

Waḡadḡa Island Literature Review



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Executive Summary

Throughout time the richness of the historical, cultural, geographic, and ecosystems of Waʔadʔa Island have led to various land uses, ownership, and literature subjects. The long history of land management left marks on the landscape of Waʔadʔa Island, many of which have been removed under the Native American Lands Mitigation Program. While the Makah Tribe has been working to restore the landscape, they seek a more thorough restoration and enhancement of habitats of Waʔadʔa Island to promote subsistence opportunities and healthy ecosystems. This Waʔadʔa Island Literature Review was identified as the first step in laying the framework to guide further restoration actions for Waʔadʔa Island. In this review we summarize historical and current activities across three broad categories to help inform and guide future restoration efforts.

Uncovering the array of uses and ownerships of Waʔadʔa Island in the literature influenced the, organization, presentation, and synthesis approach of the material. Here we compartmentalize the literature reviewed and present the findings in three broad categories of interest: (i) indigenous cultural and historical uses and importance, (ii) fish, wildlife and nearshore habitat research, and (iii) previous restoration efforts. The more commonly used narrative approach for literature reviews was deemed too coarse for this effort therefore we opted to individually review each source and catalog the findings. The numbering of the references remains sequential throughout the document and articles in each section are in chronological order.

The Makah spelling of the Island is Waʔadʔa, which is why it is used for the title of the report. However, it is addressed in most of the literature reviewed for this document as “Wa’adah” or “Waadah” Island. Hereafter the spelling of “Wa’adah” will be used in this review except in individual titles or direct quotes where the spelling will reflect the way it is spelled in that title or quote.



Figure 1: 1908 photo of Wa'adah Island. Photo Credit: University of Washington

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Cover Photo: Fishing Boats in Neah Bay looking towards Wa'adah Island 1918.

Introduction

Wa'adah Island has been of cultural and ecological significance for the Makah Tribe since time immemorial. At the northwest corner of the coterminous United States, the Makah Reservation is situated in a unique geographic location. Wa'adah Island, one of the offshore Islands of the Makah Reservation, is in the northwestern portion of Clallam County Washington, is approximately 33 acres in size and has a maximum elevation of 80 feet above sea level. From a maritime perspective, Wa'adah Island is situated in the western portion of the Strait of Juan de Fuca (SJF), at the entrance to Neah Bay, which is the nearest bay in the SJF to the Pacific Ocean.

The Treaty of 1855 between the Makah Tribe and the United States Government set the geographical boundaries of the Makah Reservation. Wa'adah Island was ceded from the Makah Tribe to the US Government in the 1855 treaty but in 1984 Wa'adah Island was returned to the ownership of the Makah Tribe. While under the Federal Government's ownership Wa'adah Island was developed for navigational and Department of Defense (DoD) purposes. In 1924 pursuant to Executive Order 3949 the management and oversight of Wa'adah Island was transferred from the Department of the Interior to the Treasury Department. In addition to the governmental developments, Wa'adah Islands nearshore ecosystems have been influenced by the adjoining Neah Bay, which has been an industrial fishing hub for over a century. While most of the DoD structures have recently been removed, further actions can be taken to foster restoration and enhancement of Wa'adah Island ecosystem processes, with a primary focus towards salmon habitat.

Since 1998 the Makah Environmental Division has been working to address relict federal government sites including Wa'adah Island, identified as Site 21, on the Makah Reservation and to remove remnants installed during from the DoD occupancy. This work has been accomplished by the multi-entity Makah Environmental Restoration Team under the Native American Lands Environmental Mitigation Program (NALEMP). With this literature review as the initial step the Makah Habitat Division, under the Fisheries Department, is laying the framework for a forthcoming Habitat Assessment and Restoration Plan of Wa'adah Island. The Habitat Division seeks to move towards a full restoration and habitat enhancement of the island by identifying actions that were not covered under the NALEMP funding and agenda.

Literature Reviewed

Indigenous Cultural, Historical Uses, and Importance

The Makah Tribe are an Indigenous culture rooted in skilled mariners, fishermen and whalers. Wa'adah Island was ceded in the Treaty of 1855, and the material in this section includes correspondence, Legislative Bills, and supporting documents, which are related to the Makah Tribe regaining ownership of Wa'adah Island.

Rectifications to the Treaty of 1855 tribal lands designation first occurred in 1872 and 1873 which formally recognized village locations that were originally omitted. Again in 1970 a 719-acre area designated as the Ozette Reservation was returned to the Makah tribe from the Department of Interior through Public Law 91-489. The return of some of the Ozette lands was determined a success and was referenced when the Makah sought the return of Wa'adah and Tatoosh Islands. In 1984 Wa'adah and other offshore islands were returned to Makah Tribal ownership through Public Law 98-282.

In addition to the Makah Tribe and U.S. Government, interest in the area also came from anthropologists (e.g., T.T. Waterman and Frances Densmore) and James G. Swan, a historical figure and resident of the area at that time. James G. Swan kept ethnographic recordings of his time in Neah Bay and published several books consisting of observations from western Clallam County. James G. Swan resided in Neah Bay as a school teacher in 1859. His recordings of his trips to Wa'adah Island include what he observed as "several stone dikes built by Indians to catch fish" (Lane 1982).

1. Department of the Interior. 1976. Department of Interior: Letter to Mr. Eugene Parker regarding the history of Tatoosh and Waadah Islands.

This is a letter of correspondence to Eugene Parker from the Department of the Interior in response to a phone call. On the phone Mr. Eugene Parker had requested information on the history of Wa'adah and Tatoosh Islands. Inclusive of the letter are copies of the Treaty of the Makah 1855, Executive Orders from 1868, 1872, 1873, 1873, 1923, 1925, Solicitors Opinions and earlier correspondence from 1960 and 1962. Correspondence from Superintendent of Western Washington Agency, Portland Area, Branch of Realty (1960 and 1962) show inquisition and investigation of rights of Washington State tidelands. Mr. Parker was investigating the history of, and rights to, the lands of the Islands after the Coast Guard informed Makah tribal members they could not clam on the Islands and were "chasing" them off the Island (included Memorandum dated 1976). A Memorandum from 1963 revisits intentions and determines there was an initial intent to recognize clamming and other tideland uses as a right that maintains a tribal culture and livelihood.

2. Lane, Barbra, PhD. 1982. Brief Report on the History of Waada Island and its Cultural Significance to the Makah Indians.

This report shares supporting accounts and documents that captured the significance of Wa'adah Island to the Makah Tribal members. Due to the significance and relativity in this report it is included as an Appendix to HR 3376, as is a similar separate document on Tatoosh Island. In 1868 Wa'adah Island was claimed as a military reserve.

Three tribal members provided a joint statement in 1909 to the Commissioner of Indian Affairs which was recorded. They recounted that at the time of the ceding of the Island that Wa'adah Island was used as a residence for several generations of a family. They stated that the grandfather had a house on the island and the father cleared more land in his time and cultivated the ground. The family was referred to as Young Doctor (Old Doctor, Old Doctors father, Young Doctor and Young Doctors son) and the statements were given by three men who were slightly older than Young Doctor. The Young Doctor boy was born in 1850 and would have been 59 years of age when the appeal was made to Congress.

Based on the statements from 1909 an appeal was made up the line to the Secretary of the Interior and the Secretary of War to Congress. The federal government acknowledged that the Young Doctor family inhabited the Island when it was taken in 1868 to be used as a military reserve. Reparations for the loss of the family's home on Wa'adah Island were made with the youngest of the Young Doctor family.

"In 1923 or 1926" anthropologist Frances Densmore visited and recorded the memories from Young Doctor the son (who was 70) of the Wa'adah Island home and the Neah Bay village as he recalled it at that time. He referred to Wa'adah Island as Wanda Island. Upon further investigation Frances discovered the Island was previously owned by a man named Wandahart, which is how the Island got its name. Lane investigated the recordings from the Treaty of 1855 proceedings and noted that since none of the Makah tribal members spoke or read English, it was clear that they did not understand the offshore islands were being ceded.

3. House of Representatives 1983. H.R.3376: A bill to declare that the United States holds certain lands in trust for the Makah Indian Tribe, Washington.

This is a Legislative Report that was submitted to congress for the lands of Tatoosh and Wa'adah Island to be restored to the Makah Tribe's ownership. It was submitted on behalf of the Makah Indian Tribe due to the recognized "cultural, historical, and religious importance" the Islands had for the Makah Tribal members. Section III of the report references the successful transfer of lands near the tribal Ozette village as an example of a way forward with Tatoosh and Wa'adah Islands.

The parallels between the 1970 Ozette lands transfer and the Tatoosh and Wa'adah lands transfer along with the cultural significance are articulated in the report. The lands will not be inhabited or developed, but returned to the ownership of the Makah Tribe. This is further shared in Dr. Barbara Lane's accompanying 1982 report which is included as an Appendix. The federal government had installed a lighthouse on Tatoosh Island and a lifesaving station on Wa'adah Island. The light house has been replaced with an automated light and the lifesaving station has been moved to Neah Bay and remains an operating Coast Guard facility. The Makah Tribe created Resolution No 140-83 (Exhibit H of H.R. 3376) with set parameters regarding use of the islands by the federal government and use for navigational aids.

The report concludes that the members and inhabitants of the Makah Tribe see Wa'adah every single day. Restoration of the lands to the Makah Tribe would amend the injustice and grievance that has occurred. Thus, the restoration of Tatoosh and Wa'adah Islands will symbolize a respectful relationship between the Federal Government and the Makah Tribe. As a result of the submitted HR 3376, on May 14, 1984 under Public Law 98-282 Wa'adah and Tatoosh Islands were returned to the Makah Tribe.

Fish, Wildlife, and Nearshore Habitat Research

The research documents in this section were often prompted by the need to better understand an ecosystem and how future decisions or occurrences may impact resources. Examples of reasons include; looking at how oil spills will affect bird populations, identification of the least impactful site for building a marina, or ecological research to better understand the hierarchy of intertidal community structures.

Shoreline and nearshore habitats west of the Elwha River are generally classified as rocky intertidal with intermittent pockets of estuary habitat. The pocket estuary habitat is thought to be important, specifically for salmon species during out-migration (Fitzpatrick 2006). This makes the integrity of habitat provided by Neah Bay and the shorelines of Wa'adah Island vital to migrations of Hood Canal and Puget Sound ESA listed salmon species.

4. Rigg and Miller. 1949. Intertidal Plant and Animal Zonation in the Vicinity of Neah Bay, Washington.

This paper begins with detailed geologic descriptions of Wa'adah Island. Some of the descriptors include; *it bears a coniferous forest with dense undergrowth of shrubs; the eastern and north eastern shore are subject to heavy wave action, especially during outgoing tides; the eastern shore, also known as Postelsia Point, has tilted sandstone strata and experiences heavy wave and surf during incoming and outgoing tides; water on the southwest side is shallow; and there are no sandy beaches on the Island.* Observations were made in the area in the years of 1911, 1912, 1933, and 1936-1938. Another trip was made in 1948 to observe differences that could have resulted from the newly constructed breakwater (noted to have been constructed between 1942 and 1943).

Eighty-eight species of algae were identified in the intertidal zone of Wa'adah Island. The least amount of algae species are found on the south side of Wa'adah Island where the shore is protected from the wave action that the other parts of the Islands' shoreline experience. *Tidepools are common in the sandstone reefs on Postelsia Point and the west shores of Waadah Island.* Observations from the 1948 visit include that the outer side of the breakwater had been colonized by a mussel and barnacle species that characteristically inhabit those types of environments and the sheltered side of the breakwater was being populated by more sessile organisms. Also observed, for unexplainable reasons, was that the *Postelsia* at Postelsia Point had become thinner and individual plants appeared less robust compared to earlier years.

5. Dayton, Paul. 1973. Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, *Postelsia Palaeformis* Ruprecht.

Postelsia palaeformis is an annual brown alga. This paper looks at the species characteristics and life history traits (e.g., dispersal, distribution and competitive abilities) that lead to its spatial distribution. It is found as a dominant species on the wave-torn northwestern tip of Wa'adah Island. Due to its persistence here this portion of the Island is referred to as Postelsia Point.

It is found that *Postelsia* only disperses within 3 meters of itself, but drifting may be a long-distance dispersal adaptation. "Postelsia patches have a strikingly contiguous, non-overlapping distribution pattern" with patches of a mussel (*Mytilus Californianus*). This is thought to be due to a negative

competition interaction. This theory was tested by removing some patches of the mussel. The areas within 3 m of *Postelsia* then recruited *Postelsia* sporophytes while areas 7-10 m away lacked recruitment. It was also thought that *Mytilus* interfered with recruitment of *Postelsia*.

Filamentous algae and barnacles are thought to assist in the establishment of *Postelsia*. This is done through competition with *Postelsia* attaching to the filamentous algae or barnacles and smothering them while still persisting. The intertidal area is one with high competition for space and *Postelsia* Point is dominated by mussels and barnacles. *Postelsia* exhibits characteristics not common in annuals which helps it persist in the environment.

6. Dayton, Paul. 1971. Competition, Disturbance, and Community Organization: The Provision and Subsequent Utilization of Space in a Rocky Intertidal Community.

This research project was done to fulfill the PhD requirements at the University of Washington. It looks at the distribution and abundance of rocky intertidal organisms. The competition of primary versus secondary space between mussels, barnacles, anemones and algae are all looked at with regards to tidal related disturbances such as physiological stressors (e.g., desiccation and heat), wave exposure and the repetitive impact of drift logs.

There were three study areas in the San Juans and five in Neah Bay including the Islands of Wa'adah and Tatoosh. In some locations barriers were created with bottomless bowls to inhibit species movement in an area. Cages were used to "exclude or regulate densities" of some species. Semi-monthly visits were made to sites, with the exception of Tatoosh due to access, and spatial use was examined photographically. Average limpet density was determined and replicated within the bowl area. On W'aadah Island four species of limpets were documented in the 3–8-foot tidal range and three species of barnacles in the 4.6-to-7.7-foot tidal range.

Overall density of gastropods per tidal zone was examined for recruitment of community species following disturbance events with regards to primary or secondary species. Biological disturbance events observed included predation by gastropods, starfish, and grazing by limpets. While barnacles and algal growth occupied primary spaces, mussels were secondary and only grew where algal species or barnacle larvae were. Barnacle presence was reduced by active limpet grazing. There was an observed increase in gastropod abundance when limpets were present due to the competition between limpets and barnacles.

7. Meyer, J.H., Blum, J., Dilley, S., and R.S. Boomer. 1985 Distribution and abundance of juvenile salmonids in Clallam Bay and Neah Bay, Washington.

This document was authored by U.S. Fish and Wildlife Service (USFWS) and Makah Tribe staff for the U.S. Army Corp of Engineers (USACOE). This study was executed in support of local harbor development; inclusive of a small boat basin and log channel in Neah Bay. In 1984 a small research team investigated the juvenile salmon use of the pocket estuaries of Neah Bay and Clallam Bay. There were three purse seine sites and two intertidal zone beach seine sites. Purse seine sites were sampled at high tide and beach seine sites were sampled at low tide biweekly from May to August.

Neah Bay had higher species diversity in beach seine samples than in purse seine samples. However, salmon species of chinook, chum, and pink caught in purse seines (the neritic zone) had longer mean

lengths than those caught in the intertidal sample zones. Overall, less salmon were caught in Neah Bay than Clallam Bay, and no coho were caught in Neah Bay, while some were caught in Clallam Bay. Three baitfish species and 14 additional species were also captured at the Neah Bay sites. A spatial temporal observation at both Clallam Bay and Neah Bay sites found salmonids to use the nearshore earlier, and the neritic zones later in the sampling season when salmonids were larger. Nearshore catch abundance had more difference between the two Bay areas than neritic abundances. Sample abundances indicate that both bays are important for surf smelt, sand lance, and herring.

8. Calabokidis, J., Steiger G.H., and J. C. Cabbage. 1987. Marine mammals in southwestern Strait of Juan de Fuca: Natural history and potential impacts of harbor development in Neah Bay. Final Report to the U.S. Army Corp of Engineers, Seattle District, Cascadia Research Collective, Olympia, WA 103 pp.

This report presents the findings and recommendations of a feasibility study that was executed by Cascadia Research Collective who was contracted by the Seattle District Army Corps of Engineers. The occurrence of, and potential impacts to sea life, with specificity of marine mammals and cetaceans, were investigated under the scenario of proposed construction and operation activities in Neah Bay. The activities proposed included the construction and operation of a log exporting facility, a small boat harbor, and a deep-water channel in Neah Bay.

Land-based observations were made from Wa'adah Island focused on getting a Wa'adah Island Harbor seal haul-out count, monitoring the number and route of passing gray whales, and to count sea lions in Neah Bay. Observations were also made by boat, kayak, and aerial surveys. Air-based photogrammetry was used to determine the size class of focus animals. Survey transects were done at one and three nautical miles from shore. A total of 800 observations were made over the course of two field seasons.

The researchers found that the area between Wa'adah Island and the mouth of the Sekiu River was a dominant feeding area for gray whales. Gray whales were observed to enter Neah Bay six times. On two other occurrences they were observed crossing the mouth of Neah Bay from Baadah Point to the outer shoreline of Wa'adah Island. A high concentration of gray whales was noted to occur between Wa'adah and Tatoosh Island by local charter boat operators.

Although only one sea otter was observed in all of the study area, the shallow areas and kelp beds around Wa'adah Island, among other areas in the study, were identified as high-quality sea otter habitat. Southwestern Wa'adah Island was one of three locations in the study area in which river otters were observed with the other two being Neah Bay and Baadah Point. On the northeast side of Wa'adah Island eight Harbor seals used tidally exposed rock as a haul-out area seasonally from May to October.

While there were other observations in the study area, a single California sea lion was observed on the south side of Wa'adah Island. Sea lions have been observed to follow the shoreline when migrating west around Wa'adah Island. They are generally known to parallel nearshore areas, just outside the kelp beds. Eight Northern sea lions were observed in Neah Bay but the species was only observed hauled-out on Tatoosh Island.

Based on spatial temporal observations, abundance and distribution some species were noted as most likely to be impacted. The most likely was California sea lions, with several species listed next being of equal concern; gray whales, Harbor seals, sea otters, river otters, and Northern sea lions.

The construction activities under consideration would require blasting, which would create shock waves. Any blasting during Northern sea lion and Harbor seal migration time could impact them. California sea lions, sea otters and river otters were also of concern for impacts from blasting activities in Neah Bay. Impaired water quality, vessel traffic noise, and decreased prey availability were other identified impacts moving forward. Additional study approaches were identified to help mitigate potential impacts.

9. Wahl, T.R., Speich, S.M., Manual, D.A., Hirsch, K.V., and C. Miller. 1981. Marine Bird populations for Strait of Juan de Fuca, Strait of Georgia and Adjacent waters in 1978 and 1979.

This research was sponsored by the Environmental Protection Agency (EPA) to collect information on marine breeding birds to gain insight into the threat of oil pollution in the Strait of Juan de Fuca to these birds. Average seasonal bird densities by habitat type (e.g., open water, broad passage, narrow passage, cobble beach and shallow bay, eelgrass) were compared and their respective migratory patterns considered. Roost habitat types, marine bird mortality, natural variation, and oil spill occurrences between 1978 and 1979 were also looked at.

“The study area was divided into 13 Regions with 64 subregions.” The Region looked at for this review is the Strait of Juan de Fuca Region and the Sub region is primarily Neah Bay, however there are some notable findings in regards to Tatoosh Island and birds for the Region. A Bird Oil Index (BOI) was used to assess species and populations' vulnerability to oil. BOI scores are based on behavioral attributes such as if it is a diver or a dabbler, habitat type used, general population size, fecundity rate and seasonality.

Two pigeon Guillemot and 4 Marbled Murrelets were observed in the Neah Bay subregion. Log booms have replaced previously available habitats for some species as roosting sites. Neah Bay, as discussed in other documents, does have log booms which were observed as roosting sites in this study. The jetty, or breakwater, was also used as a roosting site. Both species observed in Neah Bay scored a high BOI. Just to the west of Wa’adah Island, Tatoosh Island was noted to have the most important breeding marine bird colony with 3,800 breeding pairs. The total amount is comprised of the Glaucous winged Gull (for 2,000 breeding pairs), two species of storm petrel, two species of auklet, and four other species making it the most species diverse of any of the sites in the study.

10. Simenstad, C.A., Thom, R.M., Kuzis, K.A., Cordell, J.R., and D.K. Shreffler. 1988. Nearshore Community Studies of Neah Bay Washington. Final Report to the U.S. Army Corp of Engineers, Seattle District, June 1988. Wetland Ecosystem Team, Fisheries Research Institute, School of Fisheries WH-110, University of Washington, Seattle. WA. FRI-UW-8811. 200 pp.

The Wetland Ecosystem Team from the Fisheries Research Institute (FRI) at the University of Washington (UW) was contracted by the Army Corp of Engineers to investigate the marine ecosystems of Neah Bay with consideration of the location of a marina. The study looked at marine macrophyte and ecosystem functions to determine how the development of a log ship channel and small boat basin in Neah Bay would affect them. There were three potential marina sites which represented the sample sites. Survey transects were laid out across the bay in a general north to south fashion to determine habitat characteristics of Neah Bay to inform the location of the proposed navigation channel. Overall, the study looked at fishes and motile macroinvertebrates, epibenthos and pelagic zooplankton, benthic infauna macroinvertebrate, marine macrophytes, trophic relationships.

Spatial temporal variability, ecological interactions (e.g., fish and invertebrate and functions of macrophyte habitats), and potential consequences to nearshore communities were investigated specifically to the three potential marina locations. Habitat characteristics were spatially analyzed throughout the bay for baseline information to guide the proposed construction of the navigational channel and turning basin.

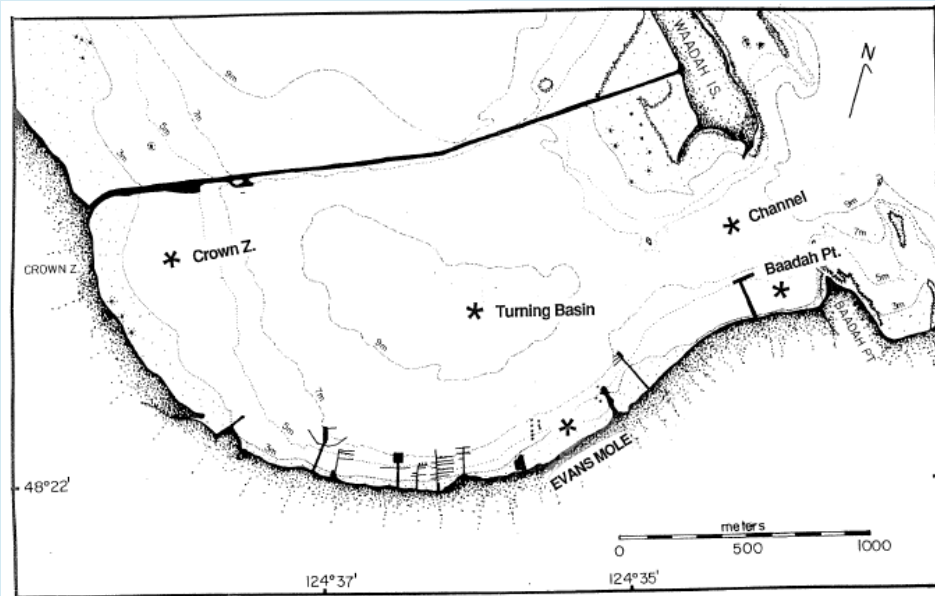


Figure 2: Proposed marina and study sample locations in Neah Bay (Simenstad et al 1988).

Baadah Point, Evans Mole, and Crown Z (Zellerbach) were the three potential marina and sample sites (Figure 3). Beach seines, purse seines, and SCUBA transects were the sampling methods used for fish and motile macroinvertebrates at potential marina sites. Crown Z, the Turning Basin and Channel were sampled using an otter trawl. Transects were used for macrophyte abundance and distribution, bivalve and, fish and motile invertebrate sampling. Baadah and Evans Mole each had three and two transects parallel the shoreline, respectively. Crown Z had three transects perpendicular to the shoreline. To sample the environmental conditions and habitat characterization of Neah Bay surface temperatures were recorded and transects were identified for both free swimming and underwater scooter assisted SCUBA methods. Transects crossed the bay in a relative North and South direction.

Neah Bay habitat characterization was also mapped and studied. The results showed four distinct categories with silty sand as the dominant substrate with tubeworms of notable presence. The middle two categories for area covered were also sandy with macrophytes in high densities. The fourth habitat identified was isolated to an area termed the Crown Z dock area and the substrate is dominated by wood chips and silt.

Baadah point had 40 different species in the beach seine samples resulting in the highest species diversity and abundance compared to the other sites. Cumulative across all three sites 47 species were caught using a beach seine and 21 species of fish were caught using the purse seine method. Beach seine samples produced salmonid species of pink, chum, coho, and Chinook. Purse seine samples produced salmonid species of Chinook, chum and coho. Other species caught were types of forage fish,

rock fish and 12 different species of sculpin, with three species in the purse seine and all 12 in the beach seine.

It was determined that there would be direct habitat losses associated with the construction of a breakwater-protected marina. The navigation channel, if timed and planned correctly could have comparatively lower long-term impacts.

11. USACE. 2003. Fish Survey, Neah Bay Breakwater Area. Prepared by Science Applications International Corporation Consulting for the USACE.

Science Applications International Corporation (SAIC) was contracted by the United States Army Corp of Engineers (USACE) to investigate the abundance and distribution of juvenile salmon, and water quality of Neah Bay and documented the findings. The goal was to better understand spatial, temporal, and seasonal use of Neah Bay by migrating juvenile salmon. Juvenile migration times were targeted. This information would inform the USACE if a fish-gap in a western portion breakwater would be beneficial to juvenile salmonids for access to the shoreline and for water quality by promoting water mixing in Neah Bay. In 2002 sampling took place that targeted understanding fish use of the fish-gap in the marina breakwater that is maintained by the USACE. The sampling was expanded in 2003 for assessing the applicability of fish-gap in the breakwater between the Strait of Juan de Fuca and Neah Bay.

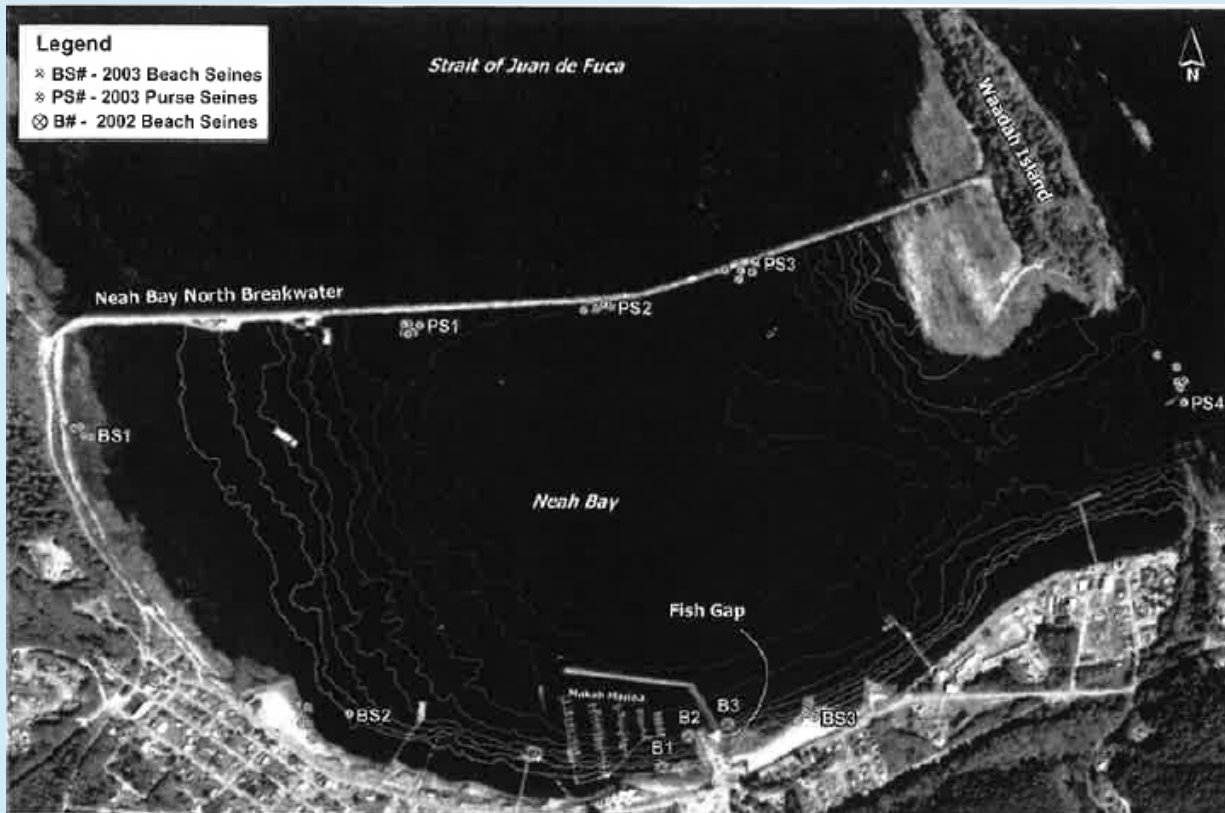


Figure 3: Image from SAIC (2003) of 2002 and 2003 sampling locations.

Beach seine surveys were conducted at 3 locations in Neah Bay (B1, B2, and B3; Figure 1) once a month from March to May. In March of 2003 when discussing expanding sampling in Neah Bay, it was determined to select new locations to sample in 2003 to increase sample locations. Three locations of

beach seines occurred along the shoreline within the breakwater and three purse seine sampling locations occurred outside the breakwater. The first 30 fish of each species, in each sample, were measured in millimeters (mm). In 2003 water quality parameters and vegetation surveys were added. Water quality parameters of temperature, pH, and conductivity were measured at 46 locations, in 2003, all in a single day. Habitat distribution of eelgrass and kelp were documented for areas with over 4 square feet of coverage.

Salmonids of chum, coho, Chinook and cutthroat, and forage fish species of Pacific sand lance and surf smelt were caught during the 2002 efforts. Bycatch of several species of invertebrates were also caught and recorded. In 2003 salmonid species of chum, coho, sockeye, and coastal cutthroat trout were caught. Juvenile chum, followed by coho, dominated the samples both years with only one sockeye and one cutthroat being observed in 2003. Five species of forage fish (Pacific herring, surf smelt, Pacific sand lance, northern anchovy and eulachon) were caught in 2003. Various bycatch species of fish and invertebrate were also caught in 2003.

Abundance was highest at 2002 sample location B2 with 671 total fish. Overall, during the 2002 sampling there were 821 chum, two coho, seven Chinook and one cutthroat. The 2003 sampling yielded 92 chum, 14 coho, one cutthroat and one sockeye salmon. Herring dominated the forage fish catch in 2003 with a total catch of 6,693 with the largest single haul of 1741 from location PS1 in June 2003. Total forage fish sample size for 2002 was 2164, with predominantly sand lance presence.

The identified threshold for water quality standards and Dissolved Oxygen (DO) is $>4-4.5$ mg/L by the Washington State Department of Ecology (DOE). Of the 46 locations sampled, 10 were identified as having low, unhealthy levels of DO. There are many sunken logs in the area and they may contribute to this. This is in the northwest portion of the Bay.

It was determined that a fish-gap in the breakwater in the northwest area of Neah Bay, on the western portion of the breakwater, would be beneficial. Based on the low DO in the northwest vicinity of Neah Bay because it would promote water mixing and also due to the large abundance of forage fish caught in the purse seine in this area. If fish migrate along the breakwater to get into Neah Bay and then migrate along it to get out, they are passing through a rocky habitat area that predatory fish species (rockfish, lingcod and greenling; SAIC 2003) inhabit.

An ArcGIS analytical tool was also created under this study. The interface has the data from the fish sampling in it. How to use it is discussed in the document, it was not further investigated for this literature review.

12. Todd, S., Fitzpatrick, N., Carter-Mortimer, A., and C. Weller. 2006. Historical Changes to Estuaries, Spits, and Associated Tidal Wetland habitats in the Hood Canal and Strait of Juan de Fuca Regions of Washington State. Point No Point Treaty Council.

This document looks at shorelines, estuaries, and areas of intertidal interaction throughout the Hood Canal and along the shoreline on the southern side of the Strait of Juan de Fuca (SJF) west to Cape Flattery. The overall study area is broken into sub-regions, with the Western Strait Sub-Region (WSR) of interest here. Each Sub Region of the study area has its own appendix (Appendix B- 1: Western Strait Sub-Region). The goal of the study was to better understand the physical processes and functions of

estuarine and nearshore environments in a manner that could be applied to protection and restoration efforts. For much of this area the information collected could also be used as a baseline.

The project sought to georeference and use digitized historical photos, topographical maps, and data to delineate the historical shoreline, tidal marsh complexes and estuaries and compare it to current day intertidal delineated findings. The topographic maps used were U.S. Coast Survey Charts from the early 1900's called T-sheets, which were often used then for navigation. Causes for the shoreline changes identified would be deduced considering land use practices and restoration actions in areas based on findings were recommended.

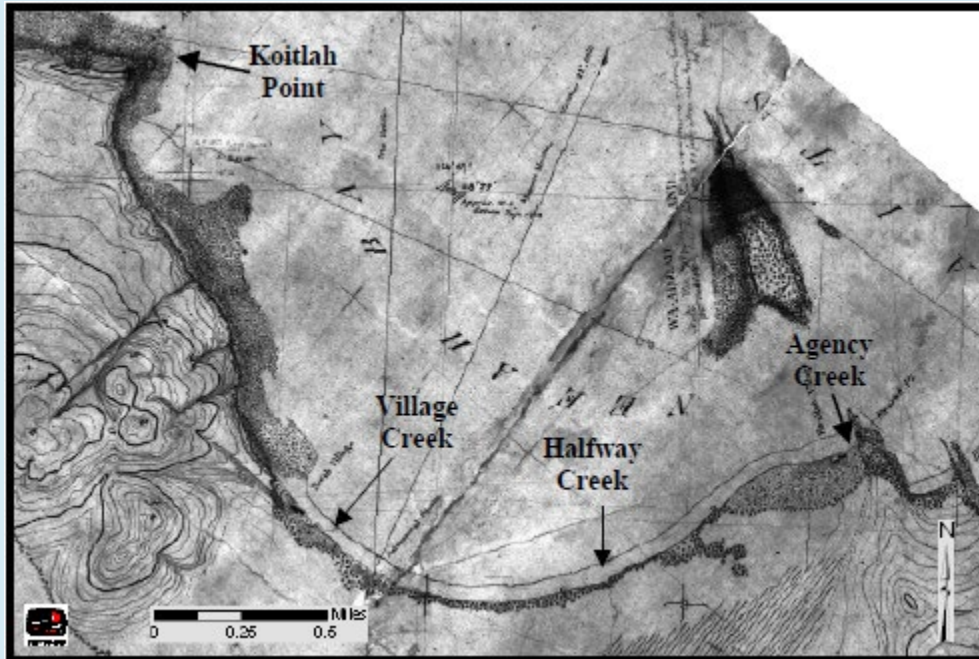


Figure 3: Historical topographic map, or T-sheet (T-386) from 1852 showing stream delta complexes entering pocket beach of Neah Bay and Wa'adah Island (Fitzpatrick 2006).

The U.S. Coast Survey Charts, T-sheets, were drawn with detail and symbology for different land features (e.g., salt marsh, stream channel, spit, tidal flat, pasture, blind tidal channel, lagoon, and orchard). The T Sheets for the Western Sub Region area, however, lacked the detail that the easterly and Hood Canal ones had (Figure 3). This created more nebulous conclusions about changes in the habitat in that area.

In the Western Strait sub region 10 habitat complexes were identified each between one and 23, with a median of 4.89, hectares in size. The study concluded that there are currently 3 tidal wetland complexes in the WSR, but the historical amount of wetland complexes could not be determined. Due to this the change in tidal wetland area for the sub region was not calculated. The total rate of change for the SJF (and not the Hood Canal) was minus 94 hectares. Although 3 streams enter into Neah Bay, it was identified as a single stream-delta, pocket beach habitat complex. In Appendix B Neah Bay is identified as nearly 22 hectares in size and having undergone “dramatic changes” historically.

Recommended actions were directed around reestablishing physical processes to spit marshes and stream-delta complexes. Specific recommendations for Neah Bay in the Appendix include to look into Waʔadʔa Island Literature Review

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reducing the rip-rap along the shorelines of Neah Bay and replacing it with stable drift log material and vegetation planting along the shoreline.



Figure 4: Photo of Neah Bay looking northeast towards Wa'adah Island and Agency Creek. Photo taken in 1915 by Asahel Curtis (Fitzpatrick 2006).

13. Blatz, Grethen. 2006. Wa'adah Island Bald Eagle Territory, Washington Department of Fish and Wildlife.

In 2006 Washington Department of Fish and Wildlife (WDFW) published a document of the recorded occupancy and productivity of bald eagle observations for 2 nests on Wa'adah Island. The 2 Wa'adah Island nest sites are referred to as Occurrence 192 and Occurrence 1471. The site referred to as Occurrence 192 has observations from 1974-2005 and Occurrence 1471 has observations from 2003-2005. Observations include how many adults and how many feathered or downy young are observed to occupy each nest. Two observations are recorded for each year, an early season and a late season, along with the observers' names. These two observations exist for site 192 for each year except for years 1976-1978. The nest locations are shared in an aerial image of Neah Bay and Wa'adah Island.

In addition to the paper review, we want to acknowledge the collaborative research efforts between WDFW and Makah Tribe staff for this project. During the years 1998 to 2006 WDFW provided data sheets to the tribe each year and Makah Tribal staff collected all of the bald eagle nesting data for the entire reservation. In 2003, Tribal staff discovered the new territory, Occurrence 1471. Makah staff also noted that the two distinct territories being in such close proximity is unusual (comms with Rob McCoy, 2022).

Previous Restoration Efforts

Military and industrious use of Wa'adah Island and Neah Bay have been documented for over 150 years. "Documented use of Wa'adah Island by the US military is as early as 1868. However, a heavier use and well recorded occupation of the US Navy on Wa'adah Island was from 1941 to 1956" (Ridolfi 2019). A lifesaving station was established on Wa'adah Island between 1907 and 1909, the breakwater was completed in 1944, an Air Force Base was opened there in 1950, and the marina was completed in 1997. With these larger structures comes responsibility of maintaining, updating with best management actions, and removing when their job is determined complete. Restoration of previous DoD structures has been underway and those actions are covered here.

The breakwater between the straits and Neah Bay extends west across northern western Neah Bay and connects Wa'adah to the mainland. Investigations have further been done to look at creating a fish-gap in the breakwater and as a preliminary step to the construction of a marina. While the breakwater remains without a fish-gap presently, a document in the previous section reviews for the breakwater fish-gap investigations. Here a document regarding a breakwater repair is covered. The first paper in this section is the exception to the chronological ordering of papers. This paper pertains to the Neah Bay breakwater while the remaining documents in this section are all part of the remediation of DoD structures and contaminants on Wa'adah Island project.

14. United States Army Corp of Engineers. 2010. Environmental Assessment Neah Bay Breakwater Repair, Neah Bay, Washington. Finding of No Significant Impact.

The breakwater that was built in 1944 and extends, 8,000 meters in length, from the mainland just north of the town Neah Bay to Wa'adah Island was under consideration for repair work. It provides protection from the continually changing tidal marine environment to the marina, the town of Neah Bay, and a Coast Guard station. This Environmental Assessment (EA) determined a finding of no significant Impact (FONSI) with regards to a 1,500 linear foot breakwater repair project. The repair project alternatives considered in the EA were no action, concrete armor, and rock armor. Repairs to the break water have occurred in 1949, 1959, 1980, 1998, and 2002. Repairs are required for a few reasons, a couple being that the breakwater is exposed to large storm surges, tidal fluctuations and wind waves, and that undersized armor rock was used.

A Biological Evaluation was prepared by USACE for the National Marine Fisheries Service and U.S. Fish and Wildlife Service per Section 107 and the Endangered Species Act as part of this process. However, it is considered part of the Environmental Assessment process and thus not cited in the references and has not yet been located. A component of it discusses that 19 ESA listed Threatened or Endangered species were identified to potentially use Neah Bay during migration through the SJF. These species included 5 salmonid species, 6 whale species, 4 turtle species, and one forage fish species.

Cooperative Agreement work between the Makah Tribe and the Department of Defense

Overview: In the past decade there have been several cycles of assessments and restoration actions on Wa'adah Island under the Native Tribe American Lands Environmental Mitigation Program (NALEMP). The paper by Keres Consulting provides the information to officially designate Wa'adah Island a

Formerly Used Defense Site (FUDS) and thus falls under specific funding for certain scopes of restoration work. A Cooperative Agreement (CA) between the Makah Tribe and the Department of Defense (DoD) was created to clean up environmental conditions on tribal lands where remnants of DoD related activities remained. The work includes, and is limited to, the removal of hazardous debris, structures, and contaminants post DoD occupation. On the ground efforts were completed by the Makah Environmental Restoration Team (MERT) which was the Makah Environmental Division and Ridolfi Incorporated. MERT addressed and implemented remediation actions that were applicable to the CA.

Wa'adah Island was identified as Site 21 on the Makah Tribal Reservation map of sites to be addressed. A map of the reservation was created with CA remediation areas identified (Figure 5). The documents from this project are included in this review. Documents reviewed include Investigations, Work Plan, and Completion Reports, as well as Maps and Memorandums.

15. Ridolfi Engineers Incorporated. 2001. Field Observation Report. Makah Environmental Mitigation.

One staff from each, the Makah Tribe, Tecumseh Professional Associates, US Army Corp of Engineers and Ridolfi Engineers met on site for a joint field visit. This documents an initial visit to Wa'adah when the Quonset Huts and a gravel road associated with them were identified. There was an attempt to locate an old Coast Guard house on the north end of the island. The area was a dense forest and after searching for it, the house was never located.

16. Keres Consulting, Inc. 2002. Draft Phase 1 Site Assessment Report. Waadah Island Quonset Huts and Bunkers. FUDS No. F10WA061400. Prepared for EG&G Technical Services, Inc.

Keres Consulting prepared this report for EG&G Technical Services, who is the primary contractor for the Office of the Deputy Under Secretary of Defense (Installations and Environment) (ODUSDI(I&E)). Impacts remaining from the Department of Defense (DoD) on the Makah Reservation were presented in 2000 to the Native American Lands Environmental Mitigation Program (NALEMP) by a representative from each the Makah Tribe and the US Army Corp of Engineers. A site investigation was then conducted to determine if Wa'adah Island falls under the NALEMP, which falls under ODUSDI(I&E).

This report presents the initial investigation findings that determine the impact characteristics on the Makah Reservation and if they fall under the NALEMP. Structures of Quonset Huts and bunkers, and contaminated soils in the vicinity were noted. It was noted that the contamination in the soils could also be leached off with surface water runoff, which could impact fish habitat. There is also a general "slip, trip, and fall hazard" of the structures identified as a proactive factor. Based on these criteria the site was determined to fall under the criteria of NALEMP.

17. Ridolfi Incorporated 2003. Memorandum: Waadah Island Quonset Huts and Bunkers Draft Phase 1 Site Assessment Report.

This documents communication between Makah Environmental and Ridolfi Inc. regarding the Keres Consulting Inc (2002) Report. There are suggested edits and recommendations to be made to the Report. EG&G Technical Services, Inc. had sent the document to Makah and Ridolfi. Suggestions

advocate to claim the subsistence, ceremonial imposition the contaminants and DoD structures have imposed on the Makah Tribe.

18. Ridolfi Incorporated 2009. Native American Lands Environmental Mitigation Program 2008: Waadah Island Site (Site 21) Investigation Report.

Site investigations in April of 2009 identified four Quonset huts, three munition bunkers, a wooden building and a navigation light area (former location of a transformer). Findings from this site investigation will be used to create a Remedial Action Plan to address remains of previous DoD uses.

Soil samples were taken from Quonset huts, the wooden building, and the navigation light area to screen them for lead, petroleum, asbestos, metals, and other toxins. Samples taken from the munition bunker entryways screened soil samples for nitroaromatics and nitramines. Soil screenings were from the top six feet from the ground surface per the Washington State Department of Ecology (DOE) Model Toxics Control Act (MTCA). This is because the surface 6 feet are determined to be the biologically active zone for soils. Lead-based paints (LBP) and asbestos-containing materials (ACM) were target toxins sampled for.

The Quonset huts, munition bunkers, and wooden building were all determined to be safety hazards. Many of them had trees down on them. Contaminated soils are found in each of the Quonset huts, which were also determined to be in poor condition. Caulking containing asbestos was found in the Quonset Huts.

Recommendations included removing the Quonset huts and approximately 250 Cubic yards of soil excavated to a depth of 2 feet from the area. Nitrates of concern were not found in soils near the munition bunkers. It was recommended that the bunkers either were removed, collapsed in place, or the openings of them sealed. The wooden building and associated debris materials were also recommended to be removed and additional soil samples taken in the footprint subsequent to removal. Contaminants of concern were not found in the navigational light area.

19. Ridolfi Incorporated 2012. Native American Lands Environmental Mitigation Program 2011: Waadah Island Site 21 Removal Action Workplan.

This 35-page document recaps previous investigations and findings, outlines safety protocol and personnel organization for the MERT, and outlines considerations and the plan moving forward for removal of structures and contaminated soils. Necessary coordination and considerations are addressed including, but not limited to: presence of eagle's nests, cultural resources, United States Coast Guard navigation aids, access, and technical contacts.

Contaminated materials and soils, and their extent are outlined. Contaminated soils will be placed into Super Sacks, and Quonset Huts will be cut into sizes that allow for transport off of Wa'adah Island and the Reservation. For the bunkers, either the metal will be removed, they will be collapsed, or the entrance to each will be sealed. Wooden building debris will be removed and activities in this area will be light due to the proximity to the eagle's nest (e.g., light on the vegetation removal, noise, and vibration).

Sections 6-8 of the report define “Investigation Specific QA/QC Procedures” (e.g., applied precision, accuracy, representation, data reporting), “Waste Disposal Protocol” and the final delivery of the “Report of Completion.”

20. Ridolfi Incorporated. 2013. Memorandum: Waadah Island (Site 21) 2012 Field Activities and Supplemental Sampling.

The Makah Environmental Restoration Team had a site visit to Wa’adah Island in October 2012 as a preliminary step to planned structure removal. This 11-page Memorandum provides a summary of the field activities and findings from that trip. While on site additional soil samples were collected and vegetation that had overgrown structures was cut back. Several contaminants were already identified to be onsite.

Additional soil samples were taken at Quonset Huts #1 and #2 to fill data gaps. These samples were analyzed for polycyclic aromatic hydrocarbons (PAHs), and lead. Both contaminants were found in levels that required soil clean up at Quonset Hut #1 and PAH’s were found at Quonset Hut #2. Building materials used for the Quonset Huts were also sampled for asbestos-containing materials (ACM’s). It was determined that ACM’s were present in tar used on the Quonset Huts.

It is noted that the funding for examining, documenting, and preparing for removal has been requested, however it has not been requested for soil or structure removal at this time. Vegetation may need to be re-cut when funding is in place for structure removal. It is recommended that the bunker area is investigated for the presence of unexploded ordnance (UXO) before structure removal begins.

21. Ridolfi Incorporated 2015. Native American Lands Environmental Mitigation Program 2013: Waadah Island Site 21 Removal Action Completion Report.

This 213-page Report captures the 2014 removal activities in the initial 14-pages. The remaining pages are supporting documentation that includes figures, field work photographs, materials disposal documentation, and tables and graphs of laboratory analysis. During 2014 previously identified structures, debris, and contaminated soils and materials were removed from Wa’adah Island. This work was scheduled in a timely manner to be done simultaneously as some work on Tatoosh Island in order to maximize resources.

The metal Quonset Huts, associated asbestos containing tar, wooden flooring, and creosote treated wood were removed. Removal of the Bunkers included removing the creosote treated flooring timbers. While removing the Wooden Structure a 6’x8x’12” concrete foundation was located, which also had a notable cable attached. Samples were taken from the cable wrapping and it was left in place for the remainder of current removal actions. Following the removal of structures, soils under associated footprints were raked or re-graded.

All contaminated materials, 40 cubic yards of metal contaminated with ACM’s, and 61.5 tons soil contaminated with of PAH’s, were removed from the reservation using Super Sacks and properly disposed of in The Dalles, OR and Roosevelt WA, respectively. The rest of the materials were either taken to a metal recycling facility or disposed of in Forks, WA.

Following the removal of structures and contaminated soils, confirmation soil samples were taken from each of the three areas; Quonset Huts, Bunker, and Wooden Structure. It was determined that 33 CY of Wa’adah Island Literature Review

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contaminated soils remained at the Quonset Hut location. It was determined that 66 CY of contaminated soils remained in the Bunker area. Recommendations for future actions include removing remaining contaminated soils and investigating the cable that was found.

22. Ridolfi Incorporated 2019. Native American Lands Environmental Mitigation Program Fiscal Year 2017: Wa'adah Island (Site 21) Removal Action Completion Report.

This 330-page report is the summary of Ridolfi assessment and actions of their work on Wa'adah Island through 2018. Specifically in 2018 they removed nearly 45 tons of creosote contaminated soils from the island and identified approximately 1000 feet of asbestos wrapped cable. This document outlines Previous mitigation investigations, contaminant and structure removals, and all Ridolfi activities for this project. The document itself is 18 pages long, included after the write up are figures, maps, charts and graphs of analytical environmental samples, appendices, and supporting documents.

23. Ridolfi Inc. 2020. Task 6. Map. Wa'adah Island (Site 21) Asbestos Abatement and Debris Removal.

This is a 1-page map that shows where the identified structures and contaminants are on Wa'adah Island for removal. The map depicts the asbestos-wrapped cable, the concrete foundation, the former wooden building location, contaminated soils and previously removed structure area. It also depicts the trail that predominantly runs in a north and south direction across the island. The label at the bottom of the map indicates it was for a January 2020 meeting.

24. Ridolfi Incorporated. 2020. Makah Environmental Restoration Team Former Navy Facilities- Wa'adah Island ACM and Debris Removal Activities.

This 1-page summary provides an overview of the plan for addressing contaminants found on Wa'adah Island and the 2020 Workplan. This includes project team members' names, anticipated logistics, and the schedule for the activities and reporting.

25. Ridolfi Incorporated. 2020. Native American Lands Environmental Mitigation Program FY 2019. Wa'adah Island (Site 21) ACM and Debris Removal Work Plan.

This document outlines the plans for removal of up to 1,000 feet of asbestos wrapped cable and 5 cubic yards of building debris to be removed from the island. It outlines the plan and oversight logistics for removing the identified materials, and includes the laboratory results of when the debris and cable were sampled for ACM. It also covers site access, mobilization, abatement and debris removal, site restoration, and waste management. The plan states that field log books will be used to document personnel present, general site information for the day, equipment used, and activities performed. Site sketches and/or descriptions of photographs taken will also be recorded.



Figure 5: Map depicting removed structures and debris.

26. Ridolfi Incorporated. 2021. Wa'adah Island (Site 21) Asbestos-Containing Material (ACM) and Debris Removal Report.

This is the most recent report from Ridolfi Inc. regarding the multi-year efforts on Wa'adah. This document is specific to the work completed in September 2020 but was under the 2019 Fiscal year. Several of the documents have outlined work accomplished under the NALEMP. Since this is the most recent document a chronological overview of work done on Wa'adah Island under the NALEMP is here:

- 1996: Reconnaissance and Assessment Work (Ridolfi Inc. 2001).
- 2001: Phase I Site Assessment Report, Wa’adah Island Quonset Huts and Bunkers (Keres 2002).
- 2009: A site Investigation to determine contamination of soils around four Quonset huts (Ridolfi Inc 2009).
- 2012: Additional soil sampling occurred to determine extent of petroleum-contaminated soils (PCS) and aromatic hydrocarbon (PAH) contaminated soils.
- 2014: Four Quonset huts, three munition bunkers, and associated contaminated materials and soil were removed from the island. Asbestos wrapped cable was identified to be on Wa’adah Island (Ridolfi 2015a).
- 2018:
- 2020- removal of 500 linear feet of asbestos lined cable.

Specific activities from 2020 included the removal of 500 linear feet of asbestos contaminated wrapped cable. Debris in the amount of 1.0 cubic yard was removed from around the concrete foundation area. Alterations from the workplan here include that less debris material was removed than anticipated and due to heavy fog on demobilization day transport to Wa’adah Island was done with a boat and not a helicopter as planned.

27. Draft Wa’adah Island (Site 21) Soil Removal Action Workplan. Ridolfi. March 2022.

This last document addresses the remaining contaminated soils in the vicinity of the recent Quonset Huts (#1,3, and 4). Contaminated soils have been removed from this area twice previously, however more remained. This workplan is in Draft.

Conclusion

Wa’adah Island is of cultural and resource significance to the Makah Tribe. It has also undergone transformation and has been utilized and developed for many purposes. The most recent decade has brought restoration actions to the Island to remove structures, contaminated soils, and movements toward restoring it to a more pre-European condition. During the summer of 2022 the remaining contaminated soils from the Quonset Hut were removed. Following the 2022 contaminated soil removal the work under Native Tribe American Lands Environmental Mitigation Program (NALEMP) will be completed. The concrete slab (6’x 8’ x 12”) will remain. It was not found to have any associated contaminants and removal would create more noise and vibration than was determined a benefit given the proximity to the Bald Eagle’s nests (comms with Mathieu Piovevan, Ridolfi).

Moving forward the Makah Fisheries Department, Habitat Division seeks to identify additional habitat restoration and enhancement actions that were not covered under the Department of Defense funding opportunity. This could include beach enhancement, removal of washed-up beach debris (an old schooner that washed up), and vegetation enhancement (terrestrial and marine). The next step is for a Habitat and Wildlife Assessment inclusive of more thorough restoration suggestions.

The Makah Fisheries Department, Habitat Division, seeks to acquire an outline of detailed restoration actions to be implemented on Wa’adah Island’s terrestrial and nearshore environments. The terrestrial environments affect the nearshore environment, and the nearshore is particularly important since it provides refuge for salmonids. Since salmonids are known to use nearshore areas along the Strait of

Juan de Fuca as refuge (Todd et al 2006; Meyers et al 1987) the shorelines of Wa’adah Island and Neah Bay may provide migratory refuge for species of significance (e.g., ESA listed Chinook, summer Chum, and Puget Sound Steelhead). This document is created as a foundational step towards the Habitat and Wildlife Assessment that will identify remaining restoration efforts to restore Wa’adah Islands ecological integrity.

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