WILDLIFE HABITAT COUNCIL

Case Study 1

West Coast Refinery Wetland Case Study	
Name and Location	**Site Name:** A West Coast Refinery **Site Location:** Refinery Effluent Treatment System
Site Description	An effluent treatment facultative lagoon, part of the refinery effluent treatment system (ETS), was converted to 90 acre wetlands. The ETS consisted of a primary facultative lagoon, followed by an aerated lagoon, and ending with a secondary facultative lagoon. The secondary or post treatment, facultative lagoon was built in 1963 from a tidal salt marsh by building a dike around the 90 acre area. Interior baffles and dividers were added to create three 30 acre sections or passes within the lagoon. The polishing lagoon was operated until 1985, when it was drained. It remained a dry lagoon bed, until 1989, when it was planted and converted to a freshwater wetland. The wetland is part of the ETS NPDES discharge permit and is considered treatment unit within the effluent treatment system. The water source to the polishing pond through 1985, and then as the constructed wetland, is treated refinery effluent water from the aerated biological treatment lagoon. The location is in an industrial area, near urban centers. The refinery is 200 acres in size. The wetland is 90 acres.

WILDLIFE HABITAT COUNCIL

West Coast Refinery Wetland Case Study	
Site Reuse Description	The site prior to 1989 was a 90 acre dry lagoon bottom. The soil was a slit- clay material, dried with deep cracks and no vegetation growing on it. The constructed wetlands was planned to provide treatment or polishing of the effluent from the aerated lagoon in the ETS. Provisions were made to include habitat for shore birds and water foul as part of the original design of the wetlands, e.g. open areas for resting, short grass areas to provide nesting areas, and a mud flat region for shore birds. Is the community involved in the end use decision making process? No, this was a Refinery project, because it was principally a modification to their wastewater treatment
Stakeholder Involvement	The refinery was the main stakeholder. This was a voluntary action to improve the ETS and make better use of an out-of-service 90 acre treatment lagoon. Agencies and non-profit organization concerned with oversight of industrial water treatment, wetlands, and wildlife management were contacted to provide input into the design and end uses of the wetlands: Regional Water Quality Control Board, USEPA Region 9, State Fish and Wildlife Service, Audubon Society, and San Francisco State University. What were the concerns of these stakeholders and how were these resolved? Initially there were not many concerns. Local government and environmental agencies encouraged the conversion to the wetlands because of the potential restoration of 90 acres of wetlands to the area. Project funded by the refinery.
Site Assessment Approach and Cleanup	The site assessment was focused on the elements of planting and growing a wetland. The end use of the site was fresh water wetlands. This was dictated by the site being part of the effluent treatment system and that the source of the water to it was fresh water. Historically the site was a salt marsh, which posed some issues to planting freshwater plant species, due to the high salt content of the soil. Since this secondary lagoon was located after the aerated treatment lagoon, there were few organics that entered with the influent or deposited in the soil. There were some metals present in the soil, Ni, Cr, Se and Zinc. There was no mandated clean-up order. The site was a permitted part of the ETS and the action to create a wetlands was done to improve the wastewater treatment system and to provide habitat to the local bird wildlife. This site is part of the refinery, so access by the public is limited.

What problems did you encounter during the corrective action? What was the nature of the problems encountered (e.g., regulatory, community perception, etc.) and how did you overcome these problems?

The major problems encountered in creating the ecological enhancement of 90 acres of wetlands, was an unforeseen problem with selenium. The wetland was managed to encourage bird usage, especial migratory water fowl. In 1995, as a result of the Selenium problem in the California Central Valley agriculture drainage pond and wetlands, the Fish and Wildlife Service and Regional Water Quality Control Board requested a test of bird eggs within the wetlands to determine if there was a potential problem with selenium at this site. After 6 years of operation, there was evidence that the eggs of nesting birds in the wetlands had increased Selenium concentration, that were potentially harmful to the bird embryos.

The RWQCB and Fish and Wildlife Service required a management plan and 5 year monitoring program be developed to demonstrate that the refinery could operate the wetland in a way to prevent selenium from harming the bird wildlife

The resulting management plan was to turn the wetland into a treatment zone and a habitat zone. We successfully move the bird usage (feeding, resting, and nesting) from treatment zone (first 30 acres) to the habitat zone (second 60 acres) by controlling water levels to discourage bird nesting, reducing open land and water areas to discourage feeding and resting, creating reducing conditions within the water and sediments to remove selenium from the water phase in the treatment zone. Testing demonstrated that the reducing conditions in the treatment zone dropped all the selenium out of the water and contained it in the treatment zone.

By creating appropriate bird management practices, in the habitat zone, we successfully move the migratory and shore bird usage to the habitat zones of the wetland (60 acres).

Bird egg testing and bird usage surveys of the wetlands demonstrated that this strategy work. There was a reduction of selenium in the bird eggs to a safe level.

The RWQCB and Fish and Wildlife Service approved the Wetland Management Plan and greatly reduced the monitoring required after demonstrating the successful operation during the required 5 year monitoring plan.

Was a closure letter obtained for the site? If so what was issued and

WILDLIFE HABITAT COUNCIL

West Coast Refinery Wetland Case Study	
	when? If not, are you currently seeking a closure letter?
Reuse	The end use is a wetland for treatment of refinery effluent, but more importantly it provides 60 acres of habitat for migratory water fowl and shore birds.
Costs and Funding	How was this project funded, i.e., were there any redevelopment funds or other resources used? Funded by the refinery. What was the total cost of the project? Approximately $1mm. The 5 year study to demonstrate wetland management plan would not harm birds cost ~ $200,000. If an ecological enhancement was used in the remediation, were there cost savings associated with the selection of this remedy. The ecological enhancement was a benefit that was planned into the project from the beginning. It was mainly to demonstrate the refineries commitment to the environment and to provide ecological benefits when and where possible in its construction projects and refinery operation. In this case, the desire to provide an ecological enhancement almost caused the whole operation to be stopped. The selenium issue almost shut down the wetland. The refinery spent ~$200,000 developing and demonstrating that with an appropriate management plan, the wetland could be operated in a way to protect wildlife and provide the ecological enhancement.
Time	How long did it take for this project to be completed? 1 year to build and 3 years to grow out the wetland plants. 5 years to demonstrate an acceptable wetland management plan to the RWQCB and Fish and Wildlife Service.
Other	List any other information that may be of value for this case study. This can be used to insert a "lessons learned" section, or highlight other information of interest.
Contact Information	Ross Smart, 510-242-2914 Will Gala, 510-242-4361