

**FEASIBILITY ANALYSIS FOR THE RESTORATION OF  
TOLAY LAKE**

Sonoma County, California

**FINAL REPORT**



**Prepared For:**

Sonoma County Agricultural Preservation & Open Space District

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## 1.0 INTRODUCTION

The Sonoma County Agricultural Preservation & Open Space District (District) is currently negotiating to acquire in fee the 1,737-acre Tolay Lake Ranch property (Property) for purposes of preserving open space, restoring wildlife habitat, and providing public recreational and educational opportunities. Tolay Lake is a variably sized, seasonally inundated basin approximately 400 acres in size. The basin is located north of San Pablo Bay, east of Lakeville Highway and northeast of Highway 121 in Sonoma County, California (Figure 1). The majority of the basin lies within the Property, however a portion does lie on the properties of adjacent landowners.

A drainage divide located near the center of the Property historically caused a damming effect of Tolay Creek's runoff, thus creating Tolay Lake. The amount and duration of water held within the basin was variable depending upon several components of the water budget. Prior to European settlement, the basin would retain precipitation from runoff and winter rainfall, and seasonally dry through natural hydrologic effects. In the late 1800s, the drainage divide was ruptured and a series of drainage canals were dug throughout the basin's floor to promote quicker drying in preparation of annual farming activities. The routes of the drainage canals collectively flow into a primary channel, which is Tolay Creek. Tolay Creek flows into San Pablo Bay, as part of the San Francisco Bay Estuary.

The current owners of the Property annually farm the basin once seasonal water has subsided or is artificially diverted. The upper reaches of the lake extend in a northwesterly direction onto adjacent properties where owners also utilize the basin for various agricultural purposes. The amount and timing of water discharged from the lake is now dependent upon the management of existing water control structures by the Property landowners. For many years, the landowners have maintained winter water within the basin, which provides valuable wildlife benefits to resident and migratory waterbirds and other wetland associated species. This winter management strategy has created an "existing conditions" scenario that the landowners and adjacent property owners have become familiar with.

## 2.0 PURPOSE AND SCOPE

Tolay Lake has experienced more than 100 years of land manipulation and hydrologic alteration. These factors, coupled with potential impacts to adjacent properties, are a concern of the District's in considering the feasibility of restoring the lakebed to near historic conditions. The purpose of this report is to provide the District with a restoration feasibility and conceptual planning assessment to assist in their due diligence of determining if restoring the lake is viable. The scope of this assessment includes:

- Review the existing water management strategy and habitat conditions;
- Describe the general habitat and species benefited from lake restoration;
- Develop a series of wetland restoration scenarios to be considered;

- Estimate construction and implementation costs for the various scenarios; and
- Identify permitting requirements and other components that may need to be addressed.

### 3.0 DATA

The assessment was developed utilizing existing documentation. Numerous reports describing the history, hydrology, and cultural significance of Tolay Lake were reviewed. The two primary sources of information used were the *Hydrologic Feasibility Analysis for the Tolay Lake Ranch Property* prepared by Kamman Hydrology & Engineering, and an aerial topographic survey by Delta Geomatics Corporation. Additional information from the *Santa Rosa Subregional Long-Term Wastewater Project* was also useful.

The *Hydrologic Feasibility Analysis for the Property* prepared by Kamman Hydrology & Engineering (Kamman Report) evaluated a suite of potential restoration alternatives with consideration to hydrology, topography, and water rights. Delta Geomatics' aerial topographic survey serves as the basis for calculating lake quantities and construction costs. However, the coverage did not capture the full extent and detail of the lake basin, and some assumptions with gap analysis had to be performed using USGS 10 Meter Digital Elevation Model (DEM) data. This data was catenated to the topographic map to complete the dataset. The resulting topographic data set has low resolution and produced uncertainty in the quantities generated for the restoration scenarios presented herein. The datums used are California State Plane Zone 2 and North American Vertical Datum 1983.

The District also provided GIS data such as shape files and polygons for property boundaries, cultural resource areas, and drainage canals.

### 4.0 HISTORICAL SIGNIFICANCE OF TOLAY LAKE

The first accounts of Tolay Lake's size and location were described in the journals of Spanish Mission explorers as far back as June 1823 (Dawson). However, maps of the area that included the Tolay Lake Basin were not developed till many years later and were highly variable and crude when depicting the Lake's dimension. Early maps typically did not include the Lake's boundaries, as most surveying was performed during the summer months when weather and ground conditions were more favorable (Dawson). The Petaluma Land Grant map of 1860 shows Tolay Lake with an area of freshwater marsh approximately a quarter mile wide and two miles long. Other maps and drawings reviewed represent the lakebed in different configurations. Though surveying technology and capability may have been lacking compared to today's methods and standards, the variance in the early maps would suggest that the lake's size was variable from year to year.

The climate of the San Francisco Bay area is commonly referred to as a Mediterranean climate with wet winters and dry summers (Kamman). Due to the weather patterns of the San Francisco Bay Area and the topography of the Tolay Lake Basin, it can be suggested

that Tolay Lake hydrologically functioned as a large seasonal or semi-permanent marsh during most years, and possibly as a permanent wetland during consecutive years of heavy rainfall. As a seasonal or semi-permanent marsh, typical water depths would have ranged from 2 - 5 feet in the deepest portions of the lake and would have retained water into the early summer months. As a permanent wetland, water would have ponded to deeper depths and would have been sustained throughout the entire year. A seasonal / semi-permanent water regime would have supported emergent vegetation such as cattails and bulrush, or would have functioned similar to vernal pool complexes. With water retained at greater depths, a permanent pond would have assisted with controlling emergent vegetation, as most plant species cannot persist when water depths exceed 4 feet for an extended period of time.

The inhabitation and use of Tolay Lake by Native American tribes such as the Wappo, Miwok, and Alaguali are well documented (Dawson and Evans). The Tolay Lake region was inhabited by native peoples as early as 12,000 years ago (Evans). The tribes that inhabited this area are believed to have utilized an economic system based on resources gathered from wetlands, and not as exploitive of "farmed" resources from uplands (Dawson). Wetland resources having sustained a population for so long can only suggest that Tolay Lake was a diverse and substantially important system that provided inhabitants with sustainable and reliable food and water resources.

Important to note is the uniqueness and value of freshwater that would have been provided by Tolay Lake. This rather large and reliable source of freshwater within an area that is dominated by brackish areas such as San Pablo Bay and the Petaluma Marsh would have been significantly valuable, not only to the human inhabitants of the region, but also to wildlife. Even more noteworthy is that fact that Tolay Lake could have provided freshwater well into the summer months, which is a time of the year when rainfall and freshwater streamflows are near nonexistent. Through correlation with known avian migration patterns, it is expected that Tolay Lake would have supported large concentrations of migrating and wintering waterbirds as the Lake's water levels would have risen and fallen during the winter and spring months. During heavier rainfall years as a semi-permanent and permanent wetland, Tolay Lake could have provided brood rearing opportunities for resident waterfowl and shorebirds as water would have been contained during the summer months of May, June, and July.

## **5.0 HABITAT PLANNING AND COMPATIBILITY**

### Ecological Context

The San Francisco Bay Estuary, which the Tolay Lake Basin is connected to, is the largest estuary system on the Pacific Coasts of North and South America. In addition to its size, this estuary consists of many different types of natural and created habitats, including tidal flats, tidal marsh, salt ponds, dunes, diked wetlands, seasonal wetlands, grasslands, oak woodlands, and riparian forest. There are more than 500 species of fish, amphibians, reptiles, birds, and mammals that find food, shelter, or some other forms of benefit within the San Francisco Bay Estuary (Goals Project). However, over the past 150 years, the perimeter areas located around San Francisco and San Pablo Bays have

experienced significant changes to their landscapes and natural processes through land manipulations for agricultural, development, and salt production. These manipulations have resulted in an estimated loss of 80% of the natural wetland habitats (Estuary). In addition, much of the remaining wetlands have been altered or damaged thus stressing wildlife populations and water quality.

The transition zones between areas influenced by tidal flows to upper reaches of the estuary, which include freshwater inlets and drainages, have been recognized as highly valuable habitats for wildlife. Ecological transition zones, generally speaking, provide high quality and unique niche habitats, as well as provide migration and distribution corridors for wildlife species including fish, avian species, invertebrates and amphibians. Due to the loss of habitat, many of the species that rely on transitional zones and freshwater wetlands in proximity to the Estuary have been declining to the point of being listed as threatened or endangered by State and Federal Agencies. The Property should be considered a valuable transition area that could provide significant wildlife benefits to native and migratory wildlife.

The Property is located in an area identified in the *Baylands Ecosystem Habitat Goals Report* (Goals Report) as the Petaluma River Area (Segment F) as part of the North Bay Region. The Goals Report, which presented the findings of a multi-partnered effort intended to guide habitat restoration and land improvements within the Baylands and adjacent habitats of the San Francisco Bay Estuary, classifies the lakebed of Tolay Lake as historically being a Perennial Pond, and classifies it now as a Moist Grassland. One of the recommendations listed in the Goals Report for the Petaluma River Area was to establish managed marsh or enhanced seasonal pond habitat on agricultural baylands.

#### Habitat Benefits to Avian Species

San Francisco Bay Estuary is globally recognized for its importance to resident, migratory and wintering avian species. Bird observation surveys during peak migration periods have documented that the San Francisco Bay Region supports more than 280,000 waterfowl and more than a 1 million shorebirds, with estimates for historical populations being much greater. Figure 2 represents migration patterns of waterfowl and geese within North America. Because of the San Francisco Bay Region's importance to birds, it is recognized by the North American Waterfowl Management Plan as a Waterfowl Habitat Area of Major Concern, and is recognized as one of only three Western Hemispheric Shorebird Reserve Network Sites on the Pacific Coasts of North and South America.

There are 43 species of waterfowl and more than 70 species of other waterbirds that breed, migrate, winter, and/or are resident to North America (Laubhan et al.). "Waterbird," a generalized term for grouping birds that require wetland habitats for some part of their life cycle, includes such groups as geese, ducks, swans, herons, terns, plovers, pelicans, cormorants, loons, grebes, rails, bitterns, sandpipers, stilts and avocets.

Though there is quite a representation of morphological and behavioral diversity amongst waterbirds, the wetland habitat required from these species with consideration to water depths is not significantly variable. Specifically, water depth is extremely important as to how these species obtain food resources. When wetlands exceed certain depths, a majority of waterbirds cannot utilize available resources. For example, the results of a study in Missouri determined that only 5 of 54 waterbird species that use seasonal marshes could effectively forage in water depths greater than 10 inches (Laubhan et al.). Coincidentally, many plant and invertebrate food sources that are important to these waterbirds will not grow in deep water (greater than 4 feet).

Aside from “diving” ducks and grebes, two groups of waterbirds that have the physiological ability to swim to the bottom of deep waterbodies to gather food, the maximum water depths that can be utilized by the widest range of waterbird species is less than 18 inches (45 centimeters). Figure 3 represents the foraging depths of some common waterbirds found in California. Shorebird species generally benefit from water depths less than six inches (20 centimeters). Typical wetlands managed for migratory waterbirds wintering in California are operated between 6 - 18 inches to provide the greatest opportunity for waterfowl use. Water is then slowly released from the majority of these wetlands to provide benefits to later season migrating shorebirds.

Although a comprehensive survey of bird species has not been conducted for the Property, it is expected that the area would provide benefits to several bird groups other than waterbirds. The basin and surrounding foothills consists of grasslands and wetland-associated uplands that may provide foraging habitat for raptors and other birds of prey, as well as foraging opportunities and nesting cover for many species of passerine and upland game species. Special-status birds likely to occur in the area include the golden eagle (*Aquila chrysaetos*), great blue heron (*Ardea herodias*), Cooper’s hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), and burrowing owl (*Athene cunicularia*) (California Natural Diversity Database 2005).

#### Habitat Benefits to Non-Avian Wildlife

Currently the Tolay Lake basin is primarily managed as an agricultural operation. For this reason the parcel is drained and treated as a disturbed upland habitat for most of the year. The farming and ranching activities, which include disking, draining, and grazing, constitute land disturbances that can significantly reduce habitat quality and species diversity.

The use and inhabitance of non-avian wildlife within Tolay Lake basin may not be well known. Tolay Creek was surveyed along the proposed reservoir sites for the *Santa Rosa Subregional Long-Term Wastewater Project* in May 1994 and 1995. Most of the creek consisted of artificial canals and ditches surrounding hayfields, vineyards, and pasture. The streambed consisted mostly of mud, however mature riparian habitat was noted within the Property. Habitat in this area was recognized as being suitable for such sensitive species as California red-legged frog and northwestern pond turtle, though observations were not documented (Merritt Smith).

Common reptiles and amphibians that may occur include the western toad (*Bufo boreas*), pacific treefrog (*Hyla regilla*), western racer (*Coluber mormon*), gopher snake (*Pituophis catenifer*), western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), common kingsnake (*Lampropeltis getula*), western rattlesnake (*Crotalus viridis*), western glossy snake (*Arizona occidentalis*), long-nosed snake (*Rhinocheilus lecontei*), and coachwhip (*Masticophis flagellum*). Special-status reptiles and amphibians that have been observed in the vicinity of the study area include California tiger salamander, foothill yellow-legged frog, California red-legged frog, California horned lizard (*Phrynosoma coronatum frontale*), western pond turtle and Alameda whipsnake (California Natural Diversity Database 2005).

The California freshwater shrimp is endemic to Marin, Sonoma, and Napa Counties, and is currently supported within seventeen coastal streams. This shrimp is found in low elevation, low gradient, perennial freshwater streams, or in intermittent streams with perennial pools. It requires streams that are structurally diverse, with undercut banks, exposed roots, overhanging woody debris, or overhanging vegetation (Napa County RCD). Deterioration or loss of habitat from water diversion, impoundments, livestock and dairy activities, agricultural activities and development, flood control activities, gravel mining, timber harvesting, migration barriers, and water pollution have threatened this species.

California red-legged frogs prefer moist habitats of low gradient streams, ponds, and lagoons that are deeper than 3 feet for breeding, foraging, and estivating (Merritt Smith). Considered "sit-and-wait predators," this species is cued to prey by continuous movement. Primarily nocturnal, adult frogs forage for beetles, sowbugs, earthworms, spiders, and other aquatic invertebrates. Tadpoles feed on decomposed plant and animal material, green algae, diatoms, and bacteria. Standing water must be present for a period of five to six months for eggs to hatch and tadpoles to cycle through metamorphosis stages. Juveniles and adults use emergent aquatic and shoreline vegetation for cover during breeding and foraging activities. Tadpoles use both mud and vegetation for cover. The eggs and tadpoles are very susceptible to predation by introduced fish and bullfrogs. Red-legged frogs are sensitive to the impacts of many land use practices. If dense cover is removed or reduced, the juveniles and adults probably experience high levels of predation (Napa County RCD).

The vernal pool fairy shrimp lives in ephemeral freshwater habitats, and is not found in running or marine waters or permanent bodies of water. This species commonly inhabits grass or mud bottomed swales, earth sump, or depression pools in unplowed grasslands. This shrimp can be found from early December through early May. Fairy shrimp feed on algae, bacteria, protozoa, rotifers, and bits of detritus. Eggs, which are thick shelled to withstand high heat, cold, and long periods of desiccation, are either dropped to the pool bottom or remain attached to the female until she dies and sinks. Eggs hatch when pools fill with rainwater, and juveniles develop rapidly into adults (Napa County RCD).

Restoration of Tolay Lake would benefit multiple wildlife species including a number of special status species. Many of the species that could potentially benefit from the restoration may not currently occur at the site. Restoration and extended water retention would establish habitat that could result in the re-introduction of freshwater shrimp and amphibian species.

## 6.0 EXISTING CONDITIONS

The hydrology of the Tolay Lake basin has been altered from its original state through the breaching of the drainage divide and the installation of ditches and water conveyance structures. The lake still forms annually, but its historic functions have not been present for more than 100 years. The modifications to the basin coupled with current farming practices have resulted in a reduced lake size and duration.

Historically, the natural drainage divide could have sustained a lake that was 14-feet in depth (Kamman). The current configuration of the basin results in a sustained water depth on the order of two to three feet. Even though the historical lake size has been reduced, the sustained level of Tolay Lake extends upstream onto adjacent properties. Tolay Lake is a variable water body due to periodic rainfall events and the limited drainage capabilities of Tolay Creek and the existing infrastructure. Stormwater runoff frequently exceeds the discharge capacity, and water temporarily rises above the sustainable level until the system can equilibrate (Kamman). The existing infrastructure has the capacity to reduce the volume of the lake substantially, but pumps are required to fully drain the lake in preparation for farming operations.

The Kamman Report noted the existing condition of the Tolay Lake basin as the 136-acre foot storage scenario based on their review of existing data and field observations. The report assumed that the existing condition was a result of water being controlled at the 214.5-foot contour elevation determined by existing water control structures operated by the landowners. This represents the sustained volume and does not include the additional water that would temporarily accumulate and spill over during flood events. The Kamman Report also assumed that the lowest elevation of the basin is approximately 212 feet above sea level.

DU assumes that the 214.5-foot contour accurately represents the existing sustained lake elevation. Using the Delta Geomatics topographic data, an analysis of configuration and storage volume at the 214.5-foot contour was performed. DU determined the size of the lake within the Property would be 127 acres, the storage capacity would be 250-acre feet. This does not include the volume of water that would be on adjacent properties under this condition. This is in contrast to 136 acre feet listed in the Kamman Report, which delineated the 214.5 contour to its fullest extent including adjacent properties. It should be noted that the Delta Geomatics data provided more accurate basin elevations than the USGS DEM data used by Kamman. Figure 4 depicts the Tolay Lake basin when maintained at the existing control elevation of 214.5 contour based upon the Delta Geomatics data.

## 7.0 CONCEPTUAL RESTORATION ANALYSIS

The conceptual restoration plans presented in this section are intended to provide the District with a feasibility level analysis of various restoration approaches. The approaches described in this section are not an all-inclusive list of restoration alternatives, but rather a listing of potential methods that we feel are best suited for the Property. It is important to keep in mind that the different approaches presented herein can be combined together in the final design and in a manner that facilitates construction and improves habitat conditions. For example, excavation of interconnected ponds and swales would not only provide increased habitat diversity but also generate fill for the construction of berms.

## 7.1 DESIGN PARAMETERS AND ASSUMPTIONS

DU met with the District to discuss the intentions for this restoration assessment and the preliminary project goals. From those meetings, primary and secondary parameters were developed to guide the design process. The parameters are listed below:

### Primary Parameters

- Habitat enhancement for Wildlife
- Public recreational and educational opportunities
- Cultural Resources Compatibility during construction activities
- Improve or maintain existing conditions on adjacent properties

### Secondary Parameters

- Preference towards a passive system
- Affordable design attractive to funding agencies
- Low maintenance
- Compatible with water rights issues
- Extending the seasonal lake duration
- Maintain causeway
- Cultural Resources compatibility with management and operation

Habitat enhancement is considered to be activities performed within the basin that will maintain water depths to provide a high range of benefits and resources to a broadest range of waterbirds and wetland-associated species. To acquire and maintain this habitat, water levels within the majority of the basin should not exceed 2 feet for an extended period of time. Public recreation and education opportunities are assumed to include wildlife viewing, interpretation, and paddling opportunities. No consideration was given to activities planned within the upland areas such as hiking or equestrian opportunities. Compatibility with cultural resources is defined as the level of impact that a restoration scenario may cause to sensitive areas during construction activities (i.e. earthwork). Impacts to cultural resources after construction, such as prolonged inundation, are not considered and must be discussed with experts within this field.

Secondary parameters weighed heavily on the design process as well but the design was not considered fatal if they couldn't be completely satisfied. Other variables and any assumptions made in order to facilitate the design process are discussed below.

**Topographic Data:** The Delta Geomatics data was the primary source of topographic information but it did not cover the full extents of the lake basin. The data gaps were filled in using USGS 10-meter DEM data. The resolution of the resulting topographic map is accurate enough for this conceptual level of study. Additional detail and topographic information would need to be collected in order to carry a scenario through to final design. Elevations and footprints of specific structures, earthwork calculations and inundation areas are expected to change as more detailed topographic data becomes available. Values listed in this report should be viewed as a level of magnitude only.

**Water Rights:** This report assumes that the Cardoza water right would be obtained.

**Impoundment Size:** Several interconnected variables are involved with impoundment size: storage capacity, acreage inundated, water depth and surface elevation, water rights fulfillment, and downstream flow intensity to name a few. The lake acts as a detention basin; it accepts runoff from the watershed and holds the water until the excess can flow through the constriction at the control point. The result is a highly varying lake elevation with moderated discharges to the downstream properties. This must be considered in the design. For example, the lake surface within the Property could be made more stable by increasing the outflow, but this would also increase the intensity and variability of flow to downstream properties.

The surface area also directly relates to lake variability; the larger the surface area the more inflow the lake can absorb before the level rises significantly. This could affect upstream properties. Placing control structures at the north end of the property without providing adequate capacity to pass flows could dramatically increase the elevation upstream of those facilities during times of high runoff. Conversely, placing the control structures at the south end of the Property would drastically increase the basin size and afford more flood protection to upstream neighbors. Similarly, a larger lake volume would have less capacity to store runoff. This would result in higher elevations and spillage intensities. The conceptual designs explored in this report impact the lake's ability to absorb inflow differently and should be considered as a key component to the individual approaches.

The significance of these impacts depends upon the timing of the runoff verses adjacent property use. Water currently backs up onto neighboring properties to varying degrees during winter months until it is drained off in the spring for farming operations. The majority of the inflow would occur during months of inactivity and as such a temporary rise of backwater should have no adverse impact to neighboring properties. The preferred design would need to be evaluated to see how the new hydrology differs from the existing hydrology and how that could relate to adjacent land practices.

It is anticipated that under all scenarios, temporary flooding during winter months could occur on upstream properties. This is consistent with the existing conditions. Final designs should consider the sensitivity of the landowners to the duration of the flooding, as well as the timing for complete draining.

**Soils:** The Sonoma County Soil Survey categorizes the basin's soil as Clear Lake series. The soil series is primarily clay in content, and is noted as having slow permeability with a high capacity for water retention. The water table for this series is typically 3 – 5 below the surface (USDA). The Kamman report investigated the soils in the lakebed and found them compatible with lake restoration. This report assumes that this is true and that the soil profiles are consistent throughout the site (this is not a far reaching assumption given that the site is a historic lakebed).

**Earthwork:** Most restoration approaches presented herein incorporate both excavation and fill operations. Attempts were made to keep these operations away from known cultural resource sites. This report assumes that these activities could be permitted and acknowledges that the project design and implementation would have to be flexible as additional sensitive areas could be discovered prior to and during construction.

## 7.2 RESTORATION APPROACHES

The conceptual designs presented in this section were developed to meet the primary parameters, and attempted to satisfy the secondary parameters. Three approaches were identified that could satisfy the criteria: 1) the water surface elevation of the lake could be kept below the elevation of the neighboring properties 2) berms, pumps or other structures could be constructed to prevent water from backing onto neighboring properties, and 3) the ground elevation on the neighboring properties could be raised above the elevation of the lake surface. Each approach can be implemented using different techniques. Combining the different approaches or techniques could facilitate meeting parameters.

Under all alternatives it is assumed that the existing constriction would be redesigned with a water control structure that could maintain the desired lake level and pass the necessary flows. Different types of structures could be implemented, some more passive than others. The structure was not sized in detail since more hydraulic and topographic data is needed to carry this forward. However, two leading options are an overshot gate that is designed to act as a varying spillway and a culvert with a full round riser spillway. Ultimate selection would depend upon final design. This structure was placed at the same location under all alternatives for comparison purposes and may not be the ideal location under the final design scenario.

The figures provided depict the alternatives at Full Service Level (FSL), or in other words maximum storage capacity. The alternatives have been structured so that they provide habitat at FSL and as the water level recedes. All designs are intended to provide habitat regardless of the quantity of precipitation received.

A summary of the restoration alternatives presented below is provided as Attachment 1.

### 7.2.1 Alternative 1

This design approach minimizes the amount of construction and infrastructure, yet mimics a somewhat historic version of Tolay Lake. The water control structure would be set to maintain a surface water elevation of 212.5-feet, which represents the largest lake footprint that can be maintained without flooding adjacent properties (Figure 5). Runoff would enter the lakebed and fill it to capacity. Surplus flows would pass through the system and continue down Tolay Creek. Similar to the existing conditions, water produced by storm events could temporarily back up onto adjacent properties until the system equilibrates. The sustained lake would have a surface area of 71 acres, a storage capacity of 44 acre-feet, and an average depth of 7 inches. Although sustained lake water would not encroach onto adjacent properties, standing water could be present within the Tolay Creek channel upstream of the Property. This could potentially be mitigated.

As with all the alternatives, habitat diversity could be increased by excavating swales and shallow depressions, and constructing submerged islands. These features are not shown on the figures but could be included in the final design.

#### Alternative Results, Attributes and Restrictions

- Limited wetland habitat with a short duration (Dry by early Spring)
- Short duration of wetland viewing
- Little or no impacts to cultural resources during construction
- Minimal construction activities
- Passive system
- Limited water management capabilities
- Does not require substantial yearly maintenance
- Permitting aspects are expected to be fairly uncomplicated
- Lowest cost alternative

### 7.2.2 Alternative 2

Under Alternative 2 (Figure 6) the water control structure would be set to maintain the lake elevation at 213.0-feet. A small berm approximately 2,050-feet in length would be constructed along the northwest corner of the property line. The purpose of the berm is to keep lake waters from encroaching onto upstream properties. A drainage swale would be constructed between the property line and the north side of the berm to convey any trapped water to Tolay Creek. Similar to Alternative 1, standing water could be present within the Tolay Creek channel upstream of the Property. The sustained lake would have a surface area of 90 acres, a storage capacity of 85 acre-feet, and an average depth of 7 inches.

The advantage of this approach is that more water can be impounded with a minimal amount of earthwork and the lake would extend further into the spring.

### Alternative Results, Attributes and Restrictions

- Provides wetland habitat similar to Alt. 1 with an extended wet period
- Short duration of wetland viewing
- Little or no impacts to cultural resources during construction
- Moderate construction activities.
- Limited water management capabilities.
- Does not require substantial yearly maintenance
- Permitting aspects are expected to be fairly uncomplicated.
- Somewhat low cost.

### **7.2.3 Alternative 3**

This alternative incorporates a reservoir in addition to shallow water (Figure 7). The water stored in the reservoir would be used to prolong the duration of the shallow water and the benefits provided by this habitat type. The FSL of the reservoir under this alternative is 217.0 and the shallow water FSL is 212.5. The reservoir levee would be intentionally kept below 6-foot mark to stay away from the jurisdiction of the California Division of Safety of Dams.<sup>1</sup> The levees could be constructed out of material borrowed from within the basin or imported.

Both passive and active structures would be utilized to convey water into the reservoir. The intake structure for the reservoir would be located at the intersection of Tolay Creek and the causeway. It is possible to locate the structure away from the causeway, near the outlet structure for instance, and thus away from higher public-use. The causeway location was selected for convenient access to the power supply.

The intake structure would be a combination of flap gates and pumps. The system would enter the rainy season with the downstream structure (near the divide) set to retain water within the lakebed. The structure could be managed to maintain winter water levels higher than the shallow water FSL, at elevations similar to the existing conditions. Water flowing into the valley would back up in the basin, flowing into the reservoir as it rose. If the water in the basin was high enough the reservoir could be filled passively. If not, the pumps located at the causeway would be used to fill the reservoir to its FSL. The pumps could be set to operate automatically in response to the varying water levels.

In preparation of adjacent farming operations the downstream structure would be set to the FSL for the shallow water habitat. Water in excess of this would be spilled downstream. Structures installed in the reservoir levee would allow water to be released back into the shallow habitat as the season progressed and waters evaporated. This would provide late season water for moist-soil habitat management capabilities, thus improving wildlife benefits during spring months. Although the shallow water would not

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<sup>1</sup> The California Division of Safety of Dams is under the California Department of Fish and Game. Dams under their jurisdiction fall under their scrutiny, must meet their criteria and may require annual inspections and fees.

encroach onto adjacent properties, standing water could be present within the Tolay Creek channel upstream of the Property. This could potentially be mitigated.

The sustained shallow water surface area is 52 acres, has a storage capacity of 33 acre-feet, and an average depth of 8 inches. The reservoir has a surface area of 41 acres, a storage capacity of 152 acre-feet, and an average depth of 44 inches.

#### Alternative Results, Attributes and Restrictions

- Provides wetland habitat into the summer months
- Extended wetland viewing and potential for water recreation activities
- Increased risk of construction impacts to cultural resources
- High amount of construction activities
- Increased water management capabilities
- Moderate yearly maintenance requirements
- Permitting aspects are expected to be intensive
- High restoration cost

#### **7.2.4 Alternative 4**

This alternative incorporates an integrated upstream levee and a water conveyance system (Figure 8). The levee would be located along the northwest edge of the Property, would span Tolay Creek, and terminate in the uplands on the other side. A swale on the west side of Tolay Creek, located between the property line and the levee, would be needed to convey surface waters from adjacent properties. The water conveyance system would consist of a one-way culvert, a spillway, and a pump.

The culvert would be fitted with a flap gate and installed in the creek thalweg. This structure would allow low creek flows to pass through the levee into the lake basin. The large structure at the outlet of the lake (near the drainage divide) would retain the water within the basin. Depending upon the magnitude of the runoff, water entering the basin could be temporarily backed up by the constriction caused by the upstream structure but would eventually equilibrate with the water on the Property. The levee would be constructed with broad slopes and be designed to act as a spillway, allowing higher flows to pass over it. The levee could be submerged during most of the winter months. In spring, a pump would be used to evacuate the remaining water upstream of the new levee in preparation for adjacent agricultural activities, which would be consistent with current practices. At this time, the levee would prevent lake water from backing onto upstream properties.

In this alternative, the levee is designed at elevation 215.5 with the spillway and FSL of 214.5. The sustained water surface area is 118 acres, the storage capacity is 242 acre-feet, and the average depth is 24 inches.

The upstream levee and water conveyance system increase the habitat management and public recreation capabilities, but at price. Constructing, operating and maintaining a pump and levee at the proposed location could be expensive. In addition, a pump failure

could leave the upstream properties with impounded water. Though not explored fully with this alternative, enhancing the causeway with additional water control structures could allow for additional water management capabilities.

#### Alternative Results, Attributes and Restrictions

- Provides wetland habitat into the late spring/early summer
- Extended wetland viewing and potential for water recreation activities
- Little or no impacts to cultural resources during construction
- Moderate amount of construction activities
- Increased water management capabilities
- Moderate to considerable yearly maintenance requirements
- Permitting aspects are expected to be intensive
- Moderate to High restoration cost
- Potential, yet temporary, impacts to upstream properties during pump failures.

### **7.2.5 Alternative 5**

This alternative would dramatically increase the volume of the lake by constructing a high levee and concrete weir across Tolay Creek. The levee would be constructed to the 219.0 foot contour, and would be located along the northwest property line (Figure 9). As with other alternatives utilizing a levee in this location, a swale must be incorporated between the levee and the property line.

The concrete weir would span Tolay Creek and contain flap gates in and near the thalweg of the channel to allow passive passage of runoff. As with Alternative 4, this structure could create a constriction that temporarily increases the water elevation on the upstream properties during storm events. This water would equilibrate over time. The weir could become completely submerged during winter months. In spring, pumps would be used to evacuate the remaining water upstream of the weir in preparation for agricultural activities on adjacent properties, which is consistent with current practices. At this point, the levee and structures would prevent lake water from backing onto upstream properties.

With this alternative, the levee is designed at elevation 219.0 and the FSL set by water control structure located near the drainage divide is 218.0. The sustained water surface area is 196 acres, the storage capacity is 804 acre-feet, and the average depth is 49 inches.

The causeway, according to the Delta Geomatics data, would be inundated by up to 1-foot of water under the scenario. Part of the existing road infrastructure would be inundated as well. These components would need to be raised in order to maintain their functionality. For comparison purposes, it should be noted that under the existing conditions the causeway can be submerged in winter by three to four feet (Marvin Cardoza, Per. Comm. 3/14/04).

The levee and weir system increases the water recreation opportunities, and is expected to extend the amount of water available for habitat management into the late summer months. The benefits provided to water birds during the winter months is not as great as

in other alternatives, however the extended water regime could be beneficial to other wildlife species. As with Alternative 4, constructing, operating and maintaining a weir and levee at the proposed location could be expensive. In addition, a pump failure could leave the upstream properties with impounded water. Though not explored fully with this alternative, enhancing the causeway and creating wetland units along the basins perimeter, could allow for additional water management capabilities and wildlife habitat benefit.

Alternative Results, Attributes and Restrictions

- Extremely high water depths that provide moderate wildlife habitat during fall and winter months, yet extends water availability into summer months
- Moderate wildlife viewing opportunities, yet ample water recreation
- Little or no impacts to cultural resources during construction activities
- Substantial construction activities in localized areas
- Moderate water management capabilities
- Yearly maintenance and operation could be extensive
- Permitting could become intensive
- Substantial construction cost is expected
- Potential, yet temporary, impacts to upstream properties during pump failures

**7.2.6 Alternative 6**

Alternative 6 increases the sustained volume of water within the Property by raising the elevation of the lands on respective upstream properties. Increasing the upstream elevations to the 215.0-foot contour would allow Tolay Creek's runoff to pass through the system passively. The water control structure located near the drainage divide would maintain the storage elevation within the Property at an elevation below the 215.0-foot level to prevent water from backing up onto the adjacent properties (Figure 10). Because of permitting concerns, fill activities may not be possible within jurisdiction wetlands, which would consist of the creek channel. If the creek channel was preserved, water from the lake impoundment would be present in Tolay Creek on the upstream properties. As mentioned in earlier alternatives, this could potentially be mitigated.

Material required to fill the proposed areas could be generated from within the Property, and/or could be imported from off-site locations. This alternative would require the complete approval and authorization from all landowners whose property could be affected, the extent of which is unknown at this time.

With this alternative the sustained water surface area is 118 acres, the storage capacity is 242 acre-feet, and the average depth is 24 inches.

Alternative Results, Attributes and Restrictions

- Provides moderate to high wetland habitat area (Dry in Spring)
- Provides opportunities for wildlife viewing and water recreation
- Level of impact to cultural resources during construction is site dependent
- Substantial amount of construction activities

- Passive management opportunities
- Moderate water management capabilities
- Low to moderate yearly maintenance requirements
- Permitting aspects could be fairly complicated
- High restoration cost
- Substantial impacts to adjacent properties during construction

### 7.2.7 Alternative 7

This alternative increases the lake volume by excavating the basin's floor within the Property. The downstream structure would be set at an elevation below that of the upstream properties. This would be a passive system and would not create any constriction points that would back water up onto adjacent lands. However, depending upon the elevation selected, water could still back up within the Tolay Creek channel onto adjacent properties. Construction activities for this alternative appear to be more robust, yet simpler, than other alternatives. However, added issues that must be addressed prior to implementation would include further geotechnical investigations to insure that excavation does not cut through the impermeable soil layer, disposal of excavated material, and impacts to cultural resources.

Figure 11 provides a conceptual rendition of how this approach could be implemented. Alternative 1 was used as a base, and areas of potential excavation have been drawn in. The cultural resource areas were avoided in developing this figure. Even so, design alterations should be anticipated as more sensitive areas could be discovered during construction. Since this drawing is conceptual in nature, no statistics were developed or presented. The depth, volume and configuration of the excavation activities are unlimited with consideration of design options. Excavation has been mentioned as a component of other alternatives to build berms and levees, but not as the primary element. Material generated from excavation could be used on site, in combination with another approach to balance the earthwork, or exported. It could be possible to identify other restoration projects in need of fill that would be willing to purchase the material and as such supplement construction costs.

#### Alternative Results, Attributes and Restrictions

- Provides moderate to high wetland habitat area
- Provides opportunities for wildlife viewing and water recreation
- Impacts to cultural resources during construction activities could be substantial
- Substantial amount of construction activities
- Passive management opportunities
- Moderate water management capabilities
- Low to moderate yearly maintenance requirements
- Permitting aspects could be fairly complicated
- Potentially high restoration cost
- Reduced impacts to adjacent landowners

### 7.3 ESTIMATED CONSTRUCTION COSTS

A range of construction costs for the various alternatives listed is presented below. The cost ranges vary widely due to the assumptions that had to be made in order to evaluate the conceptual designs. Additional data and further refining of the designs would narrow the ranges significantly and provide the district with a more accurate cost picture.

The values listed below represent estimated costs associated with construction activities for the specific alternative components only. It is impossible at this level to anticipate the total scope of the restoration and public use that could eventually be implemented. Therefore, these costs do not include any other construction components such as trail implementation, upland or riparian restorations, roadway or building improvements, parking lots, overlooks, interpretative venues, etc. To support and implement lake restoration, surveying, geotechnical investigations, detailed design, modeling, project permitting, construction management, and environmental monitoring and compliance could add \$100,000 to \$250,000 or more to these figures depending upon complexity of the final design and details discovered. Cultural resource issues could also play a significant role in the final cost of the project.

Finally, the costs presented below are based upon the conceptual alternatives as presented. As previously mentioned, each of these alternatives could be modified or combined with others in the final design in virtually unlimited possibilities. As a result, it is impossible to provide accurate cost estimates at this level, and the values presented below should be viewed as a general guide and for comparison purposes only.

#### Estimated Construction Costs

Restoration Alternative	Cost Range	
Alternative 1	\$ 130,000	\$ 320,000
Alternative 2	\$ 140,000	\$ 330,000
Alternative 3	\$ 380,000	\$ 720,000
Alternative 4	\$ 210,000	\$ 540,000
Alternative 5	\$ 470,000	\$ 950,000
Alternative 6	\$ 250,000	\$ 530,000
Alternative 7	<i>Dependent upon to many variables</i>	

### 8.0 NEXT STEPS

This section outlines the probable steps to be taken to carry the project through fruition. This report should provide the District with sufficient information to support its decisions with acquiring the Tolay Lake Ranch property, and potentially restoring the lakebed for wildlife habitat and public use opportunities. The District should attempt to narrow down the number of restoration alternatives to investigate.

Other variables would also have to be taken into account, such as executing agreements with landowners of potentially impacted properties to outline when they would need

flood waters drained from their properties (historical information would be extremely helpful in these discussions); possible agreements for flood and wildlife easements (which would greatly reduce restoration and maintenance costs), water rights issues, impacts to downstream properties, determining and mitigating cultural resource concerns, and seeking funds for restoration.

The District has done a commendable job in accumulating data for the Property. Even so, additional data collection is vital for the development of a viable, efficient and successful restoration project. These data gaps and how they would be beneficial are described below.

The water budget model generated in the Kamman report is key in evaluating the size of impoundments that can be sustained within the Tolay Lake basin and how they correlate with water rights. This information should play a large role in selecting a final alternative. However, additional hydrology data and analysis would be required to adequately design the infrastructure associated with the restoration. This data should include peak flow information from storm events and analysis of flow regimes for existing conditions and post construction conditions. The Kamman report suggested that monitoring station(s) be positioned within the Tolay Lake basin for a year or more to collect data that would help calibrate hydraulic models. DU endorses this approach.

In conjunction with the hydrology data, more detailed topographic information would be necessary to finalize the design. Cross section surveys and inverts of Tolay Creek and all drainage ditches should be collected, especially in areas of potential structure installation. Depending upon the restoration approach selected, topographic data upstream of the Property could be necessary. This data would be used to determine earthwork quantities, as well developing the hydraulic models indicated above. These models are different from those developed in the Kamman Report in that these are specifically designed to assess and fine-tune the performance of the new infrastructure. This is crucial not only to the success of the project but also in permit development in providing impact analysis to both upstream and downstream properties. The *Santa Rosa Subregional Long-Term Waste Water Report* indicated that at some elevation, floodwater could begin to flow in a northerly direction towards the Petaluma Marsh. This is a very important issue that would need to be addressed.

If a restoration alternative is to be carried forward, then permit applications and funding sources should be pursued as soon as practical. Both can easily take a year, if not longer, to obtain. All alternatives investigated and relative data collected should be done so in a manner that enables the information to be easily compiled into state and federal environmental analysis documents. Wildlife and cultural resource surveys should be conducted to evaluate the status and location of areas with sensitive conditions. This data would assist with determining impacts and/or benefits to the Property from the restoration activities.

## **9.0 PROJECT PERMITTING**

This section provides an overview of applicable federal and state regulations, and possible agency authorizations that may be required to complete any of the restoration scenarios. This is not an inclusive list, as other county or regional authorizations may be required.

### **National Environmental Policy Act (NEPA)**

NEPA is the nation's broadest environmental law, applying to all federal agencies and most of the activities they manage, regulate, or fund that could affect the environment. It requires federal agencies to disclose and consider the environmental implications of their proposed actions. The President's Council on Environmental Quality (CEQ) has adopted regulations and other guidance that provides detailed procedures federal agencies must follow to implement NEPA. Each federal agency also prepares an internal NEPA guidance manual for use in preparation of NEPA documentation.

### **California Environmental Quality Act (CEQA)**

CEQA is regarded as the foundation of environmental law and policy in California. CEQA's primary objectives are to:

- Disclose to decisions makers and the public the significant environmental effects of proposed activities;
- Identify ways to avoid or reduce environmental damage;
- Prevent environmental damage by requiring implementation of feasible alternatives or mitigation measures;
- Disclose to the public reasons for agency approval or projects with significant environmental effects;
- Foster interagency coordination in the review of projects; and
- Enhance public participation in the planning process.

CEQA applies to all discretionary activities proposed or approved by California public agencies. Under the direction of CEQA, the California Resources Agency has adopted regulations, known as the State CEQA Guidelines, which provide detailed procedures that agencies must follow to implement the law. A state lead agency, upon its identification, would use the document to comply with the State CEQA Guidelines.

### **Combined NEPA and CEQA Document**

Both NEPA and CEQA encourage the preparation of combined environmental planning documents. Therefore, a joint document can fulfill the statutory obligations of both NEPA and CEQA, and decrease the level of regulatory preparation.

## Federal Endangered Species Act

The federal Endangered Species Act (ESA) of 1973 protects fish and wildlife species that have been identified by the US Fish and Wildlife Service (USFWS) and/or the National Oceanic and Atmospheric Administration Fisheries Service (NOAA) as threatened or endangered. The term “endangered” refers to *species, subspecies, or distinct population segments that are in danger of extinction through all or a significant portion of their range*. Threatened refers to *species, subspecies, or distinct population segments that are likely to become endangered in the near future*.

The ESA is administered by the USFWS and NOAA. In general, NOAA is responsible for protection of ESA-listed marine species and anadromous fish, while other listed species are under the jurisdiction of the USFWS. Section 7 of the ESA requires project review by the USFWS and NOAA. For any project having the potential to affect threatened and endangered species significantly, a Biological Opinion with listed mitigation measures will be issued from USFWS and/or NOAA.

## Federal Clean Water Act

The federal Clean Water Act (CWA) is the primary federal law protecting the quality of the nation’s surface waters, including lakes, rivers, and coastal wetlands. As such, it empowers the United States Environmental Protection Agency (EPA) to set national water quality standards and effluent limitations and establishes permit review mechanisms to enforce them, operating on the principle that all discharges into the nation’s waters are unlawful unless specifically authorized by a permit.

Most of the CWA’s provisions are at least indirectly relevant to the management and protection of biological resources because of the link between water quality and ecosystem health. The portions of the CWA that are most directly relevant to biological resources management are contained in CWA Section 404, which regulates the discharge of dredged and fill materials into “jurisdictional waters of the United States,” including all areas within the ordinary high water mark of a stream, including non-perennial streams with a defined bed and bank and any stream channel that conveys natural runoff, even if it has been realigned; and seasonal and perennial wetlands.

Wetlands are defined for regulatory purposes as areas “*inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions*” (Federal Register, 33 CFR 328.3 and 40 CFR 230.3). CWA Section 404 requires project proponents to obtain a permit from the U.S. Army Corps of Engineers (Corps) for all discharges of dredged or fill material into waters of the United States, including oceans, bays, rivers, streams, lakes, ponds, and wetlands, before proceeding with a proposed activity. The Corps may issue either an individual permit evaluated on a case-by-case basis, or a general permit evaluated at a program level for a series of related activities. General permits are preauthorized and are issued to cover multiple instances of similar activities expected to cause only minimal adverse

environmental effects. Nationwide Permits (NWP) are a type of general permit issued to cover particular fill activities. Each NWP specifies particular conditions that must be met in order for the NWP to apply to a particular project. Waters of the United States both at the restoration site and within its vicinity are under the jurisdiction of the Corps.

In order to receive clearance for work affecting a wetland, a delineation disclosing the location of all wetlands within a project area must be submitted and approved by the US Army Corps of Engineers. Preparation of the delineation must follow the guidelines of the USACE Wetlands Delineation Manual (1987).

Compliance with CWA Section 404 requires compliance with several other environmental laws and regulations, including NEPA, the ESA, the federal Coastal Zone Management Act, and the National Historic Preservation Act. In addition, the Corps cannot issue or verify any permit until a water quality certification or waiver of certification has been issued (by the State Regional Water Quality Control Board) pursuant to CWA Section 401. Section 404 permits may be issued only for the least environmentally damaging practicable alternative. That is, authorization of a proposed discharge is prohibited if there is a practicable alternative that would have less adverse impacts and lacks other significant adverse consequences.

#### **U.S. Rivers and Harbors Act of 1899**

Section 10 of the Rivers and Harbors Act of 1899 is applicable where a project proposes to cross, work within, or place a "structure" within "navigable waters of U.S." A permit from the US Army Corps of Engineers is necessary when such work is planned. Review and authorization is typically done in conjunction with the CWA Section 404 permitting process.

#### **San Francisco Bay Conservation and Development Commission**

The Bay Conservation and Development Commission (BCDC) is the federally-designated state coastal management agency for San Francisco Bay and has jurisdiction in the greater San Francisco Bay area. In all decisions involving wetlands, the BCDC and its staff evaluate projects in light of the McAteer-Petris Act (the BCDC's primary law), the San Francisco Bay Plan, the Suisun Marsh Preservation Act, the Suisun Marsh Protection Plan, the federal Coastal Zone Management Act, and the California Environmental Quality Act.

The BCDC is dedicated to the protection and enhancement of San Francisco Bay and to the encouragement of the Bay's responsible use. The BCDC's primary roles in wetlands management in the Bay are planning the protection, enhancement, and restoration of wetlands; protecting wetlands (through the BCDC's regulatory authority); and balancing the protection of wetlands against other high priority objectives. All projects proposed in tidal wetlands within the BCDC's jurisdiction require an approved BCDC permit before proceeding. Under state and federal law the BCDC is required to set conditions for these permits in order to minimize impacts on wetlands and to offset those impacts that are unavoidable.

## **Magnuson-Stevens Fishery Conservation and Management Act**

The Magnuson-Stevens Act establishes a management system for national marine and estuary fishery resources. This legislation requires all federal agencies to consult with the National Oceanic and Atmospheric Administration Fisheries Service (NOAA) regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect essential fish habitat (EFH). EFH is defined as waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity. The legislation states that migratory routes to and from anadromous fish spawning grounds also should be considered EFH. Within the context of the Magnuson-Stevens Act, the phrase "adversely affect" refers to the creation of any impact that reduces the quality or quantity of EFH. Federal activities that occur outside an EFH but that may nonetheless have an impact on EFH waters and substrate also must be considered in the consultation process. Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan must be considered as well.

The Magnuson-Stevens Act states that consultation regarding EFH should be consolidated, where appropriate, with the interagency consultation, coordination, and environmental review procedures required by other federal statutes, such as NEPA, CWA, and ESA. EFH consultation requirements can be satisfied through concurrent environmental compliance requirements if the lead agency provides NOAA Fisheries with timely notification of actions that may adversely affect EFH and if the notification meets the requirements for EFH assessments.

## **State Endangered Species Act**

The California Endangered Species Act (CESA), which is administered by the California Department of Fish & Game (DFG), protects wildlife and plants listed as threatened and endangered by the California Fish and Game Commission. CESA prohibits all persons from taking species that are state-listed as threatened or endangered except under certain circumstances. The CESA defines "take" as any action or attempt to "hunt, pursue, catch, capture, or kill" a listed species.

Section 2081 of the CESA provides a means by which agencies or individuals may obtain authorization for incidental take of state-listed species, except for certain species designated as "fully protected" under the California Fish and Game Code (see below). Under Section 2081, a take must be incidental to, and not the purpose of, an otherwise lawful activity. Requirements for a Section 2081 permit are similar to those used in the ESA Section 7 process. In general, the requirements include identification of impacts on listed species; development of mitigation measures that minimize and fully mitigate impacts; development of a monitoring plan; and assurance of funding to implement mitigation and monitoring.

### **Lake or Streambed Alteration Agreements (Section 1600 et seq.)**

Fish and Game Code 1600 et seq. regulates activities that interfere with the natural flow of, or substantially alter the channel, bed, or bank of a lake, river, or stream. Lake- and streambed alteration activities are covered under Section 1601 for public agencies and Section 1603 for private parties. Requirements to protect the integrity of biological resources and water quality are often conditions of streambed alteration agreements administered under Section 1600 et seq.

### **California Native Plant Protection Act**

The California Native Plant Protection Act (CNPPA) of 1977 prohibits importation of rare and endangered plants into California; unauthorized take of rare and endangered plants; and sale of rare and endangered plants (the “threatened” category replaced “rare” when the CESA was enacted in 1984). CESA defers to the California Native Plant Protection Act, which ensures that state-listed plant species are protected when state agencies are involved in projects subject to CEQA. Removal of plants for performance of a public service by a public agency or a publicly or privately owned public utility is exempt from CNPPA.

### **Porter-Cologne Water Quality Control Act**

The Porter-Cologne Water Quality Control Act (PCWQCA) established State Water Resources Control Board (SWRCB) and divided the state into nine regional basins, each of is under the jurisdiction of Regional Water Quality Control Boards (RWQCBs). The PCWQCA authorizes the SWRCB to draft state policies regarding water quality. Additionally, the PCWQCA requires the SWRCB to issue Waste Discharge Requirements (WDR) for discharged into state-controlled waters. The PCWQCA also requires the SWRCB or the RWQCB to adopt water quality control plans, or Basin Plans, for the protection of water quality. A Basin Plan must identify the beneficial uses of water to be protected, establish water quality objectives for the reasonable protection of the beneficial uses, and establish a program of implementation for achieving the water quality objectives.

### **Special Status Species**

For the purpose of this document, special-status species are plants and wildlife that are legally protected under the federal Endangered Species Act (ESA), California Endangered Species Act (CESA), or other regulations and species considered sufficiently rare by the scientific community to qualify for such listing. Special status species include:

- species that are listed or proposed for listing as threatened or endangered under the ESA (Federal Register - 50 CFR 17.12 for listed plants, 50 CFR 17.11 for listed animals, and various notices in the Federal Register for proposed species);

- species that are candidates for possible future listing as threatened or endangered under ESA (Federal Register - 64 FR 57534, October 25, 1999);
- species that are listed or proposed for listing by the State of California as threatened or endangered under CESA (Federal Register - 14 CCR 670.5);
- plants listed as rare under the California Native Plant Protection Act of 1977 (California Fish and Game Code, Section 1900 et seq);
- plants considered by the California Native Plant Society (CNPS) to be “rare, threatened, or endangered in California”;
- species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380);
- animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]); and
- nesting raptors protected in California (California Fish and Game Code, Section 3503.5)

### State and Federal Permits and Approvals Potentially Required

Agency	Jurisdiction Related to Project	Areas of Jurisdiction Related to Project	Approvals/Permits
<b>STATE</b>			
California Regional Water Quality Control Board	Porter-Cologne Water Quality Control Act	Water Quality/Discharge	Waste Discharge Requirements for Construction
	Clean Water Act Section 401	Existing U.S. wetlands/waters	CWA Section 401 certification of Corps permit
	Clean Water Act Section 402	Stormwater runoff	Stormwater Pollution Prevention Plan
California Department of Fish and Game	California Endangered Species Act (CESA)	Project Area	Coordination with CDFG Region required
	California Fish and Game Code	Stream Channels (Bed and Bank)	Streambed Alteration Agreement (1600) for alterations to creek bed and bank
<b>FEDERAL</b>			
U.S. Army Corps of Engineers (Corps)	Clean Water Act Section 404	Stream channels, seasonal wetlands	Delineate and verify jurisdictional wetland areas; Consultation with USFWS
	Rivers and Harbors Act of 1899, Section 10	Structures in creeks	Section 10 Review
U.S. Fish and Wildlife Service (USFWS)	Federal Endangered Species Act (FESA)	Locations/habitat for listed federal species	ESA Section 7 Consultation and Biological Opinion
NOAA Fisheries	Federal Endangered Species Act (FESA)	Locations/habitat for listed federal species	ESA Section 7 Consultation and Biological Opinion

### 10.0 POTENTIAL FUNDING SOURCES

Given the experience that Ducks Unlimited has with multiple funding organizations at various levels of contributions, resources necessary to fund the restoration in whole or in part could be granted by the following sources. Although each source has specific habitat goals and interests, they collectively have the same objectives of protecting and improving degraded habitats for benefits to wildlife, plants, and people. These organizations are all receptive to considering the allocation of funds to large, expensive

restoration projects when their goals are met. One thing to consider is that these organizations prefer a partnered approach to a proposed restoration, and favor projects that coordinate and incorporate the resources and objectives of multiple agencies and organizations with various sources of funding for project completion.

***California Bay-Delta Authority (CBDA) - Ecosystem Restoration Program***

The state and federal interagency California Bay-Delta Authority (CBDA), formerly known as CALFED, was created to improve the quality and reliability of California's water supply, and to address various problems in the San Francisco Bay/Sacramento-San Joaquin River Delta (Bay-Delta) region. The creation of CBDA provided a combination of state and federal funding to be used with 3 specific purposes: the development of water quality standards (Category I), water projects (Category II), and habitat restoration (Category III). Category III funding is distributed for projects that benefit targeted species, particularly endangered fish and marsh species.

In order to effectively administer Category III funding, CBDA produced a draft Ecosystem Restoration Program Plan (ERPP) that describes the important ecological processes, habitats, species, and stressors of the San Francisco Bay ecosystem. The specific goals of the ERPP are to:

- Recover 19 at-risk native species and contribute to the recovery of 25 additional species.
- Rehabilitate natural processes related to hydrology, stream channels, sediment, floodplains and ecosystem water quality.
- Maintain and enhance fish populations critical to commercial, sport and recreational fisheries.
- Protect and restore functional habitats, including aquatic, upland and riparian, to allow species to thrive.
- Reduce the negative impacts of invasive species and prevent additional introductions that compete with and destroy native species.
- Improve and maintain water and sediment quality to better support ecosystem health and allow species to flourish.

**North American Wetlands Conservation Act (NAWCA)**

The U.S. Congress recognized the importance of conserving habitat for migratory waterbirds by passing the North American Wetlands Conservation Act (Act). The Act does several things:

- It encourages partnerships to conserve North American wetland ecosystems for waterfowl, other migratory birds, fish, and wildlife.
- It encourages the formation of public-private partnerships to develop and implement wetland conservation projects consistent with the North American Waterfowl Management Plan (NAWMP), a blueprint for continental waterfowl and wetlands conservation, and other North American migratory bird conservation agreements.

- The Act specifically references goals of the NAWMP. The Act provides a mechanism to support NAWMP objectives and those of other migratory bird recovery programs.
- It creates the North American Wetlands Conservation Fund to help support projects through grants.
- It establishes a nine-member North American Wetlands Conservation Council (Council) to review and recommend grant proposals to the Migratory Bird Conservation Commission for funding.
- It lists proposal evaluation factors to be considered by the Council.

A North American Wetlands Conservation Act standard grant proposal is a 4-year plan of action supported by a NAWCA grant and partner funds to conserve wetlands and wetlands-dependent fish and wildlife through acquisition (including easements and land title donations), restoration and/or enhancement, with a grant request between \$51,000 and \$1,000,000. Small grants (up to \$50,000) are administered separately. Match must be non-Federal and at least equal the grant request (referred to as a 1:1 match). Match is eligible up to 2 years prior to the year the proposal is submitted, and grant and match funds are eligible after the proposal is submitted and through the project period.

#### **Wildlife Conservation Board (WCB)**

The Wildlife Conservation Board's (Board) mission is to select, authorize, and allocate funds for the purchase of land and waters suitable for the preservation, protection, and restoration of wildlife habitat. The Board is also responsible for providing compatible recreational facilities. This has included the development of fishing piers and other means of access to coastal and inland waters and cost-sharing for wetlands enhancement.

The Board is responsible for wetlands protection through the acquisition of fee and lesser interests, such as conservation easements. In addition, the Board assists local agencies, special districts, and nonprofit organizations with cost-share projects, which restore and enhance public and privately owned wetlands. The Board is also responsible for managing the Inland Wetlands Conservation Program.

Although the Board does not actively manage wetlands, it does have the authority to manage and award leases for degraded wetlands to nonprofit organizations, special districts, and local and state agencies. Under the terms of the lease, the lessee agrees to restore wetlands to their highest possible wetland value and maintain the wetlands at their highest possible value. Also, the Board has the authority to acquire degraded wetlands, restore the wetland to highest wetland value, and then sell the wetland to the private sector or another governmental entity. Such transactions only require short-term management responsibilities.

The Board was established by legislation under the Wildlife Conservation Act of 1947 to administer a capital outlay program for wildlife conservation and related public recreation. Subsequent legislation, such as the Inland Wetlands Conservation Program (1990) and the California Riparian Habitats Protection Program (1991), expanded the Board's mandate. Generally, the Board's mandate can be found in §§1300-1431 of the

California Fish and Game Code. Although the Board is a part of the California Department of Fish and Game, it has separate funding.

### **California Coastal Conservancy**

The California Coastal Conservancy, established in 1976, is a state agency that uses entrepreneurial techniques to purchase, protect, restore, and enhance coastal resources, and to provide access to the shore. The Conservancy works in partnership with local governments, other public agencies, nonprofit organizations, and private landowners. To date, the Conservancy has undertaken more than 950 projects along the 1,100 mile California coastline and around San Francisco Bay. These projects often accomplish more than one Conservancy goal. Through such projects, the Conservancy:

- Protects and improves coastal wetlands, streams, and watersheds.
- Helps people get to coast and bay shores by building trails and stairways and by acquiring land and easements. The Conservancy also assists in the creation of low-cost accommodations along the coast, including campgrounds and hostels.
- Works with local communities to revitalize urban waterfronts.
- Helps to solve complex land-use problems.
- Purchases and holds environmentally valuable coastal and bay lands.
- Protects agricultural lands and supports coastal agriculture.
- Accepts donations and dedications of land and easements for public access, wildlife habitat, agriculture, and open space.

The Coastal Conservancy has a staff of 65 and a current annual budget of over \$185 million. Since 1976, the Conservancy has used well over \$500 million to complete its projects. The Conservancy has been funded primarily by state general obligation bonds and from the state's general fund.

### **Other Funding Sources**

Additional funding sources worth noting are Wetlands Reserve Program - Natural Resources Conservation Service, Partners for Wildlife – US Fish and Wildlife Service, and private foundations such as National Fish and Wildlife Foundation.

## 11.0 CONCLUSION

The restoration of wetland hydrology and habitat within the Tolay Lake basin is feasible and should be pursued. As presented in this report, there are numerous approaches that can achieve the District's objectives. As the options are evaluated, the District should keep in mind that the more robust approaches present more passively managed systems. The potential for public use and education is extremely high and should be incorporated into the restoration design. However, optimal benefits to wildlife and people can be achieved if use of the restored lake can be segregated or cohesively managed to minimize disturbance. In other words, recreational uses should be properly employed so that they provide adequate enjoyment to the public without disrupting or discouraging wildlife use.

A successful restoration project must also address the concerns of the adjacent property owners. The greatest amount of benefits with the least amount of construction and disturbance would be achieved if some level of flooding were accepted by the upstream properties. This in essence would result in cheaper construction, operation, and maintenance costs.

This project is a great opportunity to restore and manage wetland habitat in an area of the Pacific Flyway that is critical to many migratory bird species. The benefits to many California native and resident species are also highly favorable, and the conversion of the Property into habitats that are indicative of historic lake conditions should gain the support of many wildlife-oriented organizations and funding agencies.

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## 14.0 FIGURES AND ATTACHMENTS

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- Figure 2: Goose and Duck Migration Corridors
- Figure 3: Waterbird Foraging Depths
- Figure 4: Existing Conditions
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- Figure 8: Alternative 4
- Figure 9: Alternative 5
- Figure 10: Alternative 6
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### LIST OF ATTACHMENTS

Summary of Restoration Alternatives

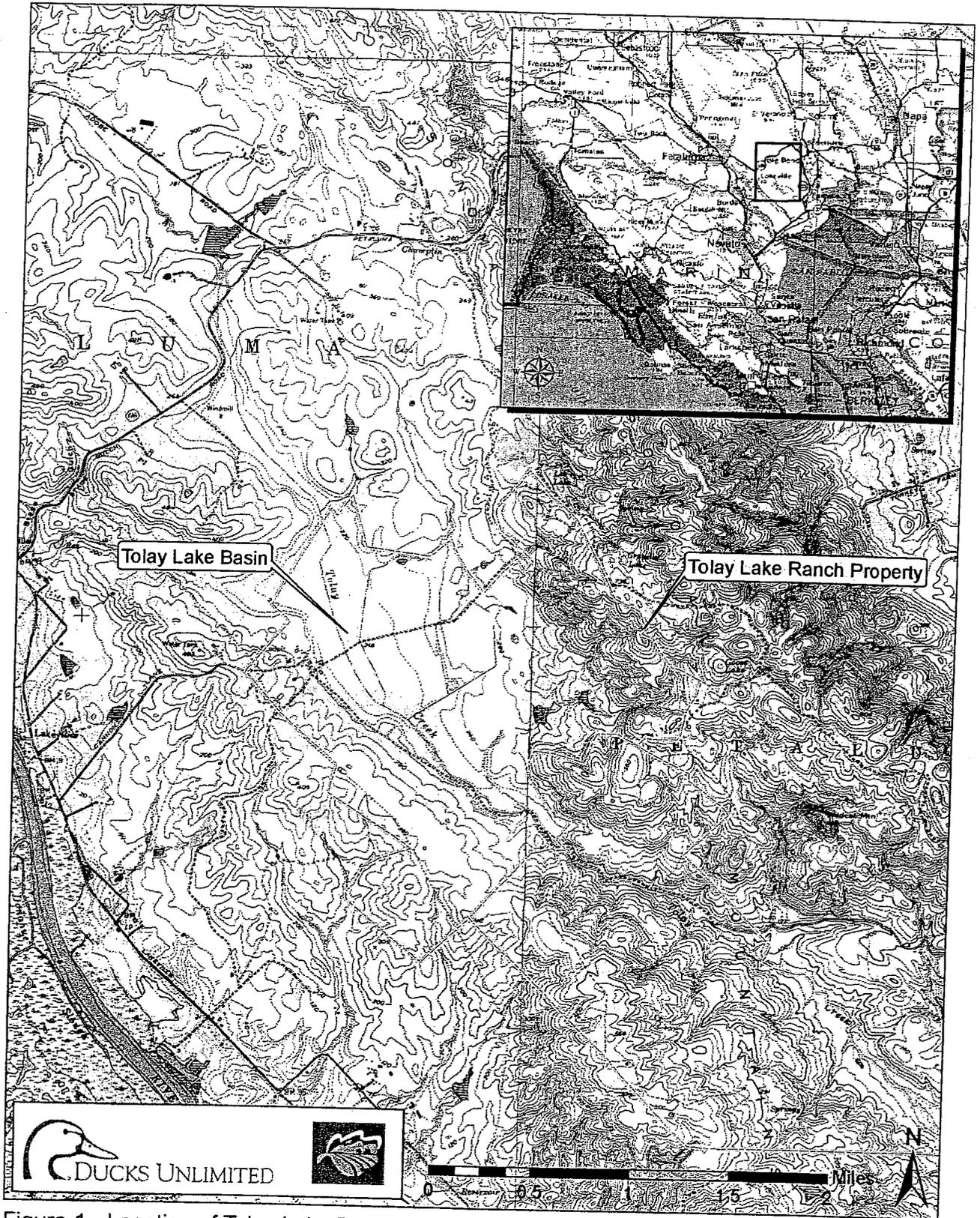
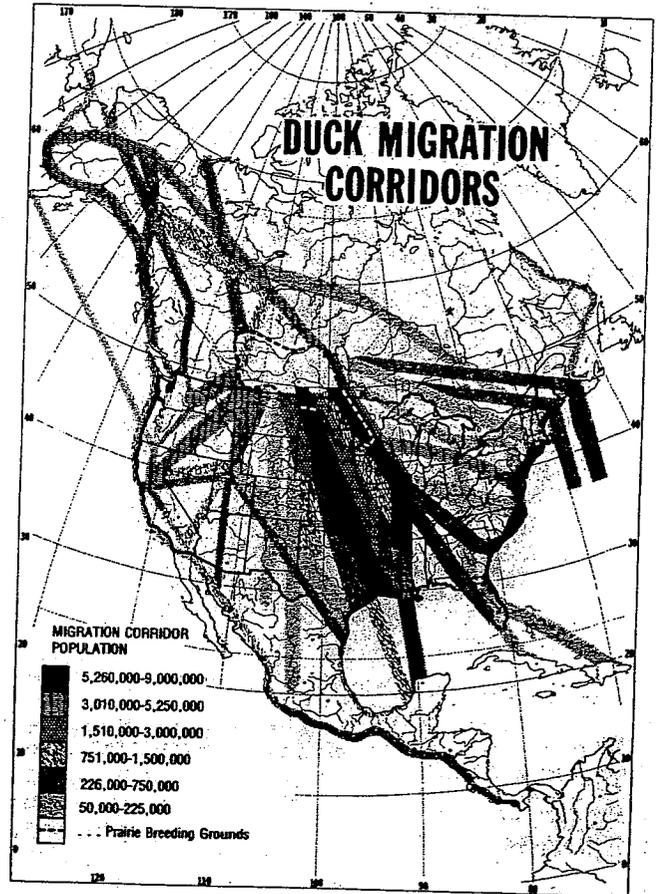


Figure 1. Location of Tolay Lake Ranch Property

Figure 2 – Migration Corridors



Bellrose, 1979.

Figure 3 - Waterbird Foraging Depths

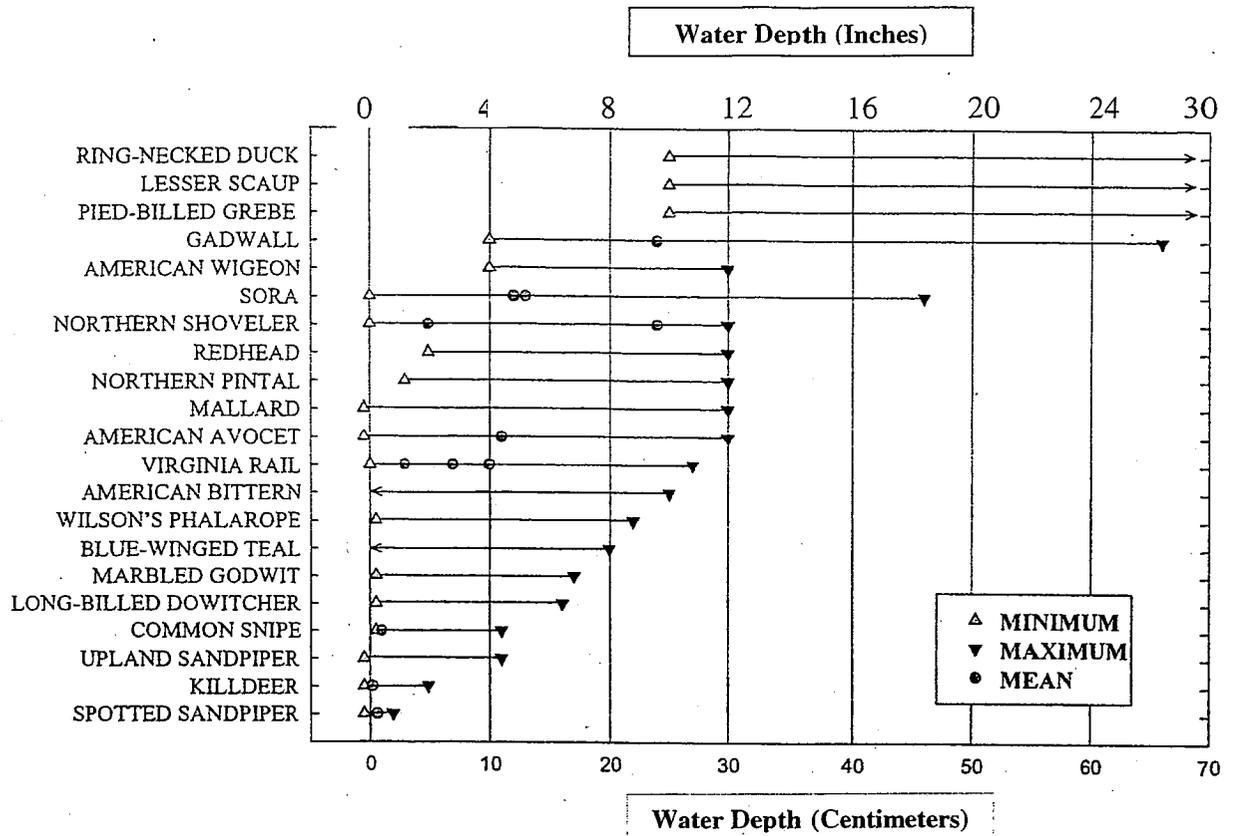


Fig. 4. Foraging depths of some common groups using wetland habitats. Information based on review of the scientific literature. Scientific names: Ring-necked Duck *Aythya collaris*, Lesser Scaup *Aythya affinis*, Pied-billed grebe *Podilymbus podiceps*, American wigeon *Anas americana*, Sora *Porzana carolina*, Redhead *Aythya americana*, American avocet *Recurvirostra americana*, Wilson's phalarope *Phalaropus tricolor*, Marled godwit *Limosa fedoa*, Long-billed dowitcher *Limnodromus scolopaceus*, Upland sandpiper *Bartramia longicauda*, Killdeer *Charadrius vociferus*, Spotted sandpiper *Actitis macularia*.

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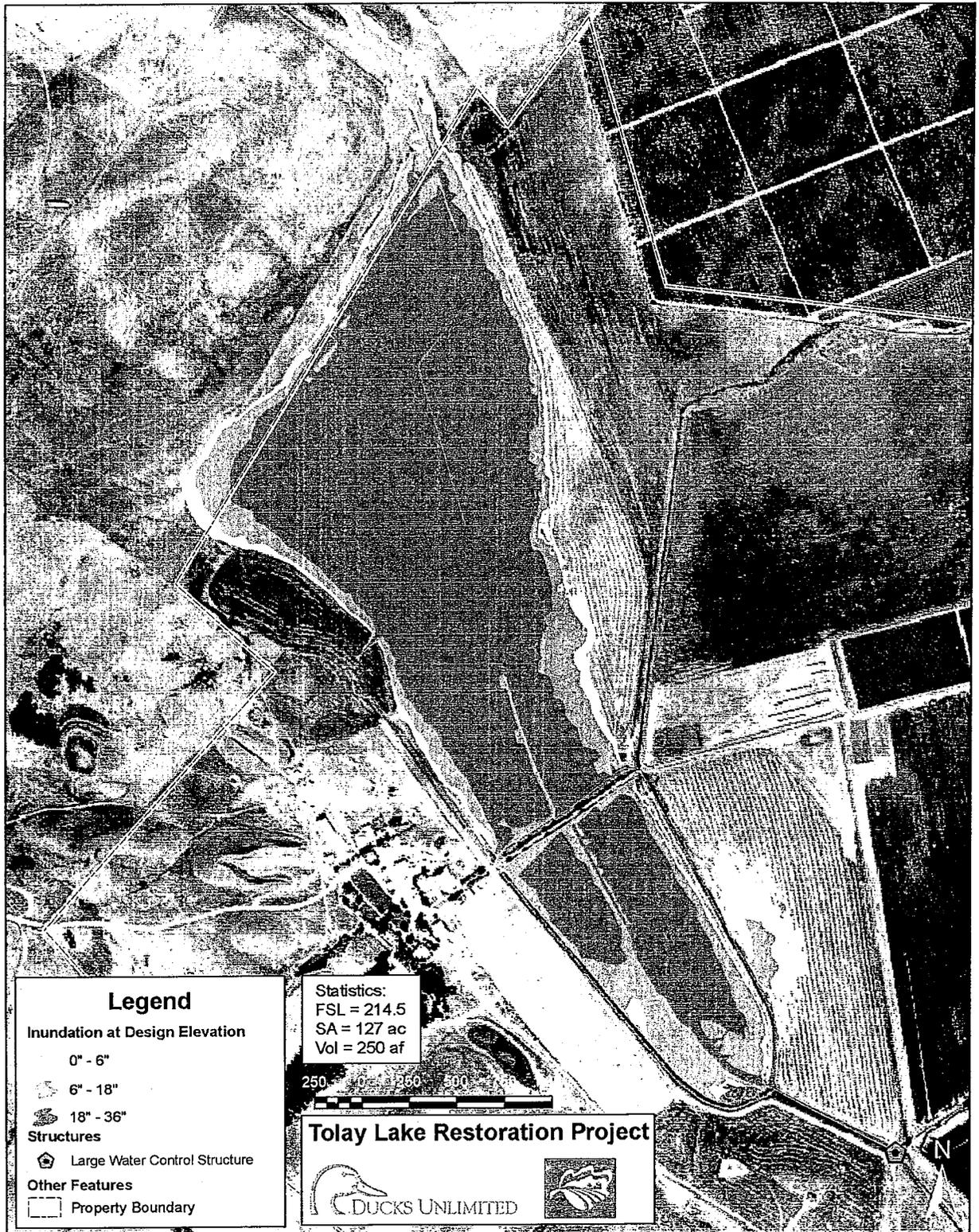


Figure 4. Existing Conditions



Figure 5. Alternative 1

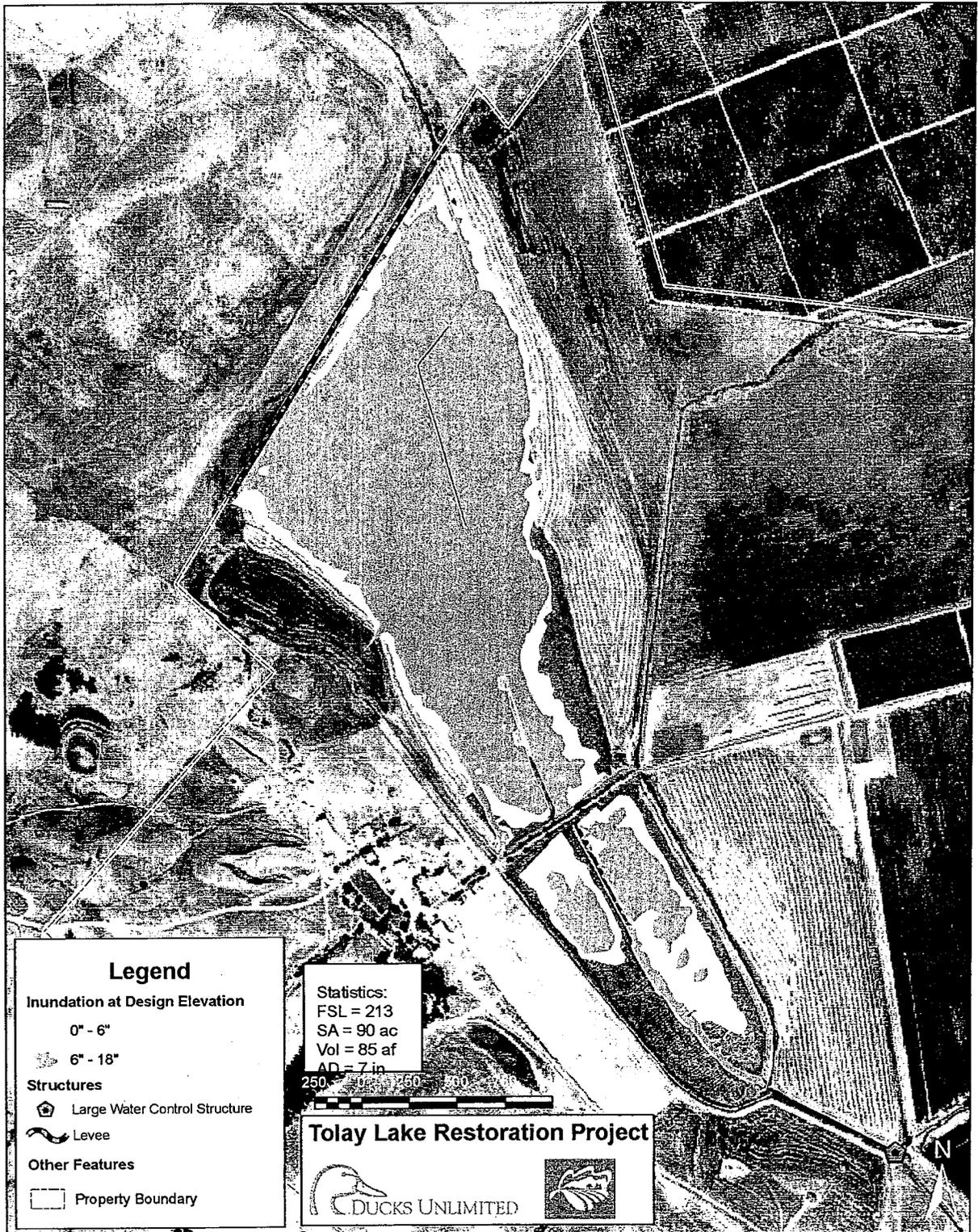


Figure 6. Alternative 2



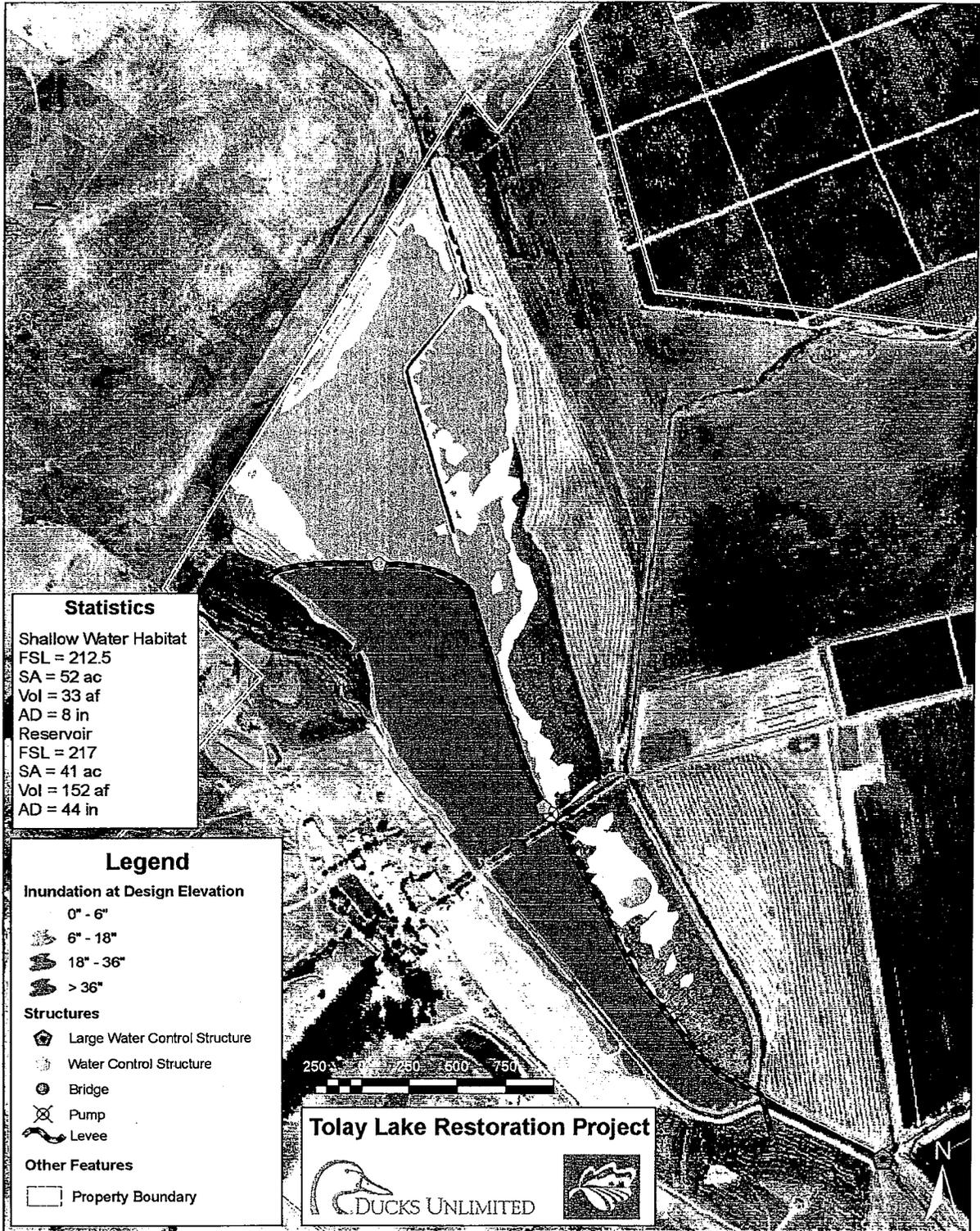


Figure 7. Alternative 3

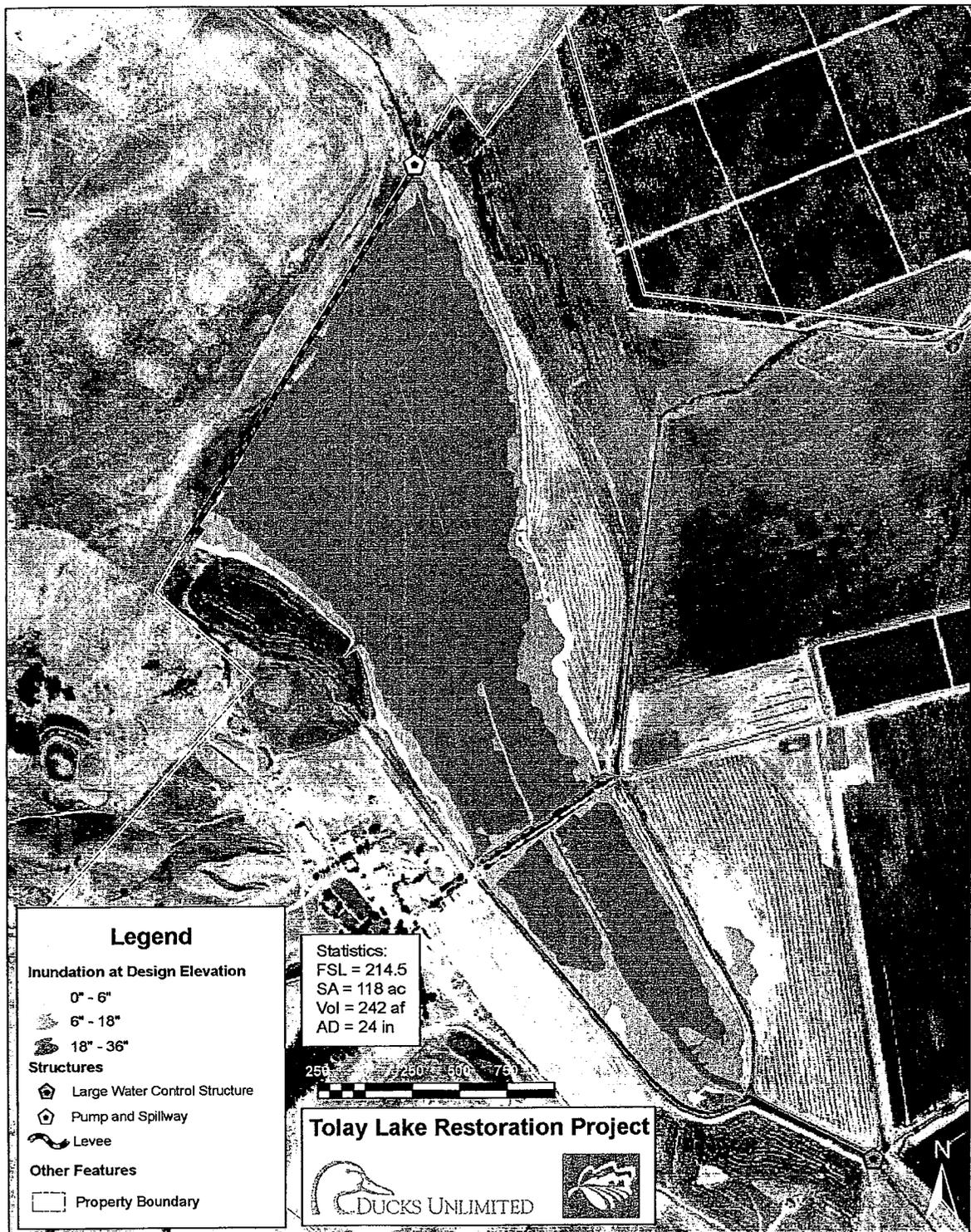


Figure 8. Alternative 4

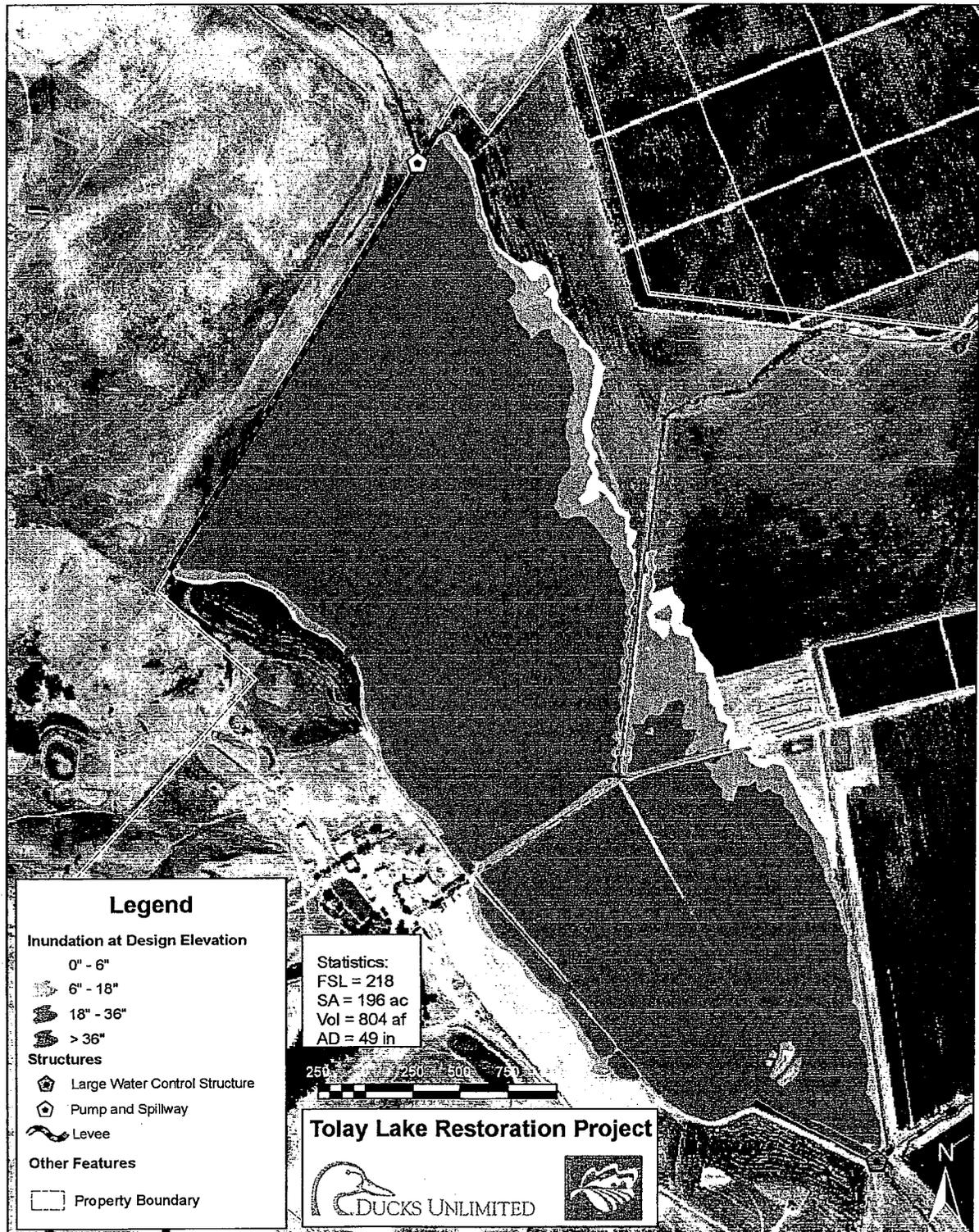


Figure 9. Alternative 5

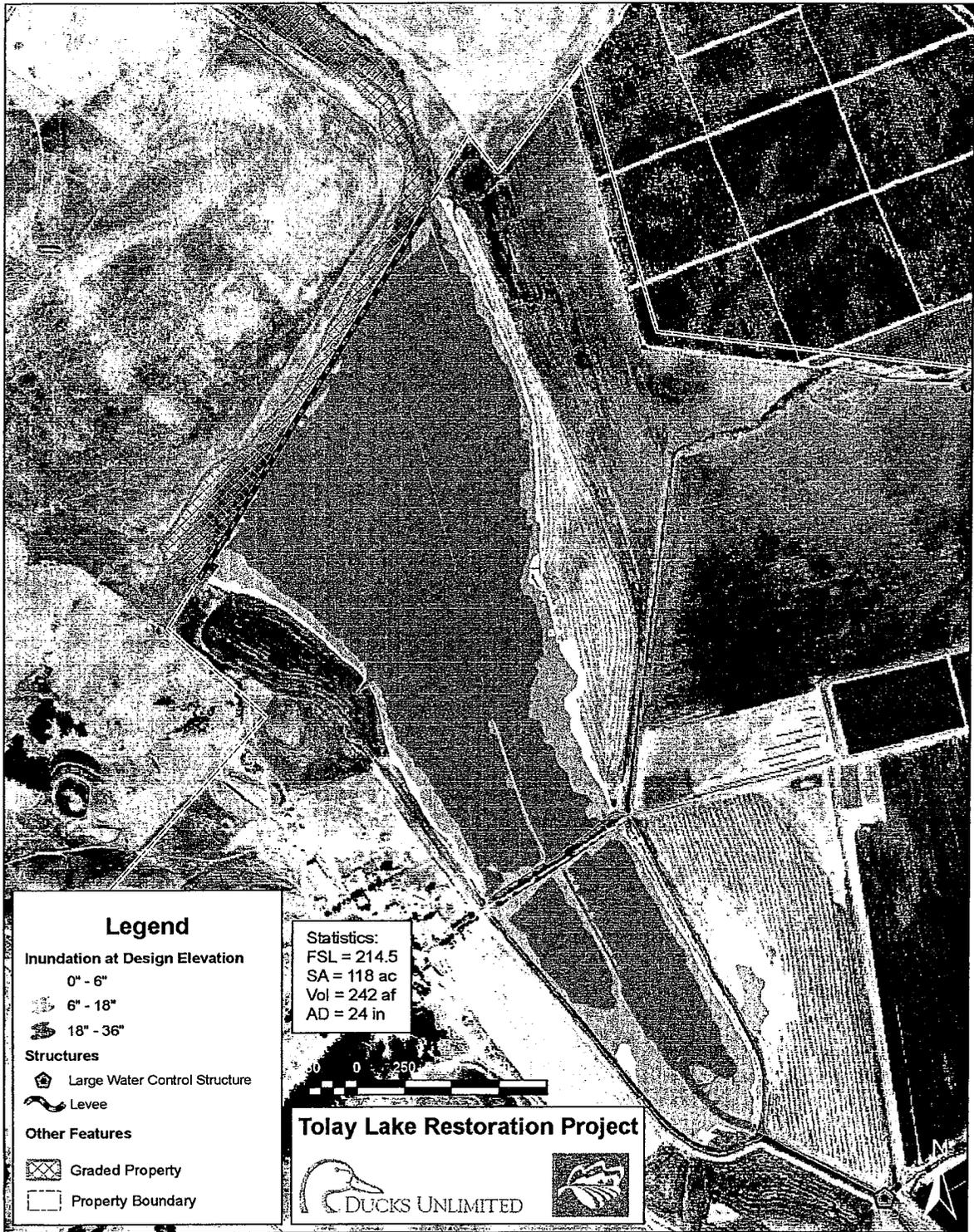


Figure 10. Alternative 6

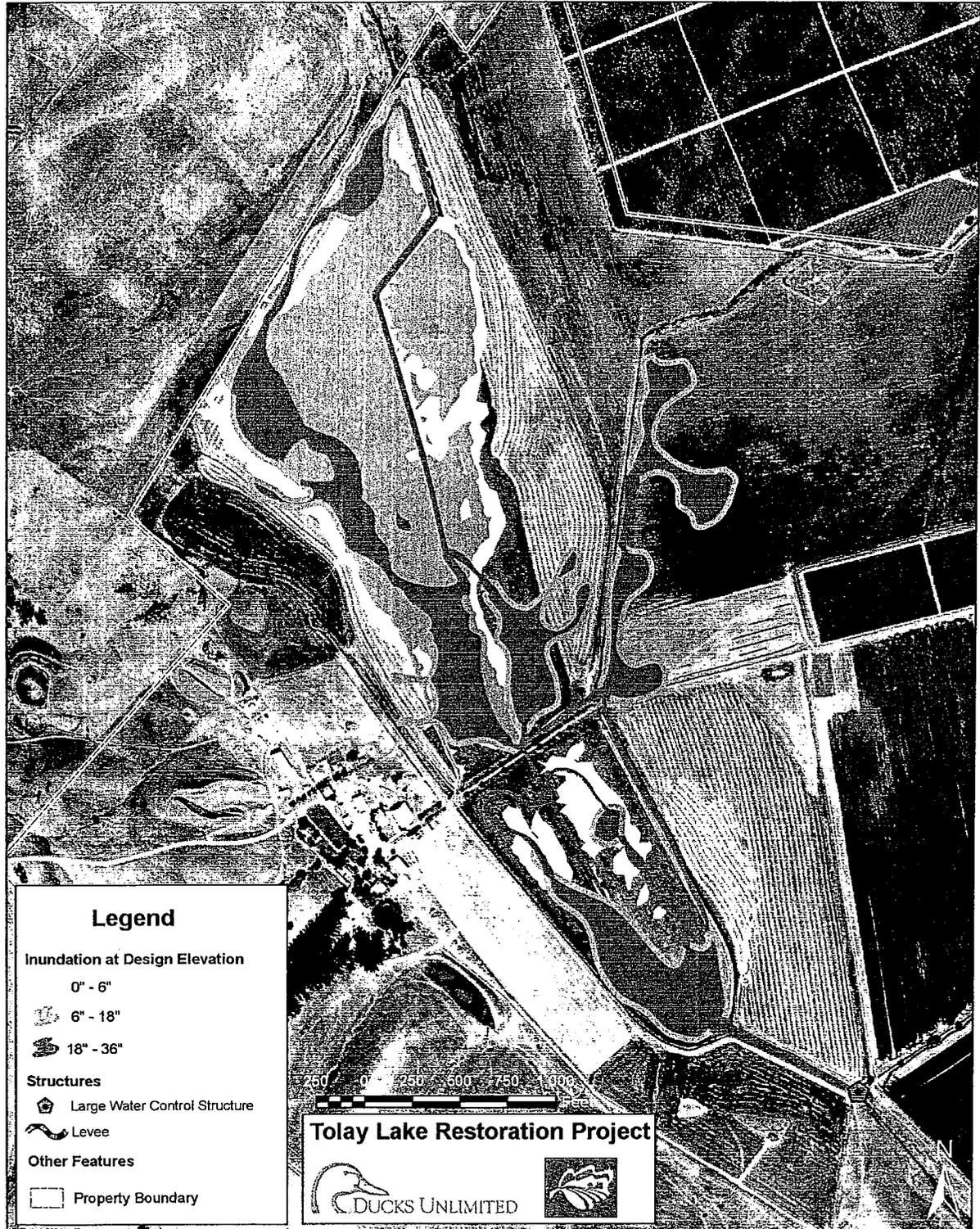


Figure 11. Alternative 7

## Summary of Restoration Alternatives

Restoration Alternative	Figure Number	Project Components	Statistics	Seasonal Lake Duration	Public Use Opportunities		Impact to Cultural Resources	Level of Maintenance	Management Capability	Construction Magnitude	Level of Permitting
					Paddling	Wildlife Viewing					
Alternative 1 (7.2.1)	5	<ul style="list-style-type: none"> <li>Water control structure (WCST) near drainage divide</li> </ul>	FSL= 212.5 SA= 71 ac Vol= 44 af AD= 7 in	LOW	LOW	MEDIUM	LOW	LOW	LOW	LOW	LOW
Alternative 2 (7.2.2)	6	<ul style="list-style-type: none"> <li>WCST near drainage divide</li> <li>Berm at N end of property (2,000 LF, TE=214.0)</li> <li>Swale between berm and property line to facilitate drainage and generate fill</li> </ul>	FSL= 213.0 SA= 90 ac Vol= 85 af AD= 7 in	LOW - MEDIUM	LOW	MEDIUM	LOW	LOW	LOW	LOW	LOW
Alternative 3 (7.2.3)	7	<ul style="list-style-type: none"> <li>WCST near drainage divide</li> <li>Levee N of causeway (2,600 LF, TE=218.0)</li> <li>Causeway Improvement (500 LF, TE=218.0)</li> <li>Levee S of causeway 2,100 LF, TE=218.0)</li> <li>WCST at causeway to fill reservoir (passive and pump)</li> <li>WCST in reservoir levee to feed shallow water habitat</li> <li>Re-contour reservoir and shallow water habitat to enhance habitat and generate fill for levee material</li> </ul>	<b>Shallow Water Habitat</b> FSL= 212.5 SA= 52 ac Vol= 33 af AD= 8 in  <b>Reservoir</b> FSL= 217.0 SA= 41 ac Vol= 152 af AD= 44 in	HIGH	HIGH	HIGH	MEDIUM	HIGH	HIGH	HIGH	HIGH
Alternative 4 (7.2.4)	8	<ul style="list-style-type: none"> <li>WCST near drainage divide</li> <li>Berm and swale at N end of property (2,400 LF, TE= 215.5)</li> <li>Spillway (TE=214.5) w/ pump and flap gates in Tolay Creek channel.</li> </ul>	FSL= 214.5 SA= 118 ac Vol= 242 af AD= 24 in	MEDIUM	HIGH	HIGH	LOW	MEDIUM	MEDIUM	MEDIUM	HIGH
Alternative 5 (7.2.5)	9	<ul style="list-style-type: none"> <li>WCST near drainage divide</li> <li>Berm and swale at N end of property (2,100 LF, TE= 219.0)</li> <li>Weir across Tolay Creek at N end of property (300 LF, TE= 218.0) w/ pump and flap gates in creek channel</li> <li>Excavate shallow water habitat at edge of lake for fill</li> </ul>	FSL= 218.0 SA= 196 ac Vol= 804 af AD= 49 in	HIGH	HIGH	MEDIUM - HIGH	LOW	HIGH	MEDIUM - HIGH	HIGH	HIGH
Alternative 6 (7.2.6)	10	<ul style="list-style-type: none"> <li>WCST near drainage divide</li> <li>Grade properties upstream of Property to minimum elevation of 215.0</li> <li>Re-contour lakebed to enhance habitat and generate fill</li> </ul>	FSL= 214.5 SA= 118 ac Vol= 242 af AD= 24 in	MEDIUM	HIGH	HIGH	MEDIUM	LOW	MEDIUM	HIGH	HIGH
Alternative 7 (7.2.7)	11	<ul style="list-style-type: none"> <li>WCST near drainage divide</li> <li>Excavate basin to desired depths and volumes</li> <li>Remove material to off-site location</li> </ul>	DEPENDENT UPON FINAL DESIGN - FIGURE PRESENTED IS FOR CONCEPTUAL REFERENCE PURPOSES ONLY								

**Legend:**

WCST Water Control Structure

FSL Full Service Level or elevation of design water surface

Vol Volume / Storage Capacity in acre-feet (af)

AD Average water depth in inches

SA surface area in acres

TE Top Elevation of levee

LF Linear Feet