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John Schwabe, Contract Manager
California Department of Fish and Game
619 Second Street, Eureka, CA, 95501

RE: **Rocky Gulch Salmonid Access and Habitat Restoration Project (Contract No. AWIP-N-1)**

ROCKY GULCH TIDEGATE COMPLETION: FINAL REPORT

The ***Rocky Gulch Salmonid Access and Habitat Restoration Project (Project)*** was begun in 2003, with grant funding provided by the CA Department of Fish and Game and the California Coastal Salmon Recovery Program (CCSRP). The project received supplemental funding (contract AWIP-N-1) to help complete portions of the original restoration project (contract P0210414). *The overarching goal for Rocky Gulch is to restore anadromous fish access, high quality habitat, and robust salmonid populations (coho salmon and steelhead) in Rocky Gulch.* This Final Report is for completion of the supplemental funding contract AWIP-N-1, describing implementation of the new Rocky Gulch tidegate.

Rocky Gulch is a small watershed (1 mi^2) that drains into Arcata Bay approximately six miles north of Eureka, CA (Figure 1). At the downstream end of Rocky Gulch, the stream flows through a tidegate and joins Washington Gulch to form Brainard Slough, before passing through a culvert under Hwy 101. The old tidegate (Figure 2) was a barrier to anadromous salmonid migration. The Project proposed to modify the existing tidegate to allow anadromous salmonids access to their ancestral spawning and rearing habitats in the Rocky Gulch watershed. Because former tidelands behind the tidegate are currently used as cattle pasture, these lands had to be protected from seawater intrusion. However, some areas of the pasture have been receiving periodic tidal inundation, and these tidal marsh lands had to be maintained by the upgraded tidegate. The new tidegate thus required a "muted tide cycle" in which a controlled volume if seawater is allowed past the tidegate during each tide cycle. The project is located at T5N; R1E; S16;Latitude 45.821^{o}N; Longitude 124.076^{o}W. The landowners are Roger and Johanna Rodoni. Access to the project site was provided across an adjoining parcel by courtesy of Mr. John Wilkins.

In addition to the tidegate modification, the project proposes to modify large sections of the creek that traverses the pasture, rehabilitate dikes, and improve cattle stream-crossings and grazing impacts in riparian areas. Because of delays in engineering designs and permitting, the earthworks portion of the project was rescheduled for summer 2005. However, given that the new tidegate project proposed to only modify the existing structure, and was designed to maintain the existing hydrology, the project was determined to be exempt from Army Corp jurisdiction. With funding from the supplemental contract (AWIP-N-1), we obtained administrative permits from the Humboldt Bay Harbor District and the CA Coastal Commission for the tidegate construction project. The Army Corp was notified in writing of the scope of the project. Our analysis determined the project had "no effect" on federally listed chinook or coho salmon, steelhead, or tide water goby, or to critical habitat designated for coho salmon or on any coastal resources.

The subcontractor Nehalem Marine, owned and operated by Leo Kuntz, constructed the new tidegate for Rocky Gulch and installed the structure during the week of 11/29/04 to 12/3/04. The new tidegate is a custom-fabricated, side-hinged aluminum gate mounted on the wing-walls of the existing structure (Figure 3). The new tidegate has a muted opening with an adjustable "guillotine-style" auxiliary door with maximum aperture of 1 ft wide by 2 ft tall. The auxiliary door is a top-hinged gate mounted on a track

that can be adjusted up and down by rotating a stainless nut and threaded rod. The 1 ft wide auxiliary opening can be reduced to 0.5 ft wide by mounting a choke plate over the opening on the back side of the gate. The auxiliary door can be closed completely by screwing down the stainless nut and threaded rod. Installation of the new tidegate required repairs to the existing concrete wing-walls and construction of a concrete "ceiling" spanning the wing-walls between the new tidegate headwall and the existing headwall to prevent water from pouring over the concrete wing-walls. After installation of the new tidegate, the concrete headwall of the adjacent non-functioning tidegate was repaired to plug a hole (Figure 4). The total tidegate installation cost was $15,000.00

The project was implemented in 4 days during low tides, according to the following specifications:

- Vehicular and equipment access to the work site was provided by an existing dirt road maintained by the property owner. Approximately 30 yards of 3x6 crushed rock were imported and placed onto the road to improve the access. The rock base was left in place after the project was completed.
- The new tidegate headwall included a 4 ft aluminum sleeve that was bolted onto the inside of the concrete wing-walls. The sleeves enclosed the ends of the eroded wing-walls (Figure 5) and created small void spaces that were dry-packed with concrete to reinforce the walls. A "high-early" type of concrete was used that hardened rapidly and allowed full loading by approximately 12 hours. Metal rebar was installed to reinforce the concrete. Approximately 4 cubic ft of concrete were required for the aluminum sleeve installation. Before being inundated with tidewater, the concrete wing-walls and aluminum sleeve were scrubbed down, and the wash-water and debris were collected on the floor of the tidegate in temporary tarpaulin ponds where it was removed for disposal in the upland area. This activity prevented discharge of concrete or other debris into the adjacent waters.
- After the tidegate was installed onto the wing-walls and secured adequately, an aluminum ceiling was installed over the wing-walls to create an enclosed box culvert (Figure 6). The project originally proposed using concrete for the ceiling, but during implementation the existing concrete was judged to be not structurally sound enough to support the weight of concrete, so the aluminum ceiling was installed. This reduced the amount of concrete used in the project by approximately 12-15 cubic ft. All bolting was done with stainless steel expansion bolts.
- After adequate time to allow the concrete to fully harden, spaces between concrete and the new aluminum tidegate headwall were grouted and sealed with urethane injection on dry areas and concrete on the parts that were sealed in the water.
- Once the new tide gate installation was complete, the fill material plugging the hole in the adjacent tidegate's headwall was removed to allow the hole to be permanently plugged. The area surrounding the hole was cleared, and forms were installed to plug the hole with approximately a cubic yard of concrete. This task also used a rapid drying concrete and was done on the upstream side of the tidegate to prevent tidewater from inundating the concrete patch until after the concrete had set-up. Once the concrete was set, the forms were removed.

After completion of the tidegate installation (Figure 7), the area surrounding the construction site was seeded with grass to reduce erosion of exposed soil. The tidegate auxiliary door was initially kept closed until the tidegate was observed during a one-month period of tide cycles, including high tides that exceeded 9 ft MLW. The hydraulic model developed for the project was used to determine the size of the auxiliary door opening, which has been set at 1.0 ft^2. Daily tidal inundation of the tidegate now allows a muted tide prism to flow through the auxiliary door to fill the slough channels upstream of the tidegate. There are numerous benefits to daily seawater intrusion upstream of the tidegate. Regular tidal flux will help maintains slough channel capacity by flushing fine sediments delivered from the upper watershed into the bay, suppresses vegetation from growing in the channel, and provides highly valuable brackish aquatic habitat used by migratory marine, anadromous, and resident fish species. At the peak tide, the auxiliary door allows tidewater to rapidly fill behind the tidegate and achieve equilibrium in water surface elevations on the inside and outside of the tidegate. As the tide ebbs, the tidegate is pushed fully open to nearly 90 degrees (Figure 7). This wide opening will allow anadromous salmonids to pass through the tidegate and migrate upstream to their spawning grounds.

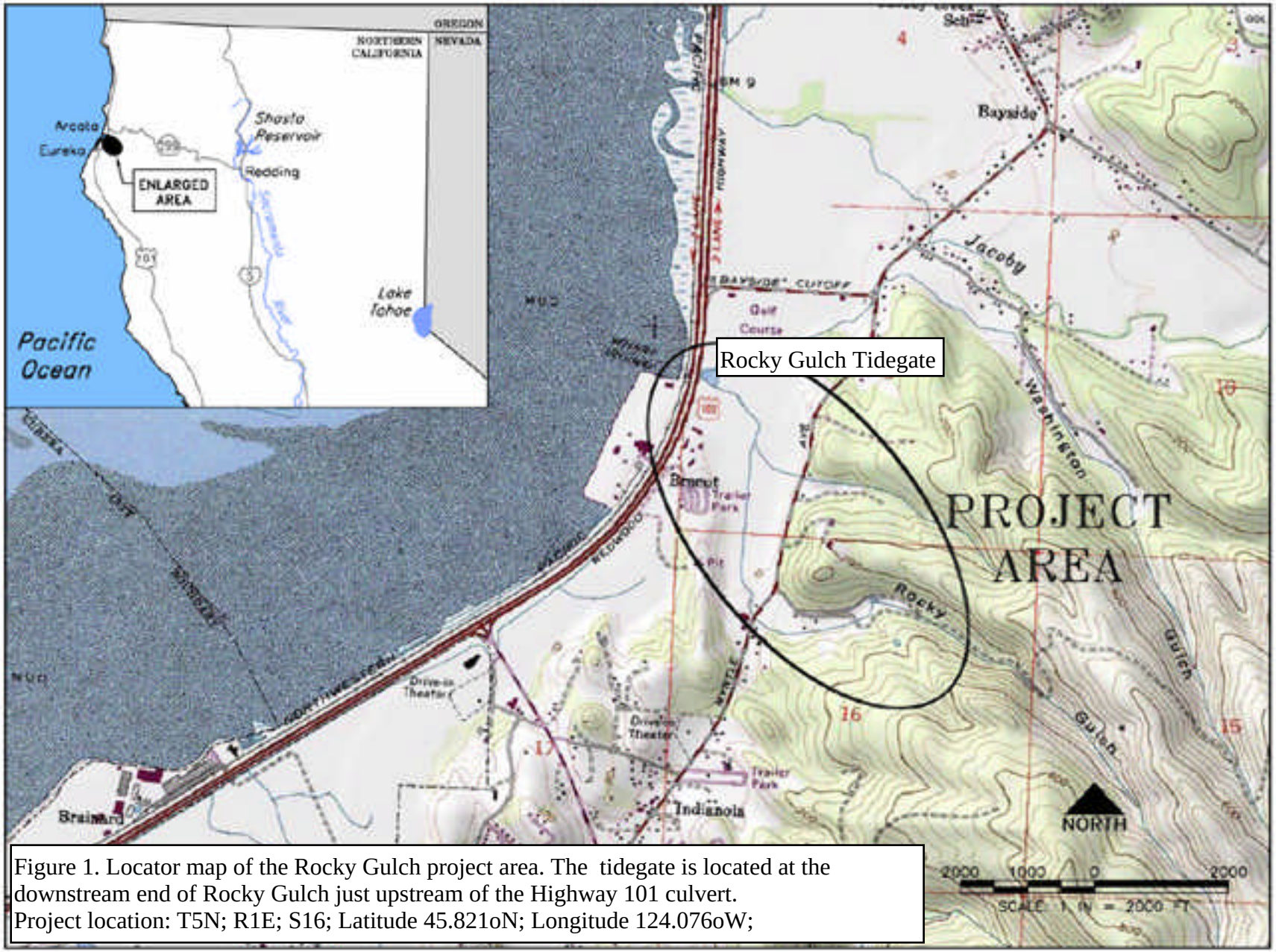

Figure 1. Locator map of the Rocky Gulch project area. The tidegate is located at the downstream end of Rocky Gulch just upstream of the Highway 101 culvert.
Project location: T5N; R1E; S16; Latitude 45.821oN; Longitude 124.076oW;

Figure 2. The old wooden tidegate on Rocky Gulch, at ebb tide. The top photo shows the abandoned tidegate to the left of the functioning tidegate.

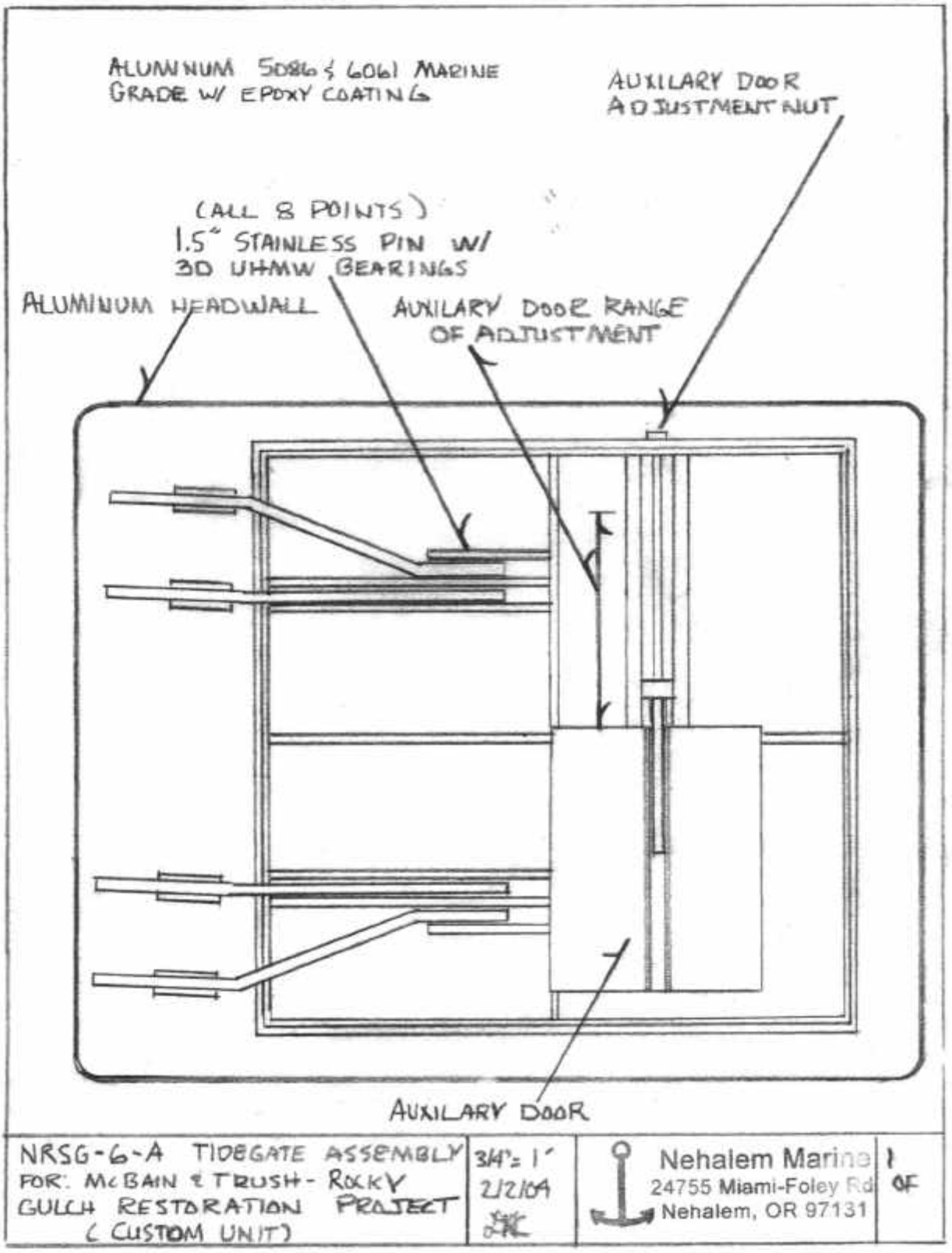

Figure 3. Design drawing of the new side-hinged aluminum tidegate and headwall assembly, by Nehalem Marine.

Figure 4. Photo showing the hole in the old tidegate headwall, with mud and debris cleared out.

Figure 5. Top view of the new tidegate structure during assembly, before the aluminum ceiling was installed. The aluminum sleeves are shown bolted to the concrete wing-walls.

Figure 6. Installation of the aluminum ceiling to fully enclose the wing-walls to form a box culvert type structure.

Figure 7. The completed tidegate project showing the tidegate open approximately one hour after the peak tide.