



Akutan Harbor Project: Delineation of Wetlands on Akutan Island, Alaska

by James S. Wakeley, Chris V. Noble, and Michael J. Bishop

BACKGROUND: The work described in this technical note was done at the request of the Regulatory Branch and the Planning Division of the U. S. Army Engineer District, Alaska, as part of a feasibility study for the potential development of a harbor on Akutan Island in the Aleutian Island chain. Akutan Bay is a steep-sided, glacially scoured, natural inlet on the eastern end of the island (Figure 1). The village of Akutan and a major seafood-processing plant cling to the narrow fringe of level ground at the edge of the fjord. Ocean-going container ships use moorings in the deep water of the bay as they wait to load the frozen catch and transport it to markets throughout the Pacific. But the bay has no natural harbor for the smaller fishing vessels that unload at the facility's dock. The proposed project would excavate a harbor basin in the broad alluvial plain at the head of the bay and would fill and grade adjacent uplands and wetlands to create level areas suitable for harbor-side facilities and associated infrastructure.

In assessing the potential environmental impacts of the project, the Alaska District was concerned not only about direct impacts to wetlands due to excavation and filling, but also with the potential for more extensive indirect impacts due to changes in flow patterns and salinity of groundwater across the site. The project area was bounded on the north and south by streams that supported anadromous salmon runs and were a particular focus of the District and the resource agencies.

PURPOSE: To help assess the impacts of the proposed project, the Alaska District requested the assistance of the U.S. Army Engineer Research and Development Center (ERDC), and supplemental funding was provided through the Wetlands Regulatory Assistance Program. Specifically, the Alaska District asked ERDC to provide the following technical assistance: (1) delineate and map the wetlands in and around the project area that may be subject to regulation under Section 404 of the Clean Water Act and might be affected either directly or indirectly by the project, (2) perform a detailed topographic survey, including stream profiles and cross sections, and (3) provide a geologic and hydrologic assessment of the site, focusing on the potential for significant hydrologic impacts to the two streams and remaining wetlands on the site. This technical note focuses on objective 1, the delineation and mapping of wetlands across the Akutan Harbor project area. A second note (Berry, Graves, and Bishop 2001) describes the topographic survey and development of a digital elevation model for the site. The geologic and hydrologic assessment is described in a technical report by Dunbar, Corcoran, and Murphy (2001).

At the time the field work was done in August 2000, three project alternatives had been proposed, differing in basin size (12, 15, or 20 acres [4.9, 6.1, or 8.1 ha]) and in the extent of filling for berms and graded areas. In all three plans, the harbor basin would be excavated behind the existing natural beach ridge and would open to the sea by an excavated channel roughly through the middle of that ridge. All three designs included an access road from the north. Later, in April 2001, a modified 12-acre-basin alternative was proposed, which took advantage of detailed topographic data gathered during the field studies. Figure 1 shows the outline of this alternative, which included approximately 55 acres (22 ha) of associated fill.

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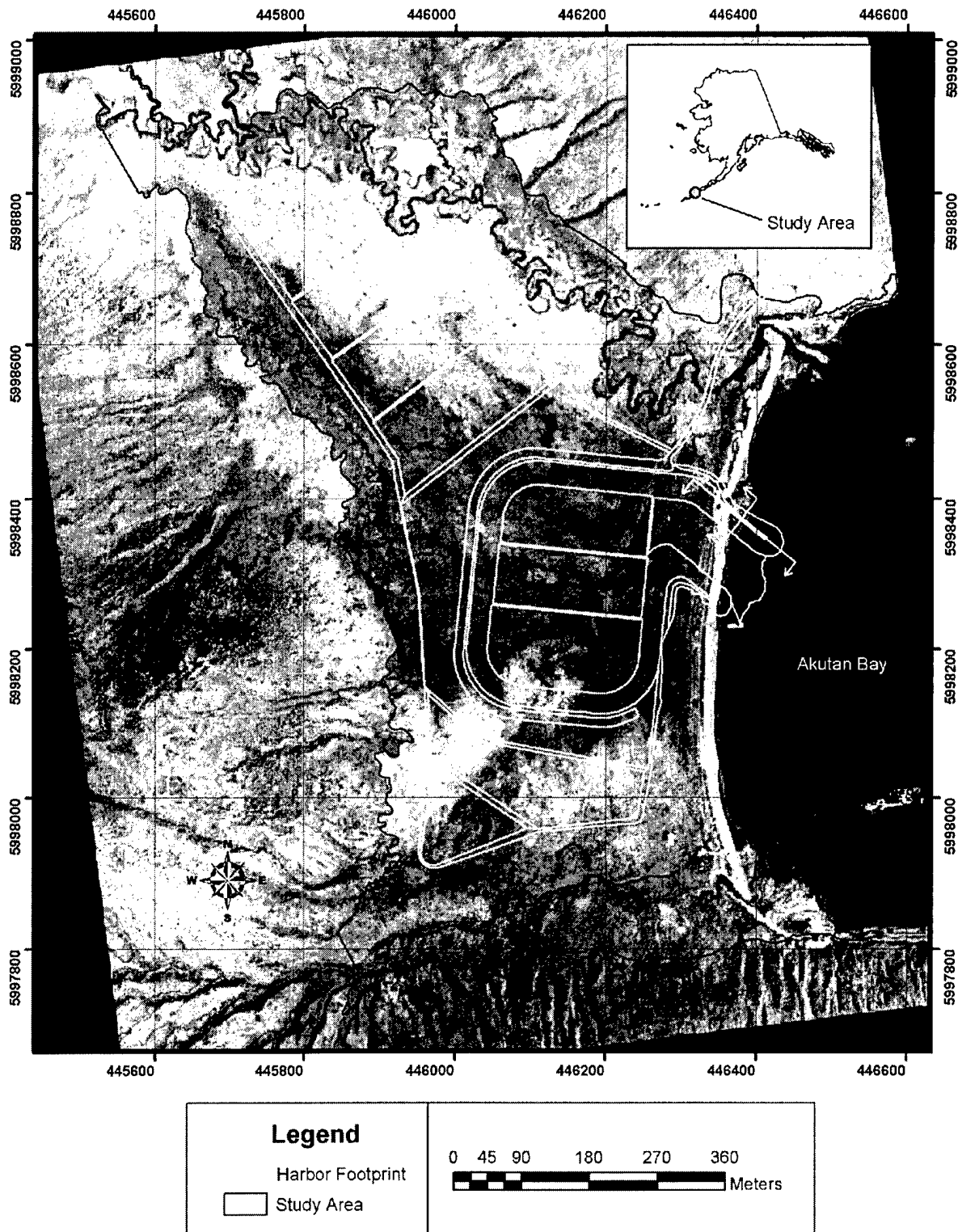


Figure 1. Study area at the western end of Akutan Bay, Akutan Island, Alaska, with the current design for Akutan Harbor and its associated fill area superimposed. Coordinates are based on 200-m Universal Transverse Mercator (UTM) grid ticks. The background photographic image was provided by AeroMap US, Anchorage, AK, and the harbor design by Tryck, Nyman, and Hayes, Inc., Anchorage

STUDY AREA: The study area for the wetland delineation consisted of the broad, relatively flat plain at the head of Akutan Bay (Figure 2). The area was bounded by the bay on the east and by the lower slopes of the hills to the north and south. On the west, the study area extended inland approximately 1,650 ft (500 m) from the mouth of the south creek and 2,000 ft (600 m) from the mouth of the north creek. In the west-central portion of the site, the study area was bounded by hill slopes. The study area was approximately 150 acres (60 ha) in size and encompassed all of the proposed alternative designs for Akutan Harbor, its related infrastructure, and access road.



Figure 2. The proposed project area on Akutan Island. Photo was taken looking southwest from the natural beach ridge adjacent to Akutan Bay. The alluvial plain at this point extends approximately 400 m to the toe of the hill slopes in the background

FIELD WORK: The wetland delineation was performed by Jim Wakeley and Chris Noble of the Environmental Laboratory, ERDC, Vicksburg, MS, with help from Mike Holley and Chad Konickson of the Alaska District. Tommy Berry and John Newton, ERDC, used a Global Positioning System (GPS) to survey the marked wetland boundaries, and Mike Bishop and Tully Wilson, ERDC, prepared the final maps. The work was supported jointly by the Alaska District and the Wetlands Regulatory Assistance Program.

On-site sampling and wetland mapping were accomplished during 18-22 August 2000. Wetland boundaries were identified based on procedures described in the *Corps of Engineers Wetlands Delineation Manual* (hereafter called the Manual) (Environmental Laboratory 1987) and subsequent guidance from Headquarters, U.S. Army Corps of Engineers. According to the Manual, identification of wetlands is based on the presence of indicators of three essential wetland characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology.

An area has hydrophytic vegetation if more than 50 percent of the dominant plant species from all strata in the community are rated “obligate” (OBL), “facultative wetland” (FACW), or “facultative” (FAC, not counting FAC-) on the appropriate regional version of the *National List of Plant Species that Occur in Wetlands* (Reed 1988). The Alaska regional list (Region A) was used in this study. The selection of dominant plants was based on visual estimates of percent coverage of each species at a sampling point. Dominant species were selected based on the “50/20 rule” (i.e., dominant species are the most abundant species that, when cumulatively totaled, account for more than 50 percent of the total coverage of plant species in a stratum, plus any individual species that accounts for at least 20 percent of the total coverage of plant species in the stratum). Sampling was simplified because only one vegetation stratum (i.e., the “herb” stratum, consisting of all herbaceous plants and woody plants less than 1 m tall) was present over most of the study area. Plants were identified with keys given by Hulten (1968). Plant names used in this note are from Reed (1988).

Hydric soils are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register 59(133): 35,680-35,681, July 13, 1994). Hydric soils are recognized in the field mainly by the presence of morphological features (called hydric soil indicators) that develop under prolonged or repeated anaerobic conditions. Hydric soils in the study area were identified based on indicators listed in the 1987 Manual supplemented with the *Field Indicators of Hydric Soils in the United States, Version 4.0* (Natural Resources Conservation Service 1998).

Wetland hydrology is present when a site is inundated by surface water or saturated to the surface by groundwater for at least 5 percent of the growing season in most years. In the absence of long-term, detailed hydrologic data, such as those provided by nearby stream gauges or groundwater monitoring wells, wetland hydrology is evaluated by looking for indicators such as water marks, debris lines, or sediment deposits resulting from inundation; direct observation of shallow water tables and soil saturation; presence of oxidized rhizospheres around living roots; and/or a plant community that meets the FAC-neutral test (i.e., the number of dominant species that are OBL and FACW exceeds the number that are FACU and UPL) (Environmental Laboratory 1987, U.S. Army Corps of Engineers 1992).

Wetlands in the study area were delineated using the “Routine approach” described in the Manual. Under the Routine approach, vegetation, soils, and hydrology are evaluated at sampling points established in representative locations in each of the plant communities present on a site. Those areas that exhibit indicators of all three factors—hydrophytic vegetation, hydric soils, and wetland hydrology—are designated as wetlands. A preliminary wetland boundary is established where a wetland community abuts or grades into a nonwetland community. The boundary is then walked, verified, and adjusted based on additional sampling of vegetation, soils, or hydrology. In the Akutan Harbor study area, verified wetland boundaries were marked with wire flags. Later, the boundaries were surveyed using a GPS and the data displayed as a map layer in the project Geographic Information System (GIS). The flags were then removed.

VEGETATION: Plant communities in the study area can be characterized generally as either sedge dominated or grass dominated. However, there was considerable variability within each type and several plant species occurred as dominants in both community types. Within the two general community types, subtle changes in abundance or coverage of associated plant species sometimes

gave the vegetation a different appearance that was readily observable on the ground and occasionally visible on aerial photos as a change in vegetation color or texture. For purposes of the wetland delineation, however, these subtle variations were disregarded and vegetation was grouped into two general communities.

Sedge-dominated communities (Figure 3) ranged from pure stands of Lyngbye's sedge (*Carex lyngbyei*) (OBL) in areas that contained standing water during the site visit to diverse communities of sedges, grasses, broad-leaf herbs, and low shrubs on somewhat drier sites. Depending upon the location, dominant species included Lyngbye's sedge, several-flowered sedge (*C. pluriflora*) (OBL), chestnut rush (*Juncus castaneus*) (FACW), common marsh-marigold (*Caltha palustris*) (OBL), meadow horsetail (*Equisetum pratense*) (FACW), black crowberry (*Empetrum nigrum*) (FAC), hooded ladies'-tresses (*Spiranthes romanzoffiana*) (OBL), seawatch angelica (*Angelica lucida*) (FACU), under-green willow (*Salix commutata*) (FAC) and others. Narrow-leaf and russet cotton-grasses (*Eriophorum angustifolium* [OBL] and *E. chamissonis* [OBL]) were showy subdominants in many sedge-dominated areas.

Grass-dominated communities (Figure 4) generally occupied topographically higher and somewhat drier sites than the sedge-dominated communities, but many of the grass-dominated areas still met all three wetland criteria. The predominant grasses were blue-joint reedgrass (*Calamagrostis canadensis*) (FAC) and tufted hairgrass (*Deschampsia cespitosa*) (FAC). Another grass species was dominant at several sampling points but could not be identified due to the lack of an inflorescence at the time of sampling. Other dominant plants in grass-dominated wetland communities included

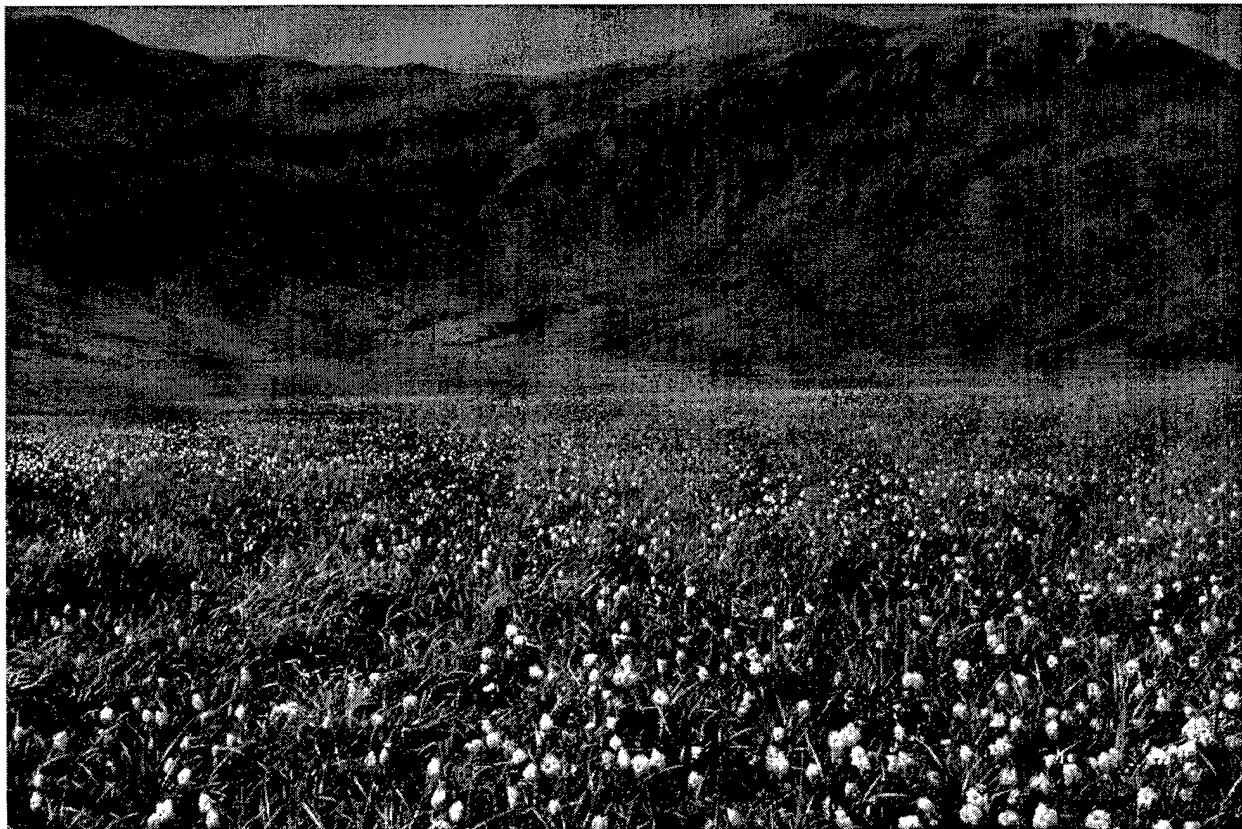


Figure 3. Sedge-dominated community containing cotton-grass as a subdominant

Siberian aster (*Aster sibiricus*) (FAC), Canada burnet (*Sanguisorba canadensis*) (FACW), under-green willow, and hooded ladies'-tresses. Not all grass-dominated communities were wetlands. Dominant species at grass-dominated nonwetland sampling points included blue-joint reedgrass, tufted hairgrass, sea lyme-grass (*Elymus arenarius*) (FAC), cow-parsnip (*Heracleum lanatum*) (FACU), seawatch angelica, meadow crane's-bill (*Geranium pratense*) (FAC), salmon berry (*Rubus spectabilis*) (FACU), fireweed (*Epilobium angustifolium*) (FACU), common yarrow (*Achillea millefolium*) (FACU), Nootka lupine (*Lupinus nootkatensis*) (FAC), and larkspur-leaf monkshood (*Aconitum delphinifolium*) (FAC).



Figure 4. Grass-dominated community

Plant communities satisfied criteria for hydrophytic vegetation throughout large portions of the Akutan Harbor study area. All sedge-dominated plant communities sampled were hydrophytic, as were many of the grass-dominated samples in low-lying areas and in seeps.

SOILS: Identification of hydric soils was based on indicators listed in the Manual supplemented by recent lists of hydric soil indicators published by the NRCS (Natural Resources Conservation Service 1998). It is Corps policy that NRCS hydric soil indicators do not supersede those given in the Manual but should be used as supplemental information, particularly in recognized “problem” soil situations. Problem situations potentially relevant to the study area included soils with deep, dark surface horizons and soils derived from low-chroma (grayish) parent materials. Furthermore, Districts are encouraged to apply and evaluate those indicators designated for “testing” by NRCS (1998). Several indicators are designated for testing in Alaska and were used in this study.

Soils in the study area ranged from organic soils in the wettest portions, to mineral soils with organic surface layers in intermediate areas, to relatively dark-colored mineral soils in drier portions of the alluvial plain and immediate hill slopes. No soil survey was available for Akutan Island, but soils on nearby islands were generally classified as Andisols (soils of volcanic origin) and Histosols (organic soils).¹ The dark color of many soils in the study area was due, in part, to the basic color of the volcanic parent materials and, in part, to the accumulation of organic matter in wet areas.

Hydric soils in the study area generally exhibited one or more of the following hydric soil indicators listed in the Manual:

- Organic soils (Histosols).
- Histic epipedons.
- Soils that are gleyed or have high-chroma mottles (redox concentrations) in a low-chroma matrix.

Organic soils have organic surface layers (peat, mucky peat, or muck) at least 16 in. (40.6 cm) thick. Histic epipedons are surface organic accumulations between 8 and 16 in. (20.3 and 40.6 cm) thick. Soils in the study area that had redox concentrations in a low-chroma matrix generally had matrix colors in the mottled horizon of hue 7.5YR to 10YR, value 2 to 4, and chroma 1 to 2.

All of the soils determined to be hydric under the Manual also exhibited hydric soil indicators listed by NRCS (1998). Four indicators designated for use in south-coastal Alaska (Land Resource Region W) were observed in the study area:

- A1 (Histosol).
- A3 (Black Histic) (for testing in LRR W).
- A10 (2 cm Muck) (for testing in LRR W).
- F6 (Redox Dark Surface) (for testing in LRR W).

Indicators designated for testing in LRR W appeared to work well. They were present in appropriate landscape positions and were supported by the presence of hydrophytic plant communities and hydric soil indicators listed in the 1987 Manual. Use of the NRCS (1998) indicators without the "testing" indicators (i.e., using only indicator A1) would have excluded large portions of the study area, including obvious wetlands.

HYDROLOGY: Hydrology was the most difficult wetland factor to evaluate during on-site sampling. In the absence of long-term hydrologic data, wetland hydrology determinations are based on field indicators, most of which are produced by surface ponding or flooding (e.g., water marks, drift lines, sediment deposits). The Akutan Island study area apparently ponds water only in isolated areas; wetlands over the majority of the site are the result of shallow water tables. Anaerobic conditions in waterlogged soils are responsible for the development and maintenance of hydric soil indicators and hydrophytic plant communities. However, shallow groundwater leaves little direct evidence of its presence, unless sampling is done during the time of year when the water table is high.

¹ Personal Communication, 3 August 2000, Mike Mungoven, Soil Scientist, Natural Resources Conservation Service, Homer, Alaska.

During the August 2000 site visit, water tables and/or saturated soils were found within 12 in. (30 cm) of the surface at only 10 of 22 detailed sampling points, although it was ultimately concluded that 15 of the points had wetland hydrology. In the case of seasonal wetlands, if a site must be sampled during relatively dry periods when environmental conditions are not "normal," the Manual allows for other information to be considered in making the wetland hydrology decision (Environmental Laboratory 1987, Section G, paragraphs 78-79). The decision that wetland hydrology existed in some areas that lacked hydrology indicators was based on the presence of hydric soils and hydrophytic vegetation (sometimes meeting the FAC-neutral test) in areas without any significant hydrologic alterations (National Research Council 1995) and the fact that sampling occurred during late summer when water tables were expected to be low. Water tables in spring and early summer are likely at or above the surface across much of the site, due to abundant runoff and shallow groundwater flow from the surrounding mountains during snowmelt and spring rains. There was evidence of earlier ponding (e.g., matted plant debris, bare sediment) in many low areas that were not ponded during the site visit.

WETLAND BOUNDARIES: In general, one vast wetland complex extended from the base of the northern hills, southward across the entire alluvial plain between the bases of the beach ridge on the east and the hill slopes to the west (Figure 5). Occasional seep wetlands extended up the lower slopes of both the northern and western hills. In the southeastern direction, the wetland ended in gradually rising terrain near the site of an old homestead. To the southwest, a wetland corridor extended toward the upper reaches of the south creek. In addition, isolated wetlands were identified near the mouths of both the north and south creeks, and along the right descending bank of the south creek.

The area surrounding the north creek was a complex of point bars, abandoned channels, natural levees, and cut banks. Elevations varied approximately 3-6 ft (1-2 m) over short distances. All of the points sampled within the floodplain were wetlands, although some were transitional toward uplands. More detailed sampling would perhaps identify a few small areas of nonwetlands in the north creek complex. However, most such nonwetland areas, if present, would be so small and isolated that they could not be developed without impacting adjacent wetlands. Therefore, we designated the entire north creek complex as wetlands.

Virtually all of the wetlands identified would be classified as palustrine emergent (PEM) in the Cowardin et al. (1979) classification of wetlands and deepwater habitats. The only possible exceptions were small ponded areas behind the beach berm in the east-central portion of the study area, along the base of the western mountains, and in abandoned meanders along the north creek. Some of these areas lacked emergent vegetation and would be classified either as palustrine aquatic bed (PAB) if they supported submerged or floating vegetation, or palustrine unconsolidated bottom (PUB) if they did not (Figure 6).

CONCLUSIONS: Approximately 95 acres (38 ha) of wetlands were identified in the study area (Figure 5) including virtually all of the sedge-dominated plant communities and the wetter portions of the grass-dominated areas. Nearly all of the northern portion of the study area was wetland, and wetlands continued up the north creek drainage beyond the end of the wetland survey area. In the southern portion of the study area, wetlands were somewhat less extensive, being more or less restricted to a broad drainageway toward the southwest and some isolated wetland patches on the south side of the south creek.

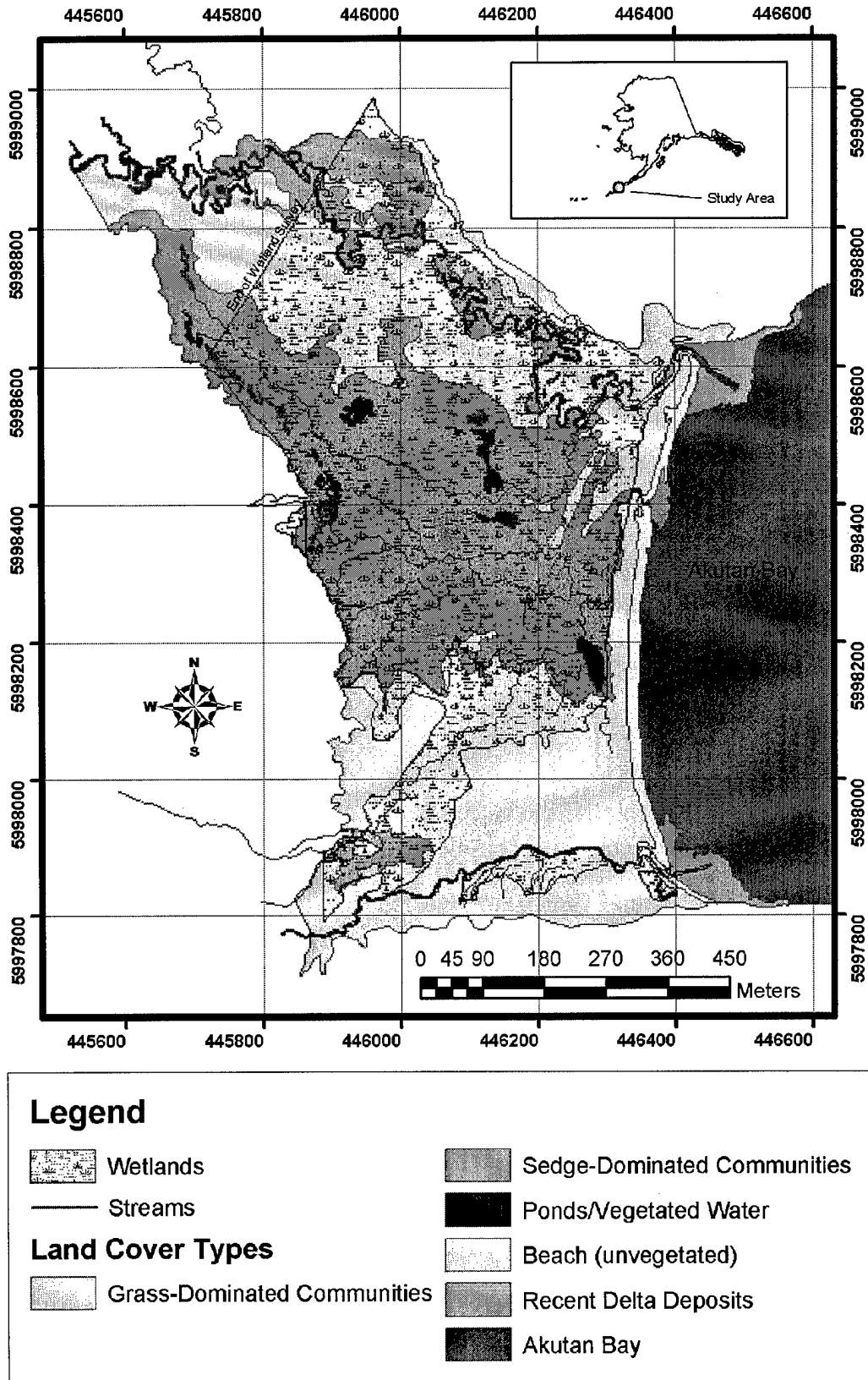


Figure 5. Land cover and wetland boundaries on the Akutan Harbor Project site



Figure 6. View from the western mountains looking northeast toward a fog-shrouded Akutan Bay. Wetlands on site were nearly all Palustrine emergent (PEM). Small ponds (bottom left) were Palustrine aquatic bed (PAB) or unconsolidated bottom (PUB)

There were 58 acres (23.5 ha) of wetlands within the footprint of the most recently proposed design for Akutan Harbor and its associated fill area (Figure 1). Placing the proposed harbor in the approximate center of the alluvial plain would result in a considerable impact to the surrounding wetlands. One option to reduce wetland impacts, and perhaps lessen the threat to the north creek complex and its salmon runs, would be to shift the project toward the south and take advantage of upland areas there, particularly to the southeast.

Hydrologic modeling (Dunbar, Corcoran, and Murphy 2001) suggested that wetland areas adjacent to the excavated harbor basin, those not filled for development, may become more saline. Effects of increased salinity on plant communities are not expected to be significant. One of the most abundant wetland plants in the area, Lyngbye's sedge, is commonly found in estuarine areas throughout the Northwest and should be tolerant of more saline conditions. It might increase in abundance or coverage in the remaining wetlands as long as existing hydrology is maintained. Other species that are adapted to saline conditions, but were not seen on the Akutan site, include seaside arrow-grass (*Triglochin maritimum*) and alkali grass (*Puccinellia* spp.). These and other salt-tolerant wetland species may become established if there are nearby seed sources.

POINTS OF CONTACT: For additional information, contact Dr. James S. Wakeley, Environmental Laboratory, U. S. Army Engineer Research and Development Center, Vicksburg, MS (601-634-3702, James.S.Wakeley@erdc.usace.army.mil) or the Manager of the Wetlands Regula-

tory Assistance Program, Dr. Russell F. Theriot (601-634-2733, *Russell.F.Theriot@erdc.usace.army.mil*). This technical note should be cited as follows:

Wakeley, J. S., Noble, C. V., and Bishop, M. J. (2001). "Akutan Harbor Project: Delineation of wetlands on Akutan Island, Alaska," *WRAP Technical Notes Collection* (ERDC TN-WRAP-01-07), U.S. Army Engineer Research and Development Center, Vicksburg, MS.

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