unconsolidated shore wetland
	PSS3	Palustrine broad-leaved evergreen shrub wetland
	PSS3/1	Palustrine broad-leaved evergreen shrub/broad-leaved deciduous shrub wetland
	PSS3/4	Palustrine broad-leaved evergreen shrub/needle-leaved evergreen shrub wetland
	PSS3/EM1	Palustrine broad-leaved evergreen shrub/persistent emergent wetland
	PSS4	Palustrine needle-leaved evergreen shrub wetland
	PSS4/1	Palustrine needle-leaved evergreen shrub/broad-leaved deciduous shrub wetland
	PSS4/3	Palustrine needle-leaved evergreen shrub/broad-leaved evergreen shrub wetland
	PSS4/EM1	Palustrine needle-leaved evergreen shrub/persistent emergent wetland
Herbaceous	PEM1	Palustrine persistent emergent wetland
	PEM1/ML1	Palustrine persistent emergent/moss-lichen wetland
	PEM1/SS1	Palustrine persistent emergent/broad-leaved deciduous shrub wetland
	PEM1/US	Palustrine persistent emergent/unconsolidated shore wetland
	PEM2	Palustrine non-persistent emergent wetland
Aquatic Bed Ponds	PAB	Palustrine aquatic bed
Ponds	PUB	Palustrine unconsolidated bottom
	PUB/EM1	Palustrine unconsolidated bottom/persistent emergent wetland
	PUS	Palustrine unconsolidated shore
	PUS/EM1	Palustrine unconsolidated shore/persistent emergent wetland
Lakes	L1UB	Lacustrine limnetic unconsolidated bottom
	L2US	Lacustrine littoral unconsolidated shore
Rivers/Streams	R1UB	Riverine tidal unconsolidated bottom
	R1US	Riverine tidal unconsolidated shore
	R3UB	Riverine upper perennial unconsolidated bottom
	R3US	Riverine upper perennial unconsolidated shore

Table 4. Enhanced National Wetland Inventory Classification Codes Observed in the Study Area [a]

ENWI Group	ENWI Code	Description
	R4SB	Riverine intermittent streambed
Estuarine	E1UB	Estuarine subtidal unconsolidated bottom
	E2EM1	Estuarine intertidal persistent emergent wetland
	E2EM2	Estuarine intertidal non-persistent emergent wetland
	E2RS	Estuarine intertidal rocky shore
	E2US	Estuarine intertidal unconsolidated shore
Marine	M1UB	Marine subtidal unconsolidated bottom
	M2US	Marine intertidal unconsolidated shore
Pond Mosaics	U:PUB	Upland and palustrine unconsolidated bottom pond mosaic
	U:PUS	Upland and palustrine unconsolidated shore pond mosaic
Uplands	U	Uplands

Sources: Cowardin et al. 1979; USFWS 1995

[a] Modifiers for "water regime" and "special modifiers" were also used as part of the ENWI coding, but are not included in this table.

3.4.2 Hydrogeomorphic Classification Characterization

Hydrogeomorphic (HGM) mapping was completed for the study area. HGM map coding was based on *A Hydrogeomorphic Classification for Wetlands* (Brinson 1993). When polygons were designated as both wetlands and uplands (mosaic), the HGM designation applied only to the wetland portion of the mapped polygon. HGM types within the study area were similar to those presented in the PJD, with the addition of the Coastal Fringe type representing brackish, estuarine waters and wetlands.

4. Mapping Results

Maps of the delineated wetlands and waterbodies are provided in Appendix A. Summary tables, data forms, and photographs are provided in the following appendices:

Appendix A. Figures

Appendix B. Plant List and Indicator Status Summary

Appendix C. Summary of 2004 to 2012 WD Sites

Appendix D. Summary of 2013 and 2019 WD Sites

Appendix E. Summary of 2004 to 2019 PP Sites

Appendix F. Wetland Mapping Acreage Summary Table

Appendix G. Data Forms and Photographs at 2004 to 2012 WD Sites

Appendix H. Data Forms and Photographs at 2004 to 2012 PP Sites

Appendix I. Data Forms and Photographs at 2013 and 2019 WD Sites

Appendix J. Data Forms and Photographs at 2013 and 2019 PP Sites

4.1 Wetlands

Overall, wetlands totaling 893.6 acres were identified in the study area. Wetlands were identified at field plots where the investigator observed indicators of hydrophytic vegetation, wetland hydrology, and hydric soils. If any of these three requirements are not met under normal conditions, the site does not meet the USACE criteria for being classified as a wetland.

4.2 Waterbodies

Overall, waterbodies totaling 2,507.8 acres were identified in the study area. Waterbodies consist of the estuarine and marine waters of Cook Inlet, and freshwater ponds, lakes, rivers, and streams, including their active shorelines and gravel bars. These do not meet the definition of "wetlands" used by the USACE because they lack hydric soil or hydrophytic vegetation. Rivers and streams mapped in the study area include both perennial and intermittent streams. Ponds and lakes were mapped throughout the study area, and ponds were characterized as seasonal or perennial.

4.3 Summary

In total, 3,401.4 acres, or 20 percent of the study area, is preliminarily determined to be wetlands or waterbodies.

Uplands are locations where one or more of the three required parameters for a wetland are not met. Uplands were found in multiple vegetation types, as noted in Table 3, and comprised 13,270.0 acres, or 80 percent of the study area.

A summary of the wetlands by ENWI groupings is shown in Table 5. The groupings reflect the wetland and waterbody mapping in Appendix A and are used for cartographic purposes. The full ENWI code is included in the mapping data set provided with this report.

Table 5. Summary of Wetlands, Waterbodies, and Uplands Identified in the Study Area

ENWI Grouping	Acres in the Study Area [a]
Palustrine emergent wetlands	359.5
Palustrine scrub-shrub wetlands	471.0
Palustrine forested wetlands	56.2
Estuarine emergent wetlands	6.8
Total Wetlands	**893.6**
Aquatic bed lakes and ponds	3.5
Total Aquatic Bed Waterbodies	**3.5**
Lakes and ponds	525.6
Pond mosaics	1.6

Table 5. Summary of Wetlands, Waterbodies, and Uplands Identified in the Study Area

ENWI Grouping	Acres in the Study Area [a]
Rivers/Streams	245.5
Total Fresh Waterbodies	**772.8**
Estuarine	684.2
Marine	1,047.3
Total Estuarine and Marine Waterbodies	**1,731.5**
Total Waterbodies	**2,507.8**
Total Wetlands and Waterbodies	**3,401.4**
Uplands	13,270.0
Total Acreage in Study Area	**16,671.4**

[a] All values are rounded to the nearest 0.1 acre.

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Appendix A:
Figures

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Appendix B:
Plant List and Indicator Status Summary

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Appendix C:
Summary of 2004 to 2012 WD Sites

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Appendix D:
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Appendix J:
Data Forms and Photographs at 2013 and 2019 PP Sites

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