TETRA TECH

Review of Otay Mesa Drainage Studies

Contract H084445

Task Order No. 16

think BLUE SM
SAN DIEGO

Review of Otay Mesa Drainage Studies

Contract H084445

Task Order No. 16

Table of Contents

List of Tables

List of Figures

I. Introduction

Otay Mesa is a community located within the City of San Diego. Originally developed as an industrial area in 1985 in response to the creation of a U.S./Mexico border crossing, Otay Mesa now includes residential areas, an airport, and more than 1200 companies which sell and ship directly to Mexico or utilize the labor pool that commutes from Tijuana. Current development projects in the area include a major transportation project, State Route 905, to improve traffic in the region, with completion anticipated by 2013. With this, continued industrial and residential growth is anticipated. See Figure 1 for a map of Otay Mesa's location.

Figure 1. Location of Otay Mesa

Prior to development, the region was primarily an agricultural community. Effects of increased development were identified soon after it began. Because most of the Mesa drains south towards Mexico, concern arose over increased stormwater runoff crossing the border. In 1987, the City Council approved a contract to prepare the Otay Mesa Master Drainage Plan and published a Notice to "All Private Engineers" that established drainage requirements for development in Otay Mesa. The Notice required no increase in the rate of stormwater runoff from the property after development than it was before development, by the construction of stormwater detention basins on-site. The Notice also

indicated the plans of the City's Engineer Office, Flood Control Section, to prepare a plan for a main north–south channel from Otay Mesa Road to the Mexican border. The *Otay Mesa Drainage Master Plan- Preliminary Channel Design* was published in January 1988, and was updated in August 1999 (*Otay Mesa Drainage Study*), May 2005 (*Otay Mesa Community Plan Update*), and April 2007 (*Drainage Study for the Otay Mesa Community Plan Update*.)

Most existing drainage facilities were constructed as part of private development. These facilities are discontinuous because of the nature of individual development projects, which creates difficulties for subsequent developers that need to connect to private drainage facilities. Most development has occurred in the East Watershed of the Mesa, where most existing drainage facilities are located. These facilities consist of a system of storm drains, improved channels, and detention basins. Many of the detention basins discharge to natural drainages, which do not have adequate hydraulic capacity. Flooding therefore occurs occasionally in the area.

Because of continuing development in the area, recommendations and guidance provided in the previous drainage reports quickly become outdated. This document provides a review of the previous reports and summarizes report recommendations. Current land use and drainage patterns, as well as regulations regarding stormwater are also reviewed to provide up-to-date considerations and recommendations for the placement of storm water management facilities and to shed light on potential restoration projects that may be required to mitigate impacts to sensitive areas (e.g., vernal pools).

II. Review of Completed and Draft Planning and Engineering Reports

A. Introduction

The purpose of this report is to provide a summary of the engineering reports to gain a better understanding on the motivation behind the reports and to highlight considerations that may require additional thought weighed if progress were to be made in implementing the projects contained within the engineering reports.

B. Review of Pertinent Notices and Planning Reports

The following sections are a summary of four engineering reports for the Otay Mesa that were supplied to Tetra Tech by the City of San Diego.

August 7, 1987. Notice to All Private Engineers

The notice required all property in Otay Mesa that is within the watershed that drains to Mexico to be developed with the following requirements:

- Each property owner shall provide stormwater detention facilities so that there will be no increase in the rate of runoff due to development of the property.
- The detention facility shall be designed so that the rate of runoff from the property will be no greater after development than it was before development for a 5-year, 10-year, 25-year, and 50-year storm.
- All drainage facilities crossing four-lane major or higher classification streets shall be designed for a Q100 (existing). Other facilities, except the major channel described below, may be designed for Q50 (existing).

- The Drainage Design Manual shall be used as guidelines for design of drainage facilities, and computing design discharges.
- The City's Engineer Office, Flood Control Section, is preparing a preliminary plan for the main north-south channel from Otay Mesa Road near La Media to the Mexican border. The preliminary design will include the design Q (Q100 existing), the invert grade and the water surface elevation at the major road crossings.

January 1988. Otay Mesa Drainage Master Plan – Preliminary Channel Design

This document provided the initial preliminary design for the main channel indicated in the Notice, above.

Introduction: To prevent flooding problems, the City has required individual developments to regulated runoff from their property. The Mesa is zoned for industrial and commercial use. To allow for the planning and development of the area, an area-wide drainage collection and conveyance system is needed to serve the many individual properties. The report presented a preliminary channel design for a main channel to give Otay Mesa developers a basis for the design of the individual property storm drains.

Hydrologic Analyses: The hydrologic analysis was conducted using the US Army Corp of Engineers (US ACE) HEC-1 flood hydrograph computer model. The watershed was divided into 53 subareas, and the design storm was a 100-year, 6-hour event. The precipitation for the design event was estimated for the 53 subareas from the NOAA isopluvial map for San Diego. Other inputs for the program included the percent of impervious area in the subarea, the Soil Conservation Service (SCS) curve number, which was estimated from SCS soil maps and existing land uses, and the basin lag time. The HEC-1 model calculated peak discharges at 5 flow concentration points along the proposed channel route.

Hydraulic Analyses: The hydraulic analysis was conducted using the US ACE HEC-2 water surface profile computer program. The design discharges for various segments of the channel were those calculated using the HEC-1 model. A minimum of 1 foot of free board was assumed, and the top of road, top of bank, and channel invert elevations needed to develop cross-sectional input data was determined from maps, surveying notes, and road grading plans for the area. Other input parameters for the HEC-2 program were estimated, using the guidelines in the HEC-2 user's manual and independent hydraulic calculations, and included the Manning's "n" roughness coefficient and flow expansion and contraction coefficients. The analysis also assumed that there would be reinforced concrete box culverts placed at the road crossings and that the design would include a spreading basin at the terminus of the proposed channel. The purpose of the proposed spreading basin in the design was to reduce flow velocities, to spread flows such that the discharge to Mexico would occur in approximately the same area, to provide area for potential wetland mitigation, and to lessen the adverse aesthetic of a concrete channel. The results of the hydraulic analysis provided the optimal design of the main channel. The channel was designed as a concrete trapezoidal channel with a 2:1 slope.

Conclusions: The proposed channel would start at the south end of reinforced box concrete culverts under Otay Mesa Road just east of La Media Road, and then end with the spreading basin prior to discharge to Mexico. The proposed channel is approximately 7,570 feet (ft) long, with a width of 56 –

150 ft. The final 515 ft length of the channel would encompass the spreading basin, which would be approximately 600 ft wide. The spreading basin would be planted with natural riparian vegetation and would have a low-flow channel connecting the upstream concrete channel to the existing channel in Mexico.

August 9, 1999. Otay Mesa Drainage Study

This document provided an update to the 1988 Master Plan and identified a project that was compatible with new development plans for Otay Mesa and considered environmental constraints and alternative analyses.

Introduction: The goal of the document was to provide a primary drainage channel from Otay Mesa Road to the border with Mexico to accommodate runoff from existing and future development. Since the 1988 study, new channels, roads, development and detention basins had been constructed. The original project predicted construction of the channel described by 2005. The funding for the project was proposed to be collected from fees collected at the Final Map/ Building Permit approval for new developments.

Hydrologic Analysis: The new hydrologic analysis using the United States Army Corps of Engineers (US ACE) Hydraulic Engineering Center – HEC-1 model reflected runoff expected with new developments. The US ACE HEC-1 model was used, and the SCS method of analysis was used to estimate the rainfall on subareas with the study area. Guidance from the San Diego County Hydrology manual was used in providing required input for the program. The analysis derived subareas and flow concentration points based on existing drainage facilities, and where available, improvement plans for proposed facilities. If no improvement plan was available, the hydrologic criteria and drainage paths were based on assumptions of further development from master plans for the Mesa. The analysis included the proposed SR 905 and SR 125 freeways, and the proposed San Diego Air Commerce Center.

Hydraulic Analysis: Water surface profiles for the proposed channel were generated using the US ACE Hydraulic Engineering Center – River Analysis System (HECRAS), Version 1.2, a US ACE computer program. The HECRAS program determined steady state flow conditions based on user supplied cross section geometry and flow rates.

The slope of the proposed channel would be controlled by the gradual slope of the Mesa, the existing drainage facility located under Otay Mesa Road, and the channel elevation at the border. To convey the 100-year flood flow, the proposed channel would have to be very wide. A rectangular channel was recommended, as the rectangular shape carries the most flow per unit of area. The proposed rectangular channel would have a width of 40 ft across the inside bottom, plus wall width and channel access, such that the total width would be 55 ft. Any channel narrower and deeper than that proposed would possibly affect the ability of adjacent properties to properly drain. Existing sewer lines also constrained the depth of the proposed channel.

Environmental Constraints

Hydrologic: The future design of the Otay Mesa Master Drainage Plan would need to include future projects, including SR 905, SR 125, the Otay Mesa Road future realignment, and the Brown Field Airport. The project must meet the purpose and interest of the San Diego Environmentally Sensitive

Lands Ordinance. The channel design must also consider the effects of other planned projects in the vicinity and the concerns of the International Boundary and Water Commission (IBWC) regarding stormwater runoff rates. Permit requirements for the project would also likely include the use of soft bottom for the channel and incorporation of natural vegetation as much as possible, and demonstration that the project minimizes impacts to regional wildlife habitat.

Biological Resources: The Empire Center Mitigation Site, constructed in 1997 as part of a City, State and federal permitting action for an earlier project, included 5 acres of land in an area north of Airway Road and west of La Media Road and included over 12 created and naturally occurring vernal pools and habitat for San Diego button celery, a federally listed species. At least 14 vernal pools, encompassing approximately 25,756 ft^2, are located outside of the mitigation area. A patch of freshwater marsh was identified in the vernal pool restoration area. Mitigation at a probable ratio of 2:1 would be required to ameliorate any impacts to vernal pools and the freshwater marsh. Indirect effects to wetlands through changes in drainage patterns that could significantly affect their functionality would also possibly require mitigation.

Recommended actions for the Master Drainage Plan in reference to biological resources constraints included:

- Avoiding impacts to the Empire Centre Mitigation Site;
- Accurately mapping vernal pools with a survey crew in the spring;
- Avoiding impact to the vernal pools or concurrently mitigating impacts to the pools outside of the project site;
- Avoiding impacts to federally listed and narrow endemic plant species (i.e., San Diego celery-button, Otay tarplant, and variegated dudleya;
- Avoiding impacts to the San Diego Multi-Habitat Planning Area (MHPA);
- Including plans in the Master Drainage Plan to maintain low flow drainage patterns to avoid indirect effects on wetland habitats;
- Conduct surveys for burrowing owl burrows prior to development and impacts should be avoided or mitigated;
- Conduct protocol surveys for other potential federally listed species on the site;
- Mitigation of nonnative grassland at a ratio of 0.5:1.

Cultural Resources: Completion of a literature review and record searches at San Diego University and the San Diego Museum of Man was recommended for previously conducted archeological surveys.

Alternative Analyses

The objective of the alternatives analysis was to identify an alignment for the drainage channel that will efficiently convey the flows from an existing rectangular concrete box culvert under Otay Mesa Road to the U.S.-Mexico Border while minimizing impacts on environmentally sensitive areas and adjacent properties. The preferred alternative placed the channel along the east side of La Media to a box culvert crossing from the northeast corner to the northwest corner of the intersection of La Media with Siempre Viva Road. The channel continued along the north side of Siempre Viva from the box culvert outlet at La Media to a box culvert crossing to the south side of Siempre Viva to connect to the existing stream channel. This alternative was chosen as the preferred alternative because an existing drainage ditch is on the east side of La Media Road; the channel would intercept flows from

the east without potential conflicts from utilities in La Media Road; and flows from the west would continue to flow in the old drainage path. Additionally, the alternative minimizes impact on properties by following the property line and minimizes potential utilities conflicts in Siempre Viva Road by crossing under it through a box culvert at the existing stream location.

Possible funding mechanisms identified for funding the project included general obligation bonds, Mello-Roos Community Facilities Districts tax, special assessment bonds, and certificates of participation.

May 2005. Drainage Study for Otay Mesa Community Plan Update

The report was prepared as an appendix to the Otay Mesa Community Plan update EIR to provide a summary of existing drainage facilities and to provide alternatives for draining the Mesa. Most existing drainage facilities are located within East Watershed. The system existing at the time of the report was a combination of storm drains, improved channels, and detention basins, which discharge in many areas to natural drainage paths that do not have adequate hydraulic capacity. As many of the projects have been developed, portions of the properties have been dedicated to the city as drainage easements or flood water storage easements. These were presumably recorded as easements, however, this part of the Study was not verified.

Hydrologic Analysis: The Otay Mesa Drainage Study area included all of the Mesa area within the City of San Diego, divided into 5 watersheds (West Perimeter, West, North Perimeter, East, and Border Crossing), excluding the far northwest arm of the Mesa which had been fully developed. Most of Otay Mesa slopes from north to south with flow entering Mexico at several points. The perimeter of the Mesa drains into the adjacent canyons. The watershed boundaries on the Mesa are not well defined because the Mesa is flat, with stormwater run-off mostly sheet-flowing across the Mesa. Previous drainage study reports (1988, 1999) prepared hydrologic analyses for the East watershed. In the current report, new hydrologic models were developed using the HEC-1 model for the East watershed, since that was the hydrologic model previously used in analysis of the watershed. For the other main watersheds, West Perimeter and West, the AES-developed standard City of San Diego Modified Rational Method was used. The hydrologic analyses calculated that the total flow from these watersheds at the concentration point at the border for the 100-year flow was 5,793 cubic feet per second (cfs). The Spring Canyon open space in the West Watershed was calculated to contribute an additional 257 cfs.

Hydraulic Analysis: The HEC-RAS model was used to size the 100-year floodplain of Otay Mesa Creek based on current conditions. The model was also used to size the proposed new channel to contain the 100-year flow which would reduce or eliminate flooding impacts to nearby facilities. An existing channel that is tributary to the proposed main channel and located just upstream of the Siempre Viva Road Crossing is approximately 15 ft wide and 4 ft deep, with a hydraulic capacity of approximately 120 cfs. The 100-year flow in this channel however would be 1116 cfs. A new channel proposed for this tributary by this report is sized 50 ft wide with 1.5:1 side slopes to convey the 100 year flow. The cost estimate proposed by this report does not include this tributary channel.

Proposed Drainage Facilities: Caltrans had completed their plans for the SR-905 project. For proposed private development, the only Master Planned facility which would need to be constructed prior to

continued development is the Main Channel and the Detention Basin in the East Watershed. The Main Channel proposed by this report would have a bottom width of 240 ft at the Detention Basin to 200 ft from just north of Siempre Viva Road to the intersection of Airway Road and La Media Road. The side slopes would be 4:1 to 10:1 and heavy riparian vegetation would be allowed to grow in the channel. Hiking trails and access roads with a width of 12 feet would line each bank of the channel. At the Airway Road and La Media intersection, a 35 ft wide concrete channel would connect the channel with the proposed Caltrans culverts which would be constructed concurrently with SR 905.

The proposed Detention Basin was designed to attenuate peak flows from 5 year to 100 year storms, with dimensions of approximately 1700 ft by 1500 ft. The basin would encompass 58 acres with a maximum storage depth of 6.0 ft and a maximum storage volume of 308 acre-ft. The basin would be graded and vegetated to appear natural and to create a low flow stream. The basin and channel would require removal of 915,000 cubic yards of soil. It was assumed this soil would be used on adjacent properties to raise building pad grades.

A preliminary cost estimate was $23,868,000 to complete the proposed project.

Recommended Drainage Design Criteria: The current study estimated that approximately 140 cfs will flow off of Otay Mesa into the West Perimeter Watershed. Detention basins were recommended for this watershed to reduce peak flows to predevelopment levels. Because of unstable soils in the area, placement of these detention basins and relocation of drainage facilities should be planned carefully to avoid an increase in soil instability and slope failure.

The West Watershed consists of smaller mesa-top watersheds that drain into the tributary canyons of Spring Canyon, which then flow into Mexico via the Spring Canyon concentration point. Detention basins were recommended in this watershed to reduce post-development peak flows to predevelopment levels. Care must be taken if detention basins concentrate flows at the upper edge of canyons so that erosion potential is not increased downstream.

Requirements have already been implemented in the East Watershed for control of peak runoff from development. The August 7, 1987 Notice provided requirements for individual developments to regulate stormwater such that runoff from developed properties did not increase above the runoff rate prior to development. The proposed single Detention Basin at the border would eliminate the need for individual on-site detention basins for subsequent development.

In the North Perimeter watershed, there were no identified peak flow attenuation requirements for the small watersheds that flow into small canyons that flow into the Otay River.

Stormwater Quality Requirements: The City requires Best Management Practices (BMPs) be constructed for all new projects. In 2003, the City published “Storm Water Standards – A Manual for Construction & Permanent Storm Water Best Management Practices Requirements”, a reference document for all stormwater issues encountered in development. Most projects on Otay Mesa will require Priority Project Permanent Storm Water BMPs and High Priority Construction Storm Water BMPs. The manual requires the submission of a “Water Quality Technical Report” for all projects subject to priority permanent BMP requirements.

Most of Otay Mesa drains to the south across the U.S./Mexico border to the Tijuana River, which has been identified as an impaired water body pursuant to section 303(d) of the Clean Water Act. A small portion of the drainage flows north into the Otay River and the far western part of the Mesa flows to the west through San Ysidiro and then into the Tijuana River.

April 2007. Drainage Study for the Otay Mesa Community Plan Update

The 2007 report was identical to the 2005 report, except for the addition of a section regarding the proposed drainage alternatives. This additional section is summarized below.

No Project Alternative: The alternative of doing nothing to improve drainage along the main creek channel would prevent future development from taking place along portions of La Media Road. The intersection of Airway Road and La Media Road floods during significant precipitation. The existing creek would not be deep enough to allow adjacent properties to drain effectively. To provide continued access along the truck route during storms the roads would need to be raised to allow flow to pass under them, or an alternative route would need to be identified.

Concrete Channel: The 1999 Otay Mesa Drainage Study identified a concrete channel as a recommended plan from Otay Mesa Road to the Border Detention Basin. The concrete channel would follow the east side of La Media Road until intersecting at Siempre Viva Road, where it crossed under La Media and followed on the north side of Siempre Viva to box culverts under Siempre Viva that connected to the Border Detention Basin. The concrete channel plan assumed that the existing creek with its habitat would continue to carry low flows. The 1999 cost for this project was $10.6 million dollars, without including land acquisition costs, which corresponds to a 2005 cost of $14.9 million.

La Media Channel and Border Detention Basin: The East Watershed is the largest watershed on the Mesa. All flows from the watershed collect at a concentration point at a large culvert where flows cross the U.S./Mexico border. The surrounding area is very flat and adjacent properties cannot drain effectively into the existing creek. To allow for future development, and to accommodate runoff from proposed future projects, a new channel would be required that has an invert of 3 to 5 feet below that of the existing creek channel. The proposed La Media Channel and Border Detention Basin would be built as described in the 2005 report.

C. Impetus of Drainage Studies

Tetra Tech was asked to provide as much detail as possible into the funding and motivation behind the drainage studies completed for Otay Mesa. It is well understood that the first report in 1988 was intended to provide drainage opportunities in the developing Otay Mesa area. The 1999, 2005, and 2007 reports all indicate the need for drainage planning in the rapidly developing Mesa area but also point to the need for water quality considerations and regulations, as well. Meeting regulatory requirements for flood and drainage control (1988) as well as water quality and environmental considerations (1999, 2005, and 2007) seem to be the initial motivation behind the reports.

The drainage reports provided little insight into the funding mechanisms supporting these studies. There were suggestions in several of the studies for funding mechanisms to implement the recommendations

within the studies including general obligation bonds, Mello-Roos Community Facilities Districts tax, special assessment bonds, and certificates of participation. Based on the direction of recommendations, the development community might have initiated the request for drainage control and improved drainage within the public right of way to accommodate drainage from developing areas. However, it is also quite possible that the motivation was also a part of a plan to design the public portion of the drainage system to fully accommodate a built out Otay Mesa that would provide the necessary public safety and flood control needs that a future fully developed scenario might require.

III. Data Compilation and Review

Plans and data including GIS data relevant to Otay Mesa study have been compiled for this report. Relevant drainage requirements and existing drainage plans for Otay Mesa area are summarized in the previous section. Using GIS data, drainage areas for the project site were defined and relevant spatial analyses have been conducted for each drainage area. Potential areas for restoring or improving vernal pools were identified using soil suitability, land uses, and site availability.

A. Data Compilation

The following data were compiled for this Otay Mesa study. Most of the data were downloaded from two websites, SanGIS (http://files.sangis.org/) and SANDAG (http://www.sandag.org/). Vernal pools data were supplied directly from the City.

- Otay Mesa community boundary (SanGIS)
- Zoning (SanGIS)
- Land use (SANDAG)
- Soils (SanGIS)
- Topography: 20-m DEM and 2-ft contours (SanGIS)
- Streams (SanGIS)
- Roads / Streets (SanGIS)
- Parcel boundaries (SanGIS)
- Watershed / Subwatershed boundaries (SanGIS)
- Vegetation (SanGIS)
- Existing vernal pools (City)

B. Drainage Areas

From the existing watershed/subwatershed data, three drainage areas were found in the Otay Mesa study area, which are Otay Valley, San Ysidro, and Water Tanks. Otay Valley covers north of Otay Mesa around the Otay River, San Ysidro covers west, and Water Tanks covers south of Otay Mesa. Otay Valley and Water Tanks were sub-divided into east and west areas respectively. As a result, the Otay Mesa area was divided into five drainages as shown in Figure 2. The sizes of drainage areas are presented in Table 1.

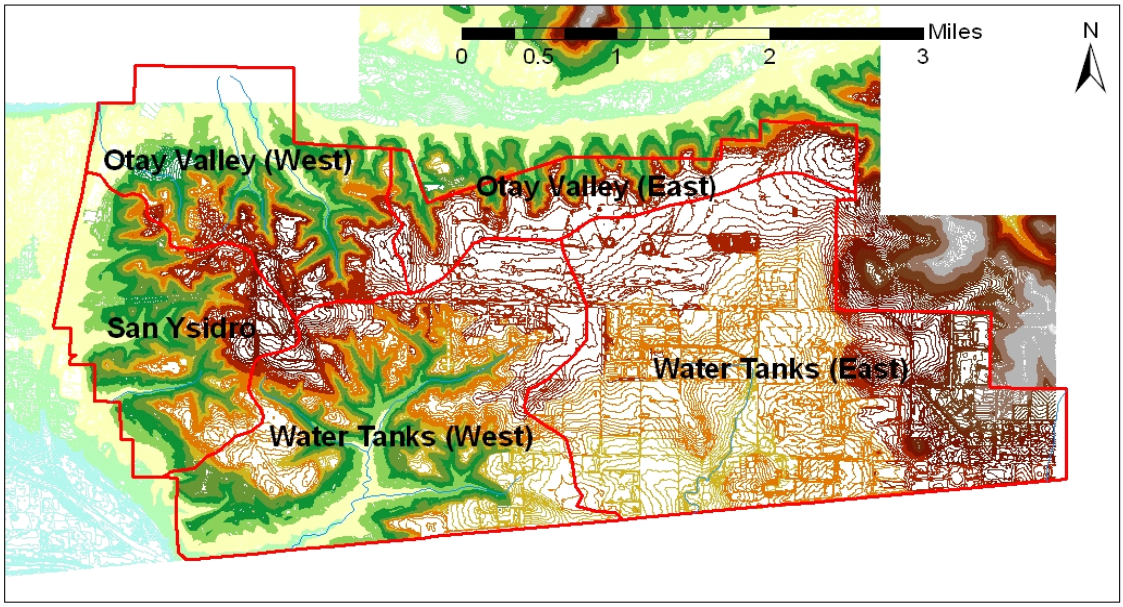

Figure 2. Defined Drainage Areas

Table 1. Drainage Area Sizes

Drainage Areas	Acres
Otay Valley (East)	827.5
Otay Valley (West)	1,378.4
San Ysidro	1,226.1
Water Tanks (East)	3,380.2
Water Tanks (West)	2,488.0
Total	9,300.2

C. Zoning Status

Existing zoning for the Otay Mesa is presented in Figure 3. Otay Mesa zoning consists of Industrial (41.2%), Agricultural (25.4%), Residential (12.2%), Commercial (4.8%), Open Space (0.2%), Other (4.8%), and Unzoned (11.4%) areas. The individual drainage area of each zone and total area is summarized in Table 2.

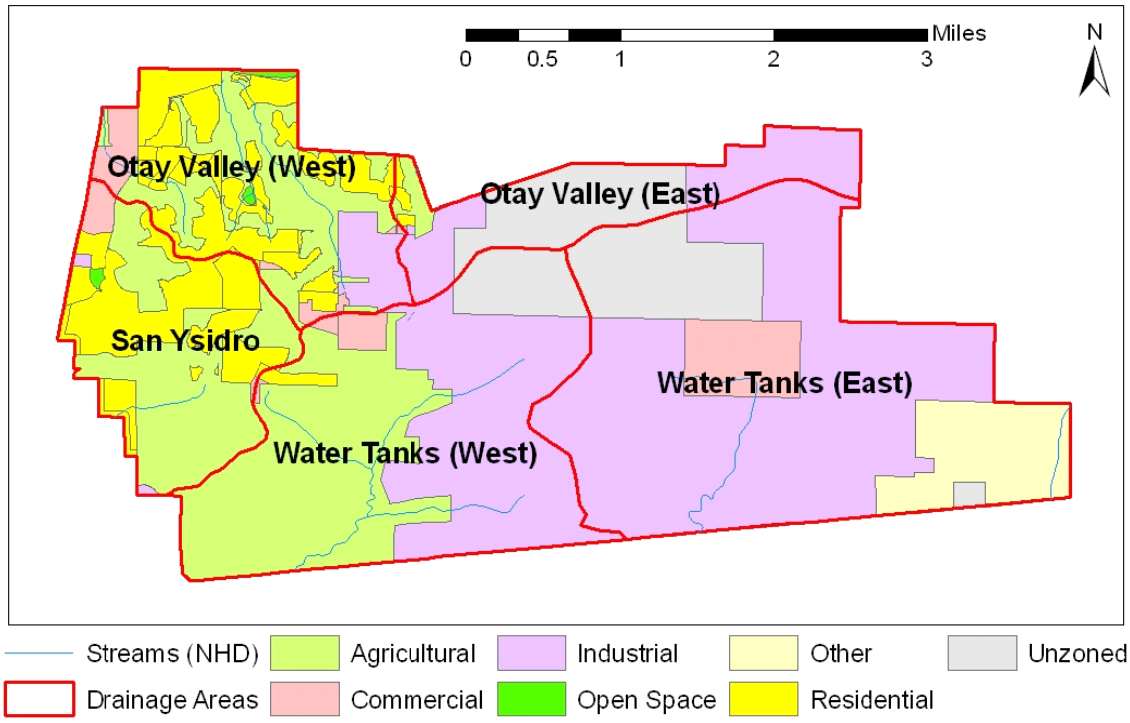

Figure 3. Zoning Status

Table 2. Zoning Status for Drainage Areas

Zoning	Drainage Areas					
	Otay Valley (East)	Otay Valley (West)	San Ysidro	Water Tanks (East)	Water Tanks (West)	Total
Agricultural	46.3	543.2	643.0	0.0	1,127.3	2,359.8
Commercial	0.7	100.2	43.2	241.5	61.5	447.0
Industrial	378.4	149.3	10.6	2,227.9	1,062.6	3,828.7
Open Space	0.0	15.1	5.9	0.0	0.0	21.0
Other	0.0	0.0	0.0	445.3	0.0	445.3
Residential	18.8	570.7	523.3	0.0	25.8	1,138.6
Unzoned	383.3	0.0	0.0	465.7	210.8	1,059.8
Total	827.5	1,378.4	1,226.1	3,380.3	2,488.0	9,300.2

D. Land Uses

Land use status for Otay Mesa is presented in Figure 4 using the 2009 SANDAG land use data set. The detailed land use status for each drainage area is summarized in Table 3. The Otay Mesa land uses consist of Open Space (28.8%), Undeveloped (25.4%), Transportation (21.5%), Industrial (12.1%), Residential (5.6%), Agricultural (3.3%), Commercial (2.1%), Education (1.0%), and Park (0.1%). Land use status appears quite different from the Otay Mesa zoning status. This might be because some areas within a particular zone are not fully developed or because the land use data have more detailed spatial descriptions, which consider topography that can impact land use, than the zoning data.

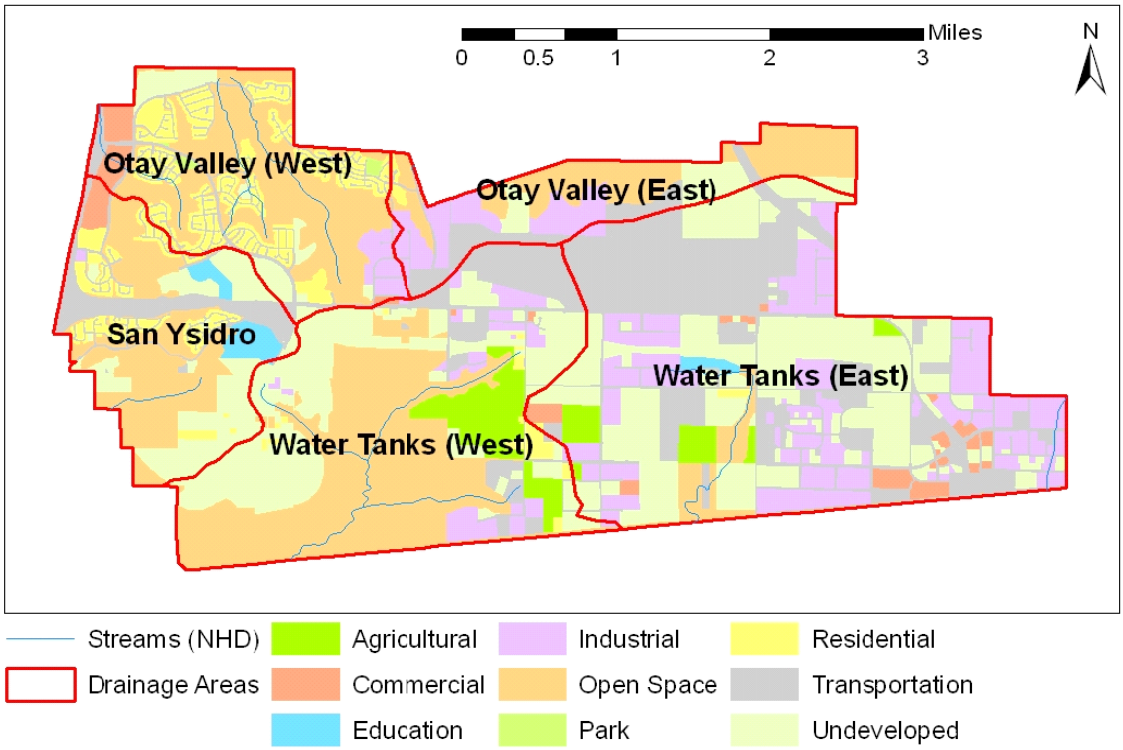

Figure 4. Land Uses

Table 3. Land uses for Drainage Areas

Land Use	Drainage Areas					
	Otay Valley (East)	Otay Valley (West)	San Ysidro	Water Tanks (East)	Water Tanks (West)	Total
Agricultural	0.0	0.0	0.0	101.6	204.3	305.9
Commercial	0.0	60.7	30.6	101.3	5.4	197.9
Education	0.0	0.0	70.1	17.6	0.7	88.4
Industrial	181.6	59.8	2.9	740.5	137.6	1,122.6
Open Space	377.3	629.0	461.2	133.1	1,081.3	2,681.9
Park	0.0	12.9	0.0	0.0	0.0	12.9
Residential	10.7	316.8	136.0	9.9	49.7	523.1
Transportation	146.5	190.0	227.0	1,148.0	290.1	2,001.7
Undeveloped	111.4	109.2	298.1	1,128.2	719.0	2,366.0
Total	827.5	1,378.4	1,226.1	3,380.2	2,488.0	9,300.2

E. Soils

Soil properties for the Otay Mesa are presented in Figure 5. Soil coverage for each drainage area is summarized in Table 4. Otay Mesa is covered mainly by loam (81.2%) and clay (18.0%) type soils.

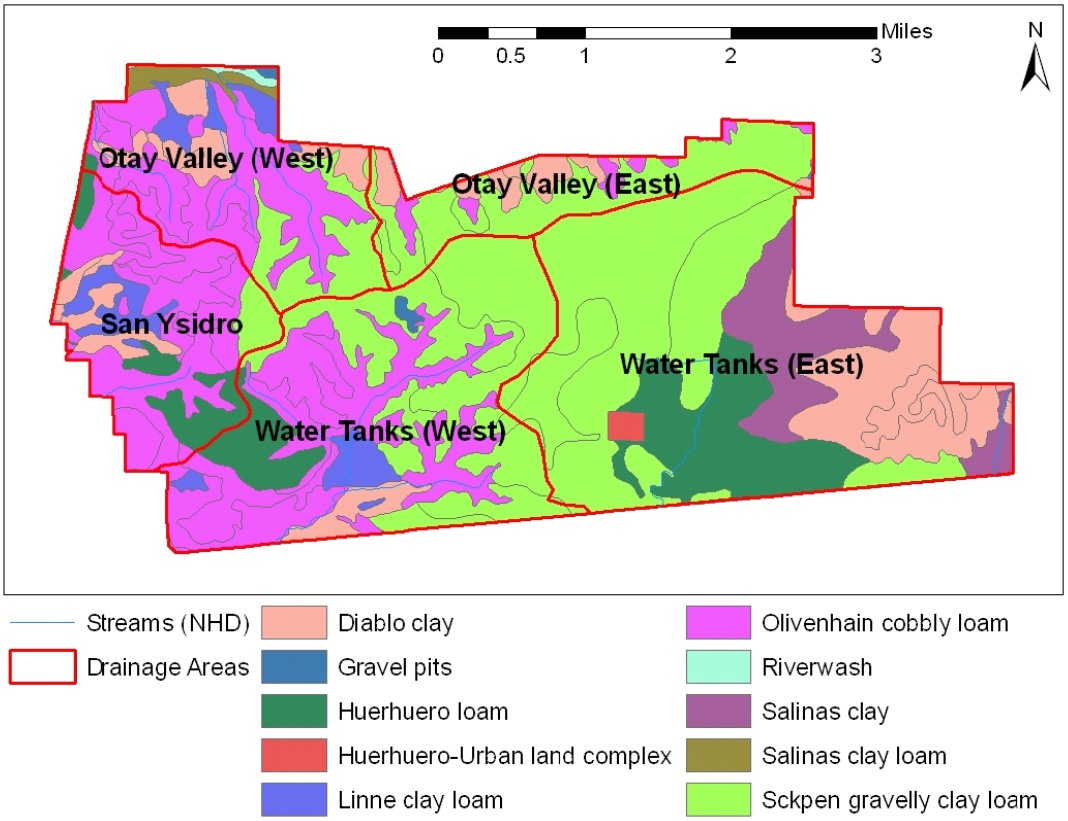

Figure 5. Soils

Table 4. Soils for Drainage Areas

Soils	Drainage Areas					
	Otay Valley (East)	Otay Valley (West)	San Ysidro	Water Tanks (East)	Water Tanks (West)	Total
Diablo clay	149.8	196.0	121.3	635.1	98.0	1,200.1
Gravel pits	0.0	8.6	0.0	0.0	15.7	24.3
Huerhuero loam	0.0	6.9	174.7	606.4	182.4	970.4
Huerhuero-Urban land complex	0.0	0.0	0.0	31.4	0.0	31.4
Linne clay loam	1.5	93.2	111.1	0.0	105.9	311.7
Olivenhain cobbly loam	83.0	714.0	742.3	0.0	989.7	2,529.1
Riverwash	0.0	17.8	0.0	0.0	0.0	17.8
Salinas clay	0.0	0.0	0.0	474.1	0.0	474.1
Salinas clay loam	0.0	71.3	0.0	0.0	0.0	71.3
Stockpen gravelly clay loam	593.1	270.7	76.7	1,633.2	1,096.2	3,670.1
Total	827.5	1,378.4	1,226.1	3,380.2	2,488.0	9,300.2

F. Vegetation

Vegetation coverage for Otay Mesa is presented in Figure 6. The size of vegetation coverage for each drainage area is summarized in Table 5. Otay Mesa vegetation consists mostly of non-native vegetation or developed/unvegetated areas (70.6%), scrub and chaparral (18.9%), grasslands and meadows (10.2%), and other areas (0.4%).

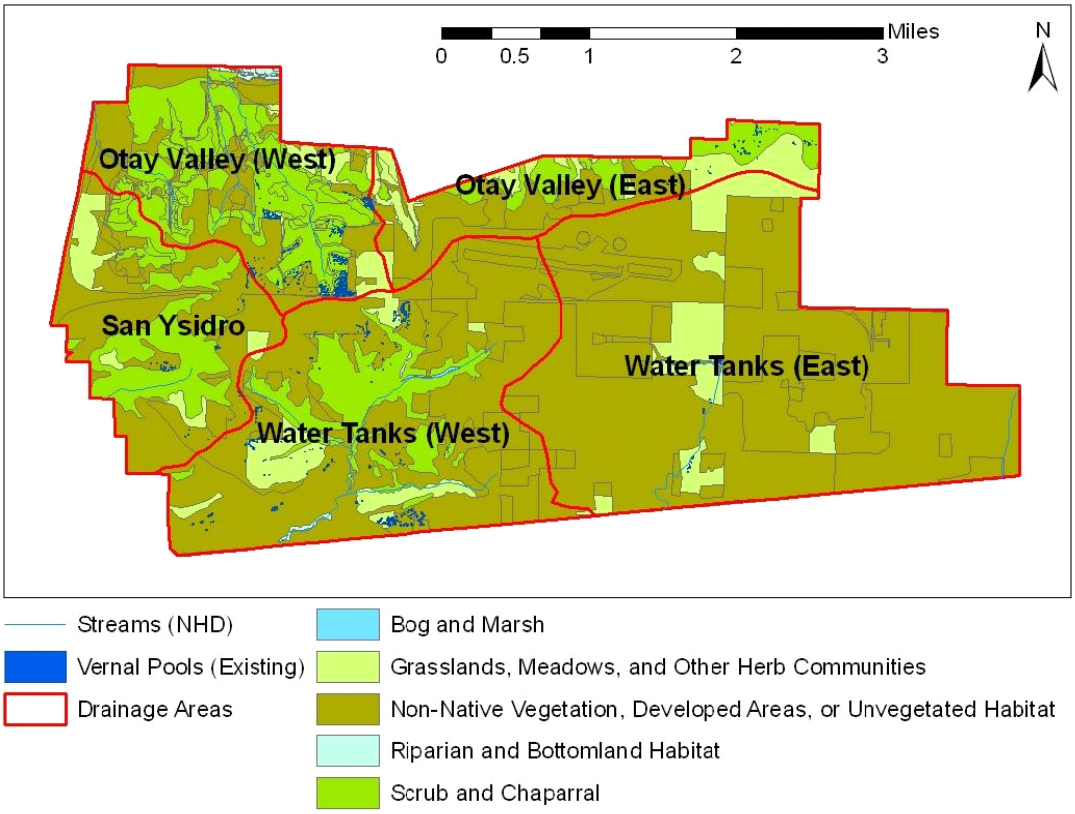

Figure 6. Vegetation of Otay Mesa

Table 5. Vegetation Coverage for Drainage Areas

Vegetation	Drainage Areas					
	Otay Valley (East)	Otay Valley (West)	San Ysidro	Water Tanks (East)	Water Tanks (West)	Total
Bog and Marsh	0.0	0.8	0.0	0.0	4.0	4.8
Grasslands, Meadows, and Other Herb Communities	205.1	88.6	112.0	341.0	201.8	948.5
Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	394.2	528.9	720.2	3,039.2	1,883.4	6,565.9
Riparian and Bottomland Habitat	0.0	17.6	0.2	0.0	8.6	26.4
Scrub and Chaparral	228.2	742.5	393.7	0.0	390.2	1,754.7
Total	827.5	1,378.4	1,226.1	3,380.2	2,488.0	9,300.2

IV. Environmentally Sensitive Lands

A. Vernal Pool Background

Vernal pools are unique seasonal and ephemeral wetlands that result from specific depression-type geomorphic regions. (City of San Diego Vernal Pool Inventory, 2004) Vernal pools form when small, shallow depressions collect precipitation, and by nature are dry basins in the dry months followed by variable lengths of saturation and inundation. [Draft City of San Diego Multiple Species Conservation Program (MSCP) Vernal Pool Management Plan, 2008] The variability in moisture conditions separates these pools from other wetland ecosystems, which is a characteristic of the Mediterranean –type climate that exists in southern California.

Within the City of San Diego, groups or series of vernal pools are found in Del Mar Mesa, Mire Mesa, Carmel Mountain, Kearny Mesa, Mission Trails Regional Park, Otay Mesa, Otay Lakes, and Marron Valley. The pools are often associated with small hills known as Mima mounds, and form in the inter-mound swales. The vernal pools located in these areas have been found to be associated with the particular soil types in these areas. (Bauder and McMillan, 1998) In Otay Mesa, Stockpen, a gravelly clay, is the dominant type of pool-supporting soil, as identified from the county's 1973 Soil Survey maps, with the type of vernal pools associated with this soil called Coastal Mesa pools. Coastal mesa pools are found almost exclusively on the mesas but sustain different flora and fauna depending on the dominant soil series.

Vernal pools support a specific biological ecosystem. Research has found that 47 plant species from 20 families are restricted to vernal pool habitat. (Draft San Diego MSCP Vernal Pool Management Plan, 2008) Vernal pool habitat also supports animals from insect larvae to amphibians, birds, and mammals. San Diego vernal pools provide habitat for two federally listed endangered invertebrates, San Diego and Riverside fairy shrimp; five federally listed endangered plants, spreading navarretia, San Diego and Otay mesa mint, San Diego button celery, and California Orcutt grass; and an unprotected, although rare, plant, little mousetail. *Pogogyne nudiuscula* is a mesa mint species endemic to the coastal mesa pool type of Otay Mesa.

Ecological processes that occur within vernal pools are complex, and not fully understood. Local processes are affected by the relatively short period of wet conditions and relatively small affected area (Leidy and White, 1998). The ecology of the vernal pool is also influenced by larger-scale effects of the watershed including landscape processes of stormwater run-off and native and invasive vegetation. Vernal pools and their associated wetland functions may be indirectly impacted by changes in the watershed, especially changes in hydrologic conditions which need to be considered when development or other landscape changes occur.

B. Otay Mesa Vernal Pools

Within Otay Mesa, the number and quality of vernal pools has been impacted historically by farming and grazing, and more recently, by rapid development in the area. Vernal pool surveys in the San Diego area have been conducted since the late 1970s. In 1988, the California Department of Parks and Recreation estimated that approximately 905 of the Otay Mesa vernal pools had been lost to urban development, agriculture and mining (Leidy and White, 1998). The most recent survey was conducted by the City of San Diego in 2002 – 2003 (City of San Diego Vernal Pool Inventory 2002 – 2003, 2004). This survey identified 29 series, or clusters, of vernal pool basins within the Otay Mesa area, and a total of 983

basins. The survey also identified a total of 12.89 acres of pools that were under creation, enhancement or restoration activities.

The Draft San Diego MSCP Vernal Pool Management Plan identified several factors that should be considered in management and preservation of vernal pools, with urban development identified as the primary threat to these ecosystems. Border Patrol activities along the U.S./Mexico border have caused impacts to Otay Mesa vernal pools because of foot traffic of illegal immigrants and Border Patrol agents. Recreational off-road vehicle users, illegal dumping and littering have also lead to vernal pool impacts. Disturbance and fragmentation of native habitat have resulted in vernal pool ecosystem impacts.

Recommendations for management of vernal pool resources have been implemented at the City and federal level. The 2008 draft San Diego MSCP Vernal Pool Management Plan includes site-specific management requirements and general recommendations for multiple vernal pool complex locations in Otay Mesa. These recommendations include conservation, enhancement or restoration of degraded basins through government implementation, project mitigation requirements, and/or interested non-governmental organizations. The document also recommended research on vernal pool plant genetics, native pollination and dispersal mechanisms to better understanding of vernal pool functions. Also, public education efforts are recommended to increase awareness of vernal pools. The City prioritized the following recommendations:

1. Conservation of land comprising the vernal pool site(s) through government or private land trust acquisition, dedication in fee title, conservation easement, or covenant of easement.
2. Adequate protection of conserved vernal pools from illegal and inadvertent impacts by fencing the site, placing signs, and providing education and/or law enforcement patrol of the sites.
3. Enhancement or restoration of vernal pools to reinstate historic ecosystem functions and values.
4. Solicit and fund, if possible, research on vernal pool ecosystems.

The recommendations provided by the Vernal Pool Management Plan may be enforceable by regulatory agencies through permit conditions, approved mitigation, monitoring and reporting programs, a Biological Opinion resulting from a Section 7 consultation with the U.S. Fish and Wildlife Service (FWS), and development agreement(s).

The U.S. FWS first provided a vernal pool recovery plan for southern California in 1998, and again in 2005. The more recent plan addressed 33 species of plants and animals that occur exclusively or primarily within a vernal pool ecosystem in California, with the ultimate goal of achieving and protecting self-sustaining populations of each species, through stabilizing and protecting populations to prevent further decline. (U.S. FWS, 2005) The key elements included in the plan for achieving these goals were habitat protection; adaptive management, restoration and monitoring; status surveys; and research.

U.S. EPA has also provided recommendations for vernal pool compensation and conservation (Leidy and White, 1998). In light of the complex system of processes that occur within vernal pool ecosystems, and the relationship of these niches to the larger watershed, U.S. EPA recommended using an ecosystem approach in assessing vernal pool compensation. The ecosystem approach would base compensation on preservation of vernal pool complexes within *an ecosystem* rather than the current approach of creating or restoring isolated pools. A hydrogeomorphic approach to assessing wetland function was

recommended to provide the most efficient method to determine mitigation requirements for impacted vernal pools (Leidy and White, 1998).

V. Review of Stormwater Regulations

A. Federal Regulations and Permits

CWA Section 404 Permits

Most projects conducted in or adjacent to streams or wetlands will require a U.S. Army Corp of Engineers (US ACE) Clean Water Act (CWA) Section 404 Permit. A Section 404 Permit is required if materials, including dirt, rocks, geotextiles, concrete, or culverts, are moved or placed into or within US ACE jurisdictional areas. Permit coverage may be granted if the following are performed: (1) actions are taken to avoid wetland impacts, (2) potential impacts are minimized, and (3) compensation for any unavoidable impacts is provided.

Proposed activities are regulated through a permit review process. An individual permit is required for potentially significant impacts. Individual permits are reviewed by the US ACE and evaluated under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines. However, for most discharges that will have only minimal adverse effects, a general permit may be suitable. The Section 404 general permit process is more streamlined than the individual permit process due to the elimination of the individual review, provided that the general or specific conditions for general permit coverage are met. General permits are issued on a nationwide, state, or regional basis for particular categories of activities.

- Regional General Permits (RGPs) are issued for common maintenance-type activities with minimal impact to the environment and often include pre-approval from the RWQCB Section 401 Certification and/or from the U.S. Fish and Wildlife Service (FWS) and NOAA Fisheries Service for Endangered Species Act consultations. Permit coverage takes approximately one to six months for existing activity categories or six months to one year for new and unique activity categories.
- Nationwide Permits (NWPs) are written for categories of projects that occur nationwide, such as road crossings, bank stabilization, repairs to existing structures, flood control maintenance, and wetland restoration for wildlife habitat. Permit coverage takes from three to nine months.
- An Individual Permit (IP) may be required if over one-half acre of permanent impacts may occur. Public review is required for an IP, which lengthens the amount of time between permit application and permit coverage (six months to a year under the best circumstances, but can be multiple years).

The 404 Permit process should begin with a consultation with US ACE. Prior to application for a Section 404 Permit, a wetland delineation and estimation of US ACE jurisdictional area should be performed. RWQCB 401 Water Quality Certification must also be obtained when applying for a NWP or IP. After any pre-application steps are completed, the US ACE “Application for Department of the Army Permit” should be prepared and submitted.

The US ACE Section 404 permit also requires that a Section 106 Review be conducted as part of the permit application. Section 106 is a document review of the project site for historical significance. Based on the results, additional studies may be required, such as an additional Historical/Archaeological Report or mitigation to protect the historical significance of the site. The review search and approval duration varies on the project scope.

Endangered Species Act

Impacts to endangered or threatened species are regulated under both the California Endangered Species Act (CESA) administered by CA Department of Fish and Game (DFG) and the federal Endangered Species Act (ESA) administered by US Fish and Wildlife Service (FWS). Species that are protected under these laws are designated on the state and federal endangered and threatened species lists. The term "take" is used to describe the impact to a species. Under Section 2081 of the DFG code, a development project that coincides with the occurrence of a listed species must have an incidental take permit. To obtain this permit, the applicant must meet the following criteria (California Department of Fish and Game, 2009):

1. The authorized take is incidental to an otherwise lawful activity
2. The impacts of the authorized take are minimized and fully mitigated
3. The measures required to minimize and fully mitigate the impacts of the authorized take are roughly proportional in extent to the impact of the taking on the species, maintain the applicant's objectives to the greatest extent possible, and are capable of successful implementation.
4. Adequate funding is provided to implement the required minimization and mitigation measures and to monitor compliance with and the effectiveness of the measures
5. Issuance of the permit will not jeopardize the continued existence of a State-listed species.

A mitigation plan is attached to a permit that outlines how these criteria will be met. Measures for meeting the criteria vary and may include avoidance measures or acquisition and transfer of habitat management lands (including funds for protecting and maintaining land in perpetuity). Applicants must avoid all take for "fully protected" species and "specified birds" as defined in Fish and Game Code Sections 3505, 3511, 4700, 5050, 5515, and 5517 (http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=fgc&codebody=&hits=20). All take of bird species protected under the Migratory Bird Treaty Act must also be avoided, as stated in Section 3515 of the DFG code.

An applicant determines whether an incidental take permit and a Habitat Conservation Plan (HCP) are required by contacting the nearest DFG. The potential need for a permit can be assessed by using the DFG's online mapping resources. If a listed species is present on the property and the project will result in a take of that species, then a permit is required. Permit processing is likely to take between 3 and 12 months or longer depending on the project circumstances and whether a federal permit is required.

To meet federal ESA requirements for a take of federally listed species, an incidental take permit (http://www.dfg.ca.gov/habcon/cesa/incidental/CodeRegT14_783.pdf) must also be obtained by developing a HCP that outlines plans to offset impacts to the species listed as threatened or endangered (http://www.fws.gov/Endangered/wildlife.html). HCP must meet the following criteria:

1. Taking will be incidental
2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking
3. The applicant will ensure that adequate funding for the plan will be provided
4. Taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild
5. Other measures, as required by the Secretary, will be met.

Mitigation measures for ESA, like measures for CESA, vary by the project and may include the following:

- Payment into an established conservation fund or bank
- Preservation (via acquisition or conservation easement) of existing habitat
- Enhancement or restoration of degraded or a former habitat
- Establishment of buffer areas around existing habitats
- Modifications of land use practices and restrictions on access.

An applicant determines whether an incidental take permit and HCP are required by contacting the nearest DFG or FWS office. If a listed species is present on the property and the project will result in a take of that species, then a permit is required.

Under ESA, an incidental take permit is not required for plant species. However, if a permit is required for other endangered or threatened species and an HCP must be prepared, then the HCP must analyze the effects of the action on any endangered or threatened plant species. Accordingly, if a plant is on the California threatened or endangered list, then a permit must be obtained through DFG.

The timeline for federal incidental permit processing varies by project complexity and whether FWS must require National Environmental Policy Act (NEPA) documentation. Minor, or "Low Effect," HCPs do not require FWS to prepare NEPA documentation, and the target processing time for these HCPs is three months. HCPs that require an Environmental Assessment (EA) under NEPA have a target processing time of four to six months, and for HCPs requiring an Environmental Impact Statement (EIS), processing may take up to 12 months or longer (U.S. Fish and Wildlife Service, 2005).

A Section 7 Consultation may also be required under the ESA if the project has a "federal nexus," usually in the form of another federal permit or federal funding, at some stage of the project and with any federal agency. The type of consultation will be either informal or formal, depending on whether the project affects listed or protected species. If the project has a federal nexus, it will also require NEPA documentation, which is described under the federal requirements section of this report.

Data on endangered and threatened species observations are available from the California Natural Diversity Database, which is developed by the Biogeographic Data Branch of DFG, and these data estimate the approximate spatial range of the species.

B. State Regulations and Permits

California Endangered Species Act (CESA)

CESA states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected or preserved (California Department of Fish and Game, no date). Sections 2081(b) and (c) of CESA allow the California DFG to issue an incidental take permit for a State listed threatened and endangered species only if specific criteria are met. These criteria are as follows:

- The authorized take is incidental to an otherwise lawful activity;
- The impacts of the authorized take are minimized and fully mitigated;
- The measures required to minimize and fully mitigate the impacts of the authorized take are roughly proportional in extent to the impact of the taking on the species, maintain the applicant's objectives to the greatest extent possible, and are capable of successful implementation;
- Adequate funding is provided to implement the required minimization and mitigation measures and to monitor compliance with and the effectiveness of the measures; and
- Issuance of the permit will not jeopardize the continued existence of a State-listed species.

Measures to minimize the take of species covered by the permit and to mitigate the impacts caused by the take will be set forth in one or more attachments to the permit. Incidental Take Permit Applications include the following (California Department of Fish and Game, 2008):

1. Applicant's full name, mailing address, and telephone number(s).
2. The common and scientific names of the species to be covered by the permit and the species' status under CESA, including whether the species is the subject of rules and guidelines pursuant to Section 2112 and Section 2114 of the Fish and Game Code.
3. A complete description of the project or activity for which the permit is sought.
4. The location where the project or activity is to occur or to be conducted.
5. An analysis of whether and to what extent the project or activity for which the permit is sought could result in the taking of species to be covered by the permit.
6. An analysis of the impacts of the proposed taking on the species.
7. An analysis of whether issuance of the Incidental Take Permit would jeopardize the continued existence of a species. This analysis includes consideration of the species' capability to survive and reproduce, and any adverse impacts of the taking on those abilities in light of (a) known population trends; (b) known threats to the species; and (c) reasonably foreseeable impacts on the species from other related projects and activities.
8. Proposed measures to minimize and fully mitigate the impacts of the proposed taking.
9. A proposed plan to monitor compliance with the minimization and mitigation measures and the effectiveness of the measures.
10. A description of the funding source and the level of funding available for implementation of the minimization and mitigation measures.
11. Certification of accuracy.

California Environmental Quality Act (CEQA)

CEQA requires environmental impact assessment and mitigation for non-exempt projects occurring within the State of California. As unique ecosystems associated with endangered and threatened species, vernal pools are considered rare biological resources in CEQA review. CEQA applies to projects proposed to be undertaken or requiring approval by State and local government agencies. The lead agency is responsible for completing an environmental review process defined by CEQA. The review process includes

1. Determining if the activity is a project subject to CEQA,
2. Determining if the project is exempt from CEQA, and
3. Performing an Initial Study to identify the environmental impacts of the project and determine whether the identified impacts are "significant." Based on the findings of significance, one of the following documents must be prepared:

    - Negative Declaration if the review finds no "significant" impacts;
    - Mitigated Negative Declaration if the review finds "significant" impacts but the project can be altered to avoid or mitigate those significant impacts;
    - Environmental Impact Report (EIR) if the review finds "significant" impacts.

Some projects may be determined to be exempt from CEQA by law because the project may fall under a category of projects that have already been determined to generally not have significant environmental impacts. Examples include resource and environmental protection actions by regulatory agencies, wildlife habitat acquisition, habitat restoration on five acres of less, maintenance activities, or emergencies. Retrofits to existing structures may be considered an exception. Articles 18 (http://ceres.ca.gov/ceqa/guidelines/art18.html) and Article 19 (http://ceres.ca.gov/ceqa/guidelines/art19.html) of the Act contain details on exemptions and exceptions to CEQA.

This project may require consideration of cultural resources as part of CEQA documentation. The purpose of a cultural resources study is to identify significant impacts and potentially significant impacts of a proposed project to cultural resources, and to provide mitigation measures to reduce impacts to a level less than significant.

401 Certification

Under CWA Section 401, every applicant for a federal permit or license for any activity which may result in a discharge to a water body must obtain State Water Quality Certification (401 Certification) to ensure the proposed activity will comply with state water quality standards. In general, a 401 Certification is required for all projects in which a US ACE CWA Section 404 Permit (described above) is obtained or that will discharge dredged or fill material to waters of the U.S., including removing vegetation or channel materials for flood control, constructing levees, and filling wetlands. If the Regional Water Quality Control Board (RWQCB) deems a project exempt from the provisions of Section 401, it may regulate the dredge and fill activity under State authority in the form of Waste Discharge Requirements or Certification of Waste Discharge Requirements.

To initiate the 401 Certification process, a Biological Assessment is typically performed in which any potential impact to waters of the U.S., adjacent wetlands, and receiving waters is determined. Coordination between the City and the RWQCB is recommended before the application is submitted. A *Section 401 Water Quality Certification Application Form* should then be prepared and submitted to the RWQCB. On average, the 401 Certification application process takes three to four months to complete from the time of application to the time of approval.

C. Local Regulations and Permits

Post-Construction Stormwater Management

For typical development projects, the City requires project proponents to use a checklist to determine whether standard stormwater requirements (low impact development and source controls) or priority stormwater requirements (for development that meets certain size or land use thresholds or that might impact sensitive areas) are applicable. The Stormwater Standards Manual describes the steps that then need to be taken (i.e., Best Management Practices, or BMPs) to meet the applicable requirements. These stormwater requirements are not likely to apply to a drainage project.

Project proponents are required to submit Urban Stormwater Mitigation Plans consistent with the region's Standard Urban Stormwater Mitigation Plan (http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html) to meet the following objectives:

- Reduce Priority Development Project discharges of pollutants from the MS4 to the maximum extent practicable
- Prevent Priority Development Project runoff discharges from the MS4 from causing or contributing to a violation of water quality standards
- Manage increases in runoff discharge rates and durations from Priority Development Projects that are likely to cause increased erosion of stream beds and banks, silt pollutant generation, or other impacts to beneficial uses and stream habitat due to increased erosive force.

Some areas within Otay Mesa could be considered a Priority Development Project Areas if they were to discharge runoff from any development or redevelopment directly into or directly adjacent to receiving waters within an Environmentally Sensitive Area (ESA; includes vernal pools). Other conditions that would trigger the application of a priority development project area include either the creation of 2,500 square feet of impervious surface on a proposed project site or an increase in the area of imperviousness of a proposed project site to 10 percent or more of its naturally occurring condition (San Diego Regional Water Board Order R9-2007-0001 (Section D.1.d.(2)(g)). Within these definitions, "directly adjacent" is defined as project sites situated within 200 feet of the ESA. "Discharging directly to" is defined as outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.

Provision D.1.g of San Diego Regional Water Board Order R9-2007-0001 requires the San Diego Stormwater Copermittees to implement a Hydromodification Management Plan (HMP) "…to manage increases in runoff discharge rates and durations from all Priority Development Projects, where such increased rates and durations are likely to cause increased erosion of channel beds and banks, sediment pollutant generation, or other impacts to beneficial uses and stream habitat due to

increased erosive force." To comply with this requirement, the San Diego Copermittees developed an HMP (http://www.projectcleanwater.org/pdf/susmp/hmp_final_12-29-09_clean.pdf, December 29, 2009), which is subject to Regional Water Quality Control Board approval. The HMP specifies that Priority Development Projects are required to implement hydromodification mitigation measures so that post-project runoff flow rates and durations do not exceed pre-project flow rates and durations where such increases would result in an increased potential for erosion or significant impacts to beneficial uses. Hydromodification mitigation can be provided as follows:

- Demonstrate no post-project increase in impervious area and resultant peak flow rates as compared to pre-project conditions
- Installation of LID BMPs, such as bioretention facilities, to control runoff flows and durations from new impervious areas
- Mitigation of flow and durations through implementation of extended detention flow duration control basins
- Preparation of continuous simulation hydrologic models and comparison of the pre-project and mitigated post-project runoff peaks and durations (with hydromodification flow controls) until compliance is achieved
- Implementation of in-stream rehabilitation controls to demonstrate that projected increases in runoff peaks and/or durations would not accelerate erosion to the rehabilitated receiving stream reach.

Chapter 6 of the HMP Guidance provides guidance on applicability, hydromodification mitigation criteria and implementation options, and a framework for in-stream rehabilitation options.

Construction Stormwater Management

In California, discharges from construction sites one acre or larger are regulated under the State-wide General Permit for Waste Discharge Requirements for Discharges of Storm Water Associated with Construction Activity (NPDES General Permit CAS000002) Water Quality Order 98-08-DWQ (General Permit). The General Permit requires a Storm Water Pollution Prevention Plan (SWPPP) that describes BMPs to prevent pollutant and sediment discharges from the construction site, as well as an inspection and monitoring program. A Notice of Intent (Attachment 2 of the General Permit) is to be submitted to the State Water Resources Control Board (SWRCB) along with a project site map and fee at least two weeks prior to construction initiation.

The SWPPP must remain onsite at all times and regular self-inspections must be performed to assess the effectiveness of the BMPs. Stormwater samples must be collected if there is reason to suspect that non-visible pollutants have come into contact with stormwater or the site discharges to a water body listed on the 2006 CWA Section 303(d) List of Water Quality Limited Segments Requiring TMDLs. If permit coverage is not terminated within a year, an annual report must be completed and submitted to the LARWQCB. To terminate permit coverage, a Notice of Termination is to be completed and submitted to the SWRCB. The Construction Storm Water General Permit is currently under revision and is available online at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml.

Biological Resources

Multi-Species Conservation Program

The Multi-Species Conservation Program (MSCP) applies to the Otay Mesa area. The MSCP is designed to preserve native habitat for multiple species by identifying areas for directed development and areas to be conserved in perpetuity (referred to as Multi-Habitat Planning Area or MHPA) to achieve a workable balance between smart growth and species protection. The project area falls within portions of the City's MHPA and includes areas directly adjacent to the MHPA. These two categories have different requirements as follows:

- For **premises that are located within or adjacent the City's MHPA**, the project must demonstrate compliance with the MHPA land use adjacency guidelines (see the City's MSCP Subarea Plan, March 1997, http://www.sandiego.gov/planning/mscp/pdf/subarea.pdf) to address potential indirect effects to the MHPA through features incorporated into the project and/or permit conditions. The following issue areas are addressed:

    1. Drainage;
    2. Toxics;
    3. Lighting;
    4. Noise;
    5. Barriers;
    6. Invasive species;
    7. Brush management; and,
    8. Grading/land development.

- For **sites partially within the MHPA**, the allowable development area under the MSCP includes all the land outside the MHPA. If less than 25 percent is outside the MHPA, the project would be allowed the required area to achieve a 25 percent development area. In defining the 25 percent developable area, the least sensitive portion of the site must be used and would include avoidance/minimization of wetlands and MSCP narrow endemics.

The MHPA can be altered on a site to accommodate a project, subject to approval by the City and wildlife agencies in accordance with meeting the six MHPA boundary line adjustment functional criteria (see Section 5.4.2 of the Regional MSCP Plan, August 1998, http://www.co.san-diego.ca.us/dplu/mscp/docs/SCMSCP/FinalMSCPProgramPlan.pdf). These criteria include:

- Effects on significantly and sufficiently conserved habitats;
- Effects to covered species;
- Effects on habitat linkages and function of preserve areas;
- Effects on preserve configuration and management;
- Effects on ecotones of other conditions affecting species diversity; and
- Effects to species of concern not on the covered species list.

The analysis for any proposed MHPA adjustment should be included in the project biology report[1] (if required, see below), and include:

1. An exhibit clearly showing the proposed removal and addition areas with the proposed grading;
2. A table showing, by habitat type, area within the existing MHPA, area to be removed, area to be added, and the proposed net change to the preserve; and
3. A written analysis of how the proposed MHPA adjustment meets the six required functional equivalency criteria.

Environmentally Sensitive Lands (ESL) Regulations
The City oversees development that may impact listed species through the ESL Regulations (San Diego Municipal Code, Land Development Code, and Biology Guidelines, currently pending amendment). City public projects do not need a grading permit, however these projects will still be required to obtain all necessary City, State, and Federal permits prior to the preconstruction meeting or any clearing or grading of the project site.

Land Development Code Biology Guidelines (City of San Diego, 2001) lists *Eryngium aristulatum* var. *parishii* (Parish's eryngo, San Diego button celery), *Navarretia fossalis* (spreading navarretia, vernal pool pincushionplant), *Orcuttia californica* (California Orcutt grass), *Pogogyne abramsii* (San Diego mesa mint), and *P. nudiuscula* (Otay Mesa mint) as narrow endemic species. Narrow endemics are included in the definition of Environmentally Sensitive Lands, which requires a discretionary review of the project permit including biological surveys and species specific mitigation requirements. These species are associated with vernal pool habitats, which are found within the project area (see Section Vernal Pool Management Plan, below, for more information about vernal pool management).

A biological survey report is required for all proposed development projects that are subject to the ESL Regulations, and/or where CEQA review has determined that there may be a significant impact on other biological resources considered sensitive under CEQA. Table 6 summarizes survey requirements for various biological resources inside and outside the MHPA. Note that the proposed project site includes areas that are inside, adjacent to, and outside of the MHPA area.

The Biological Survey Report must identify all potential impacts from the development (both on-site impacts and off-site impacts such as roads, water and sewer lines) to sensitive biological resources and to other significant biological resources as determined by the CEQA process. The report should evaluate the significance of these impacts. Impact assessments need to include analysis of direct impacts (e.g. grading, Zone 1 brush management), indirect impacts (e.g. lighting, noise) and cumulative impacts. The City of San Diego (1994) Significance Determination Guidelines under the CEQA should be used as a reference.

The ESL regulations require that impacts to wetlands be avoided, and all unavoidable wetlands impacts (both temporary and permanent) will need to be analyzed and mitigated via wetland creation, restoration, enhancement, and/or acquisition. Acquisition and/or enhancement of existing wetlands

[1] Three full sets of the MHPA adjustment materials will be required for any proposed MHPA adjustment.

may be considered as partial mitigation only. The mitigation ratio for vernal pools ranges from 2:1 when no endangered species are present, up to 4:1 when endangered species with very limited distributions (e.g., *P. abramsii*) are present.

Table 6. Summary of biological survey requirements

Resource	Survey Requirements	
	Inside MHPA	Outside MHPA
Vegetation		
Uplands	Confirm/Revise MSCP mapping	Confirm/Revise MSCP mapping
Wetlands	Delineate wetlands per City definition	Delineate wetlands per City definition
Covered species[1]		
Listed species	Focused survey per protocol	Per MSCP conditions of coverage[2]
Narrow endemic	Focused survey per protocol	Focused survey per protocol
Other	Survey as necessary to comply with requirements as outlined in Section II.A.2 of Biology Guidelines	Per MSCP conditions of coverage[2]
Non-covered species		
Listed species	Focused survey per protocol	Focused survey per protocol
"Other sensitive species" [3]	Case-by-case determination depending on the species	Case-by-case determination depending on the species

1. Based upon the MSCP mapping, site specific surveys, the NDDB records, previous EIRs and biological surveys and/or discussion with the Wildlife Agencies, the potential for listed species, narrow endemic and CEQA sensitive species will be determined. Where there is a reasonable likelihood that one of these species exists, surveys will follow the above requirements.
2. Survey as necessary to conform with to Appendix A of the City of San Diego MSCP Subarea Plan (March 1997).
3. "Other Sensitive Species". Those other species that are not listed by federal and/or state agencies and/or not covered by the MSCP and to which any impacts may be considered significant under CEQA.

Vernal Pool Management Plan

To protect vernal pools, site-specific management recommendations were developed for ten Otay Mesa locations (http://www.sandiego.gov/planning/mscp/vpmp/index.shtml), two of which occur in the project area: "J28 East" and "J21." J 28 East is a 20-acre site located southwest of the intersection of La Media Road and Avenida de la Fuente with five mapped vernal pools that are located within the MHPA. J21 is a 49-acre site located southwest of Siempre Viva Road and La Media Road with seven vernal pools that are located outside of the MHPA. Both sites' vernal pools were identified by the adopted Recovery Plan for Vernal Pools of Southern California (USFWS, 1998) as necessary to stabilize populations of the following endangered and threatened species: *E. aristulatum*, *P. nudiuscula*, *N. fossalis*, *O. californica*, *B. sandiegonensis* and *S. woottoni*.

Both sites are subject to the same threats: development (both sites are privately owned and not conserved); invasive species (particularly grasses); trespass from foot traffic and off-road vehicles; litter, wind-blown debris, and illegal dumping; and fire and fire suppression activities. Both sites are recommended for conservation through public acquisition or private mitigation, and restoration or

enhancement of the vernal pools is appropriate given the high species diversity recorded historically at those sites. Restoration at J28 East should focus on creating stable populations of the aforementioned species, particularly on *E. aristulatum*, *M. minimus*, and *P. nudiuscula*, and restoration at J21 should focus particularly on *E. aristulatum*, *N. fossalis*, *O. californica*, and *P. nudiuscula*.

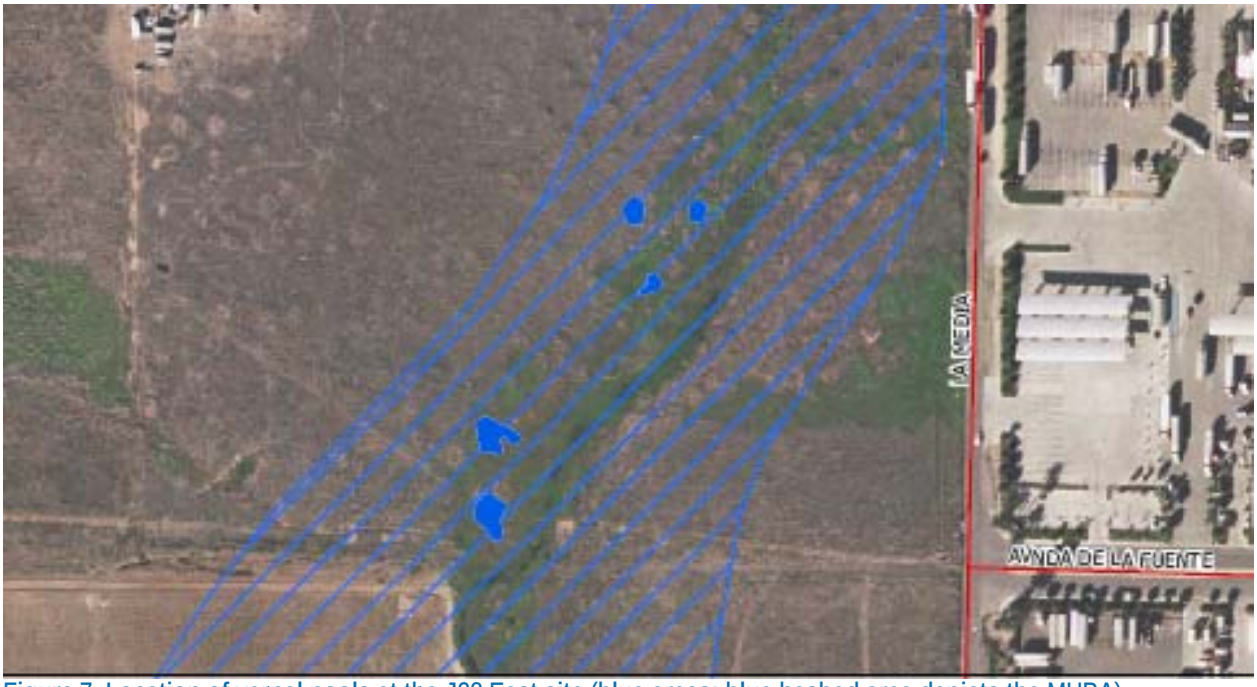

Figure 7. Location of vernal pools at the J28 East site (blue areas; blue hashed area depicts the MHPA).

Figure 8. Location of vernal pools at the J21 site (blue areas; blue hashed area depicts the MHPA).

Geologic Hazards

Unstable slopes, slide-prone geologic formations, faults and liquefaction-prone soils occur in many parts of the City. The relative risk of these geologic hazards has been mapped as part of the City of San Diego Seismic Safety Study (SSS) (City of San Diego Development Services, 2009). The maps indicate where potentially adverse geological conditions may exist, as defined by Geologic Hazard Category (http://www.sandiego.gov/development-services/hazards/hazardsmaps.shtml).

Evaluation of the SSS maps for the project area show the presence of Geologic Hazard Category 53, defined as level or sloping terrain with unfavorable geologic structure, which presents a low to moderate geologic risk.

The proposed project can be categorized as a minor public structure, which can be considered Building Type/Land Use Category IV, defined as "residential (single-family residences, apartments, etc.) and most commercial and *minor public structures*" (emphasis added). Group III, the next more stringent group, specifies places normally attracting large concentrations of people, and this project should not fall into that category.

Based on the presence of Geologic Hazard Category 53 and a Category IV project, a soil investigation and geologic investigation are anticipated. The City of San Diego (2008) *Guidelines for Geotechnical Reports* (http://www.sandiego.gov/development-services/industry/pdf/geoguidelines.pdf) describes these investigations in greater detail.

Grading

Not applicable; public works projects do not require a grading permit.

D. County Regulations and Permits

Because the areas in question are located within the City limits, county permits are not anticipated to be needed unless drainage or other infrastructure will connect to or otherwise affect county-owned infrastructure.

E. International Regulations and Permits

The International Boundary and Water Commission (IBWC) issues licenses and permits for activities in the IBWC right-of-way at the border or on IBWC maintained floodways. The *Criteria for Construction Activities within the Limits of USIBWAC Floodways* specifies that a license or permit is required for any proposed activities crossing or encroaching upon the floodplains of the IBWC flood control projects and right-of-way. This project does not affect the floodplains or right-of-way of any IBWC flood control project. Water quality considerations under IBWC jurisdiction focus on Texas rivers only and do not apply to the Otay Mesa area.

VI. Drainage Requirements, Considerations, and Opportunities

This report provides information primarily on the East and West Water Tanks drainage areas as these are the areas covered by the engineering reports. The West Watershed consists of smaller mesa-top watersheds that drain into the tributary canyons of Spring Canyon, which then flow into Mexico via the

Spring Canyon concentration point. While there is a need for some runoff management in these areas to reduce post-development peak flows to predevelopment levels, this area is of fairly low priority.

The engineering reports completed in the Otay Mesa area and summarized above focus primarily on the industrialized areas of the East Water Tanks drainage areas. This East Watershed is the largest watershed on the Mesa. All flows from the watershed collect at a concentration point at a large culvert where flows cross the U.S./Mexico border. The surrounding area is fairly flat and adjacent properties have difficulty draining effectively into the existing creek during larger storm events. The existing drainage is a combination of storm drains, improved channels, and detention basins, which discharge in many areas to natural drainage paths that do not have adequate hydraulic capacity. As projects have been developed in this area, portions of the private properties have been dedicated to the city as drainage easements or flood water storage easements (not verified as a part of this report).

Collectively, the engineering reports have recommended in one way or another that for this area to accommodate future development, the construction of a drainage channel along the east side of La Media crossing from the northeast corner to the northwest corner of the intersection of La Media with Siempre Viva Road would be required. The proposed channel would continue along the north side of Siempre Viva at La Media to the current culvert crossing along Siempre Viva to connect to the existing stream channel. This plan was selected because an existing drainage ditch located on the east side of La Media Road could be expanded to intercept flows from the east without creating potential conflicts from utilities in La Media Road; and flows from the west would continue to flow in the old drainage path. Additionally, this plan may reduce impacts to properties by following the property boundaries and could minimize potential utilities conflicts along Siempre Viva Road.

In this area, drainage alternatives should be given substantial thought by the City of San Diego. The next section presents several considerations that highlight key practical issues that might impinge on future drainage and development decisions.

A. Consideration 1: Drainage and Runoff Management Responsibilities

One of the first considerations is who has the responsibility to provide drainage the East Water tanks Drainage Area. The City of San Diego is responsible for public land including runoff from public roads and right of ways. However, as has been pointed out several times in this document, private property owners or developers are required to provide adequate storage and conveyance for 50-year flows in areas in the watershed that are above major (four lane) road crossings (City of San Diego Development Services, 2004). This is typical for most developments in the East Water Tanks drainage area. However, below major roadways, the drainage infrastructure must be designed to accommodate 100-year flows. The 100-year floodplain is also significant in that it is a standard used by the National Flood Insurance Program (NFIP) for floodplain management and to determine the need for flood insurance.

Figure 9 shows 100-year floodplain in the Water Tanks (East) drainage area (Kimley-Horn and Associate, 2007).

The interpretation of drainage language is that all public or private properties are required to provide adequate storage and conveyance for up to the 50-year flows, except for those in the natural drainage channel which are exempt. “Major roadways”, that is, those that are four lane or greater and major roadway crossings would require designs that consider conveyance of the 100-year storm either beneath,

along and/or on the roadway as long as not more than one lane of the four is used for conveyance and the conveyance does not encroach onto private property outside of the road right-of-way. None of the areas shown in Figure 9 are considered to be below major roadways.

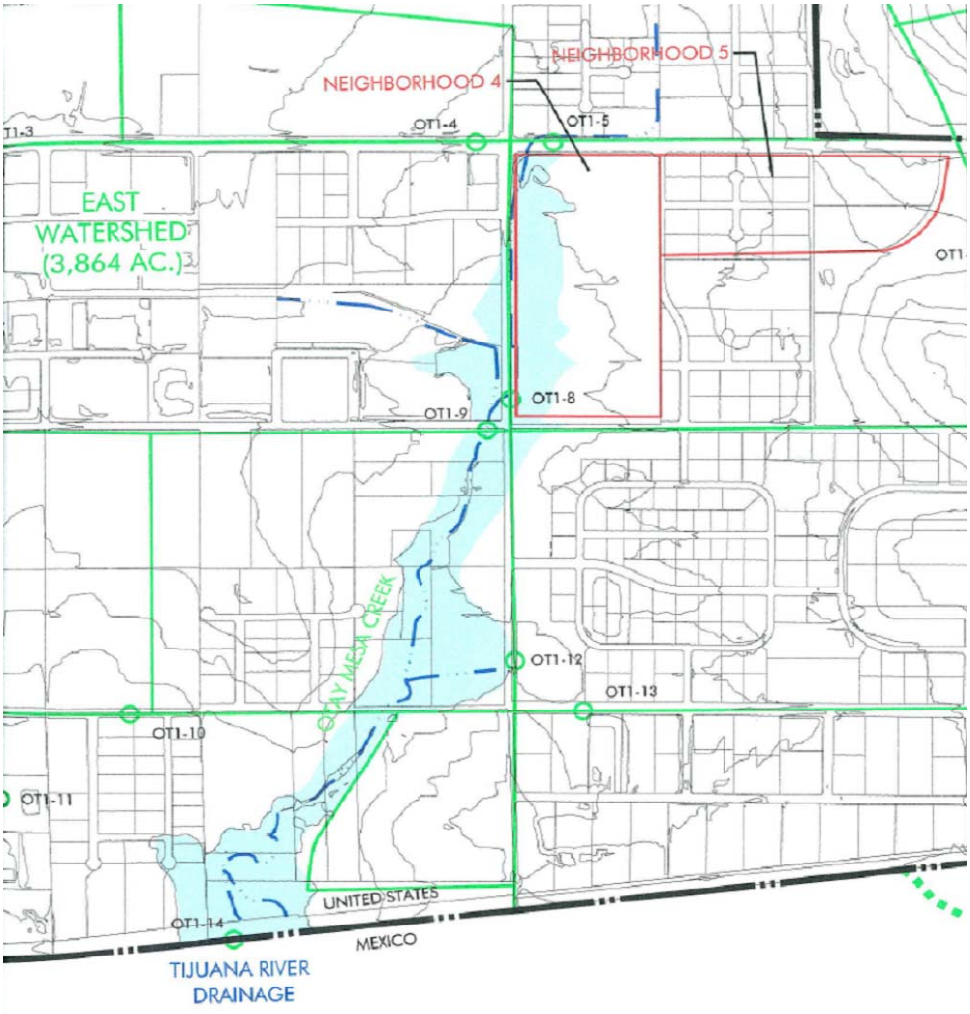

Figure 9. 100-year Floodplain in the Water Tanks (East) drainage area (Kimley-Horn and Associate, 2007).

B. Consideration 2: Potential for BMPs

The potential for stormwater BMPs is another consideration in the decision making process. If, in the future, conveyance along with water quality systems like BMPs are required in the Water Tanks East Drainage, current policies state that all BMPs be constructed for Priority Project Permanent Storm Water BMPs and High Priority Construction Storm Water BMPs. Most projects in the East Water Tanks watershed then would require the submission of a "Water Quality Technical Report" which follows the guidance "Storm Water Standards – A Manual for Construction & Permanent Storm Water Best Management Practices Requirements."

Several factors must be considered when including BMPs in this area. The suitability and types of BMPs that may be selected are highly dependent on the existing conditions, including slope, soils, adequate area, and other natural resource considerations such as destruction of natural vernal pools. However,

this may potentially be an opportunity as well. As has previously been noted, this area is endemic to vernal pools. Projects within this area may provide a very good opportunity to include vernal pool restoration or creation and habitat improvements to support this unique ecosystem natural to Otay Mesa.

Potential Areas for Vernal Pools

Potential areas for restoring and/or improving vernal pools were identified using soil suitability, land use, and site availability. Bauder and McMillan (1998) describe suitable areas for vernal pools with slopes 9% or less and a substance layer with permeability of 0.06 inches/hour or less. Suitable areas using the criteria are shown in Figure 10.

The downstream areas of the Water Tanks (East) drainage area are mainly covered by two types of soils as shown in Figure 5. Major characteristics of the soils are summarized below (Bauder and McMillan 1998).

Huerhuero loam:

- Slopes: 2 to 9 percent
- Impervious sub-surface layer: 12 to 55 inches of clay and clay loam
- Permeability of sub-surface layer: <0.06 inches/hour
- pH: 5.3- for surface and 8.2 for sub-surface

Sckpen (Stockpen) gravelly clay loam:

- Slopes: 0 to 2 percent
- Impervious sub-surface layer: 21 to 60 inches of gravelly clay or clay
- Permeability of sub-surface layer: <0.06 inches/hour
- pH: 6.5 for surface and 8.0 for sub-surface

The characteristics of these soils make them ideal for creating vernal pools.

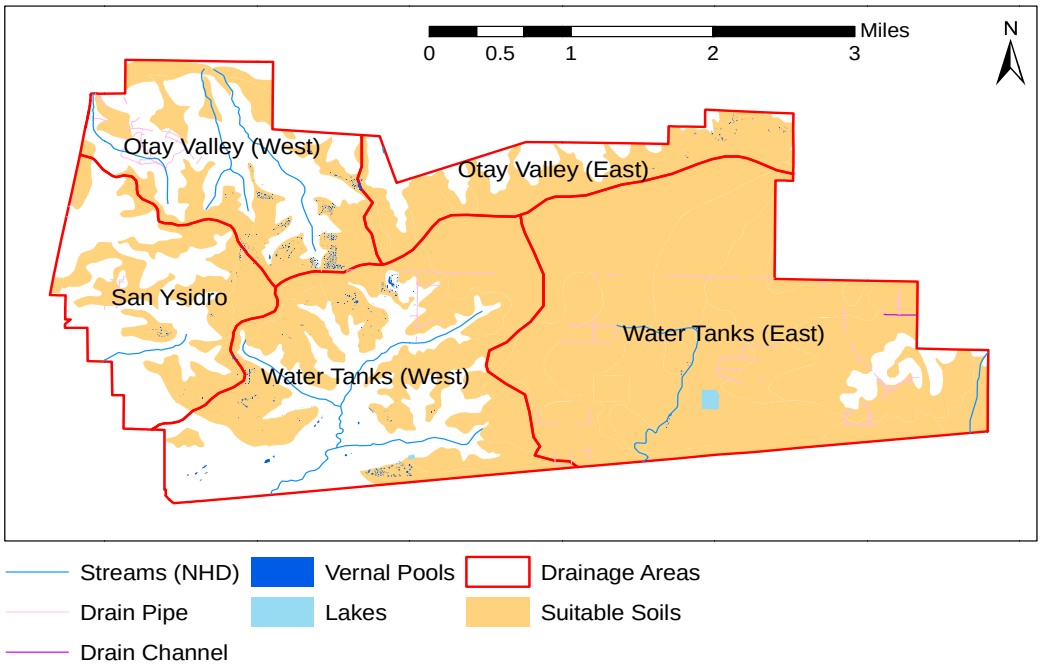

Figure 10. Suitable Areas for Vernal Pools with 9% or less Slope and 0.06 inches/hour or less Permeability

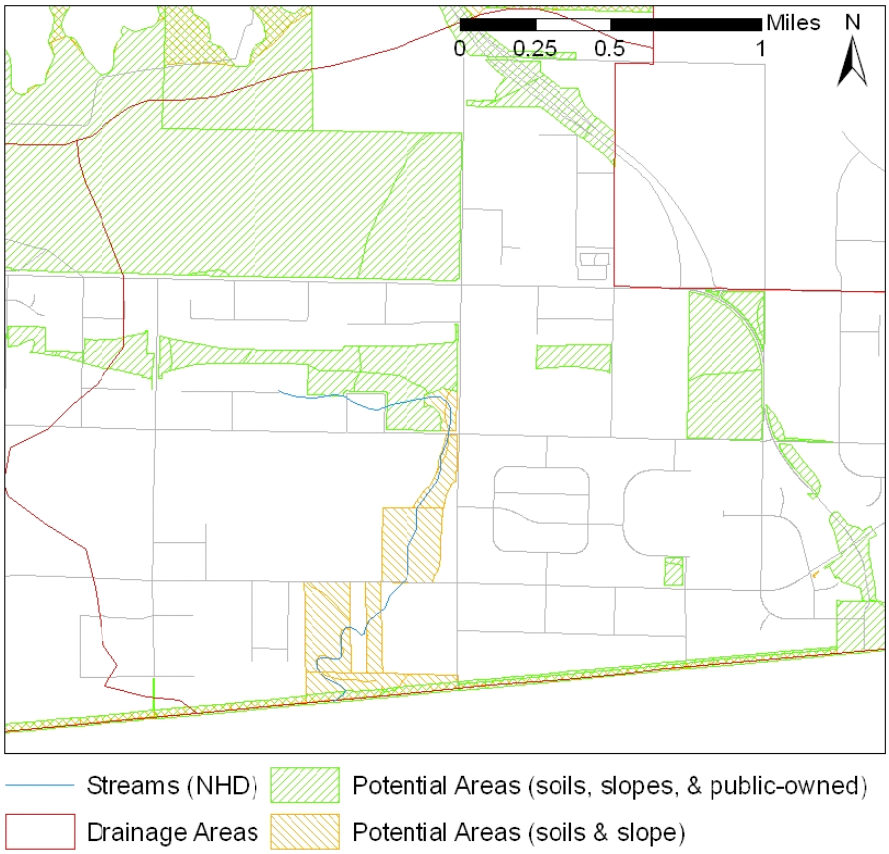

Figure 11. Potential Areas for Vernal Pools within the Water Tanks (East) drainage area

There are a number of parcels that could serve as potential areas for vernal pool creation as supplemental stormwater BMPs beyond the canal and detention system highlighted in the engineering reports.

C. Consideration 3: Estimated Annualized Costs for Planning, Permitting, Land Acquisition, Design, Construction, and Maintenance of Stormwater and Drainage Infrastructure

Another consideration is the cost of future maintenance of stormwater and drainage facilities if these were to be put in place.

Planning

Costs for planning include the effort required to further develop the project concept which, depending on the complexity of the project, could result in preparing a Project Concept Report. Additional administrative costs could be required to administer, manage and coordinate the project's implementation and are included with the planning costs. Administrative costs can vary widely with the complexity of the project, but for purposes of comparison, a value of 5 percent of the capital costs is assumed for planning.

Permitting

Regulatory requirements have to be met and environmental permits are required to implement most BMPs. The applicability of many regulations for a specific project depends on its site or design characteristics. Because the requirements imposed by regulatory agencies often have an effect on the project cost, the associated costs were included in the analysis for centralized BMPs: Because the opportunities identified for distributed structural BMPs are for areas of impervious cover and not applied to vacant or open spaces, the permitting effort anticipated for such projects is minimal, if any. Therefore, no separate costs are identified in the analysis for permitting. It is assumed that any permitting costs associated with the construction phase, such as erosion and sedimentation control, are included in the construction costs.

Land Acquisition

Cost estimates for any acquisition of private lands in Otay Mesa would be generated at the time when the City has determined to move forward with a public drainage facility. The cost estimates would be based on market value at that time, and would include BMP's as necessary.

Design

Designing structural BMPs requires collecting data, analyzing it, and preparing documents that can be used for constructing a project. Data collection could include geotechnical investigations, field investigation of existing utilities (potholing), and a topographic survey for mapping. The design deliverables are project plans and specifications that can be bid by a contractor for construction. Engineering costs can vary widely depending on the complexity of the project. For the purposes of the cost estimates, fixed rates of 5 and 10 percent were applied to the distributed and centralized BMP construction costs, respectively, to estimate the design/engineering cost. A lower percent was used for distributed BMP design costs because these BMPs are expected to have less time-intensive designs compared to centralized BMPs.

Construction

The typical levels of construction cost estimates are:

- Preliminary/Order of Magnitude—provide a range of costs at the planning level for a conceptually defined project
- Budget—cost estimates based on layouts and specific quantities
- Final/Definitive—prepared after the design documents are complete

The estimates for centralized BMPs on public and private property are not site-specific and are in the preliminary/order of magnitude category. To the extent possible, construction costs are based on approximate quantifications of the major components of the BMP.

Mobilization: Mobilization costs are highly variable depending on the magnitude of the project. A mobilization factor of 5% was included.

Excavation and removal: Excavation and removal costs include the cost of excavating the volume of soil required to provide the required storage, hauling the removed dirt offsite, and disposal to an appropriate facility.

Reinforced Concrete Pipe: Costs were derived from R.S. Means (2007) and are included to estimate the costs for constructing a storm drain extension of or to bypass an existing storm drain system.
Landscaping: One of the benefits of distributed BMPs is that they can be integrated into the site plan and often incorporated into the landscaping. Landscaping costs were estimated based on regional data.

Native Landscaping: Native landscaping should be used for any BMP because native landscaping is more adapted to the natural conditions which increase plant survivability.

Contingency: Because some of the project components have not been fully defined at this preliminary stage, a contingency factor of 25 percent should be applied to the construction costs to estimate the total construction costs and capture expected but as yet unidentified additional costs. The costs could arise from site-specific field conditions such as those associated with utility relocations, dewatering, and erosion and sedimentation control. At this stage of project development, the contingency also includes an allowance for such items as field facilities and construction scheduling, which might be required but are not specifically itemized. The contingency factor has **not** been applied to any of the cost functions or component cost estimates itemized in Table 7.

Table 7: Per Unit Cost Estimates for Construction Components

Construction Component	Cost
Mobilization	5% of construction total
Excavation and Removal	$25.00/yd^3
Asphalt/Base Removal	$8.00/yd^3
Site Preparation	$20.00/ft^2
Reinforced Concrete Pipe	$8.00 per diameter (inch) per length (ft)
Landscaping (includes mulch/sod and vegetation)	$5.00/ft^2
Native Landscaping	$25.00/ft^2
Planning	5% of total

Construction Component	Cost
	construction costs
Permits/Studies	Included in design
Design (Centralized)	10% of total construction costs
Design (Distributed)	5% of total construction costs
Contingency for Planning Estimate (Centralized)	25% of total construction costs
Contingency for Planning Estimate (Distributed)	15% of total construction costs

This costing information can be used by the City of San Diego to evaluate costs of planning, permitting, operating and maintaining the proposed drainage facilities and BMPs.

D. Consideration 4: Risk-Based Analyses

On method of assessing the level of service to provide to some drainage areas is to evaluate the risk to private citizens and the economic losses due to flooding. Risk costs are those cost items incurred due to the unexpected failure in the drainage system due to flooding and can broadly be categorized as tangible and intangible costs. Tangible costs are those measured as direct monetary losses including damage to properties and structures, loss of business, cost of repair, etc. Intangible costs include psychological trauma, damage to the environment, and other costs that do not have a direct, agreed upon, or known value.

Economic risks and flood loss costs were considered began to take hold in the early 1960's. One of the early applications was risk based concept to hydraulic design of highway culverts. Pritchett used four actual locations, calculating the investment costs with the expected flood damage costs on an annual basis for several design alternatives. The results indicated that a more economical solution would be reached by selecting smaller culvert sizes compared to the traditional return method typically used.

The basic concept of risk based design is shown schematically in Figure 13. The risk function can account for the potential undesirable consequence associated with the failure of hydraulic structures on the damage and costs related to flooding costs. However, it must be recognized that the risk costs associated with the failure of hydraulic structures cannot be precisely predicted from year to year

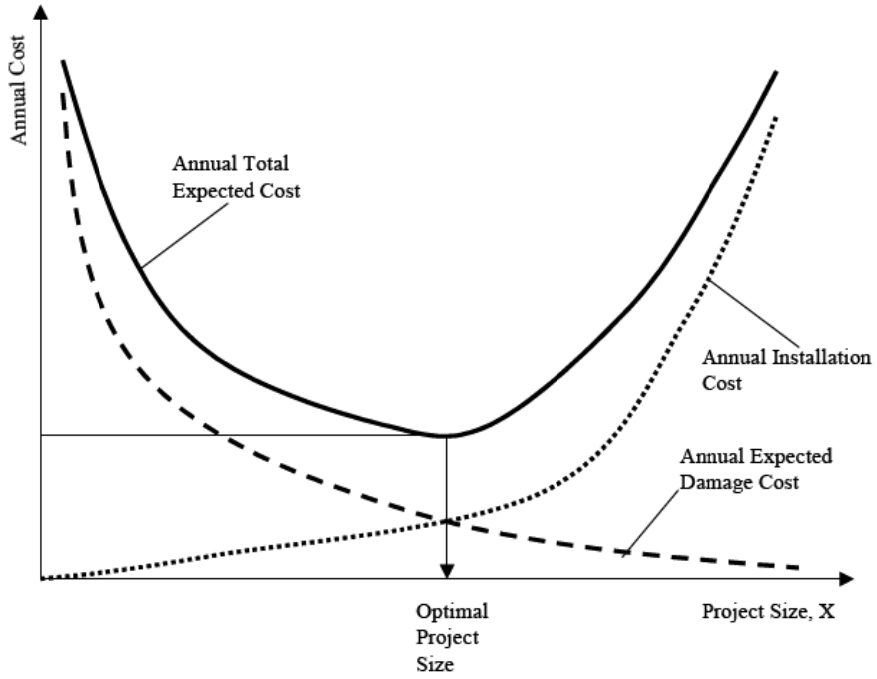

Figure 12. Risk-Based Design Costs Analyses Concepts

The Annual Total Expected Cost is the sum of the annual expected installation and maintenance costs and the annual expected damage and flooding costs. The sum of cost that makes up the intersection between the individual cost curves is the estimated optimal project size. Using this risk-based approach projects can more efficiently determine the estimated costs to inform project design.

For Otay Mesa, the engineering reports summarized potential drainage designs but do not consider the design based on a risk-based approach. These reports use the 100-year return interval for their recommended designs. It should be noted that the land uses where the drainage upgrades are suggested are primarily industrial in nature. This may impact tangible economic costs (e.g., transportation/delivery, vehicle and employee access, etc.), but other intangible costs such as loss of life and threat to personal safety are likely to be minimal because of very little if any residential land uses in this area.

A risk-based approach may be well suited for decision making in the Otay Mesa area. To adequately determine the size of a project to be designed, the annual total expected costs should be evaluated to assist in determining the optimal project size most appropriate for the drainage area. While risk based analyses is not as commonly used by engineers and planners, it is recommended that this task include economists from the City to consider risk-based costs when evaluating engineering designs such as those planned for the Otay Mesa drainage areas.

E. Consideration 5: Border Issues

There are some transboundary considerations beyond what was covered in the regulatory section of this report. The International Boundary and Water Commission (IBWC) is the lead agency for transboundary water management and settlement of bilateral disputes relating to managing shared water resources. An

international pollution abatement board makes recommendations to the EPA administrator for the abatement of international water pollution.

In August 1983, the U.S.-Mexico Border Environment Cooperation Agreement, better known as the La Paz Agreement, initiated a new era of formal multinational consultation and heightened attention to environmental issues within the border region. The La Paz process was strengthened by the 1992-1994 Integrated Border Environmental Program, the 1995-2000 Border XXI Program, and most recently by EPA's Border 2012 Program. These programs broadened the scope of border water management to include pollution prevention, water quality management, a concern for ecological processes, and a concern for advancing sustainable development of water resources along the border. Although these programs acknowledge IBWC's historic treaty role in binational water planning, they favor more regionalized and local workgroups and task forces to de-centralize decision making and to mobilize local resources for local solutions to water issues.

Even with these layers of bureaucracy, it is understood that Governments may be liable when mismanagement of reservoirs or other storage systems result in major flooding of downstream areas. For example, The U.S. Court of Claims [Gasser v United States, 14 Cl. Ct 476 (1988)] has held that the U.S. may be liable for flood damages in Mexico caused by operation of an upstream government reservoir. However, catastrophic natural events do not seem to apply to flood control requirements. Similarly, there is no standard set for the control of flows from the U.S. into Mexico, especially for intermittent or ephemeral streams such as the drainage of the Water Tanks (East) catchment. If a canal and detention system were built in this area, consideration of this area as a "hydrocommons", hydraulically linked basins connected through man-made engineered systems, may be necessary (Michel, 2000). The changing of current drainage patterns and timing of flow across the border in the Water Tanks (East) watershed of Otay Mesa could significantly alter downstream (Mexico) hydrologic functions such as water quality, aquatic habitat, riparian ecosystems, and land use. These issues are weakly addresses with federal, state, and international laws with the implications of constructing the proposed drainage and flood control systems unclear. Further investigation into the legal responsibilities and ramifications should be further reviewed if the drainage and detention projects proceed.

VII. Conclusions

This report has provided a review of previously developed engineering drainage reports with the report recommendations summarized. An inventory of current land use and drainage patterns, as well as regulations regarding storm water were provided as background to support up-to-date considerations for the placement of stormwater management facilities including the possibility of vernal pool restoration. This type of restoration may be required to mitigate impacts to sensitive areas (e.g.,vernal pools) associated with the implementation of the previously recommended drainage reports. The five considerations that were forwarded in this report are:

- Drainage and Runoff Management Responsibilities
- Potential for BMPs
- Estimated Annualized Costs for Planning, Permitting, Land Acquisition, Design, Construction, and Maintenance of Stormwater and Drainage Infrastructure
- Risk-Based Analyses
- Border issues

Through the consideration of these issues, the many regulatory layers, background on environmental sensitive areas of Otay Mesa, data compilation and description, and the summary and evaluation of the engineering reports the City of San Diego will have the necessary information for decision analysis for the Otay Mesa drainage area.

VIII. References

Bauder, E. T., and S. McMillan. 1998. *Current distribution and historical extent of vernal pools in Southern California and Northern Baja California, Mexico*. In E. W. Witham, E. Bauder, D. Belk, W. Ferren, and R. Ornduff (eds.). Ecology, Conservation and Management of Vernal Pool Ecosystems: Proceedings from a 1996 Conference. California Native Plant Society, Sacramento, California.

California Department of Fish and Game. 2008. California Code of Regulations, Section 783.2. Incidental Take Permit Applications. http://www.dfg.ca.gov/habcon/cesa/incidental/CodeRegT14_783.pdf. Last updated April 25, 2008. Accessed November 30, 2009.

California Department of Fish and Game. 2009. California Endangered Species Act (CESA). http://www.dfg.ca.gov/habcon/cesa/. Accessed November 30, 2009.

City of San Diego. *Notice to All Private Engineers, August 7, 1987*.

City of San Diego. 1994. *City of San Diego significance determination guidelines under the California Environmental Quality Act*. January 1994, revision.

City of San Diego. 1997. MSCP Subarea Plan. http://www.sandiego.gov/planning/mscp/pdf/subarea.pdf. Last updated March 1997. Accessed November 30, 2009.

City of San Diego. 2008. *Guidelines for Geotechnical Reports*. http://www.sandiego.gov/development-services/industry/pdf/geoguidelines.pdf. Accessed November 30, 2009.

City of San Diego Development Services. *Land Development Manual, Appendix B, Drainage Design Manual*. 2004. www.sandiego.gov/developmentservices/industry/landdevmanual.shtml. Accessed December 04, 2009.

City of San Diego Development Services. 2009. *Development Permit and Grading Geotechnical Study Requirements*. http://www.sandiego.gov/development-services/industry/pdf/infobulletin/ib515.pdf. Last updated March 2009. Accessed November 30, 2009.

City of San Diego Planning Department. *City of San Diego Vernal Pool Inventory 2002 – 2003*. 2004. . http://www.sandiego.gov/planning/mscp/vpi/index.shtml. Accessed November 16, 2009.

Draft City of San Diego Multiple Species Conservation Program Vernal Pool Management Plan. 2004. http://www.sandiego.gov/planning/mscp/vpmp/index.shtml. Accessed November 16, 2009.

Gasser v United States, 14 Cl. Ct 476 (1988)

Kimley-Horn and Associates, Inc., *Otay Mesa Drainage Study*. August 9, 1999. Prepared for The City of San Diego.

Kimley-Horn and Associates, Inc., *Drainage Study for Otay Mesa Community Plan Update.* May 2005. Prepared for MNA Consulting.

Kimley-Horn and Associates, Inc., *Drainage Study for the Otay Mesa Community Plan Update*. April 2007. Prepared for MNA Consulting.

Leedshill – Herkenhoff, Inc., *Otay Mesa Drainage Master Plan – Preliminary Channel Design*. January 1988. Prepared for The City of San Diego.

Leidy, Robert A., and Elizabeth White. 1998. *Toward an ecosystem approach to vernal pool compensation and conservation*. Ecology, Conservation, and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference. California Native Plant Society, Sacramento CA. pp 263-273. http://www.vernalpools.org/proceedings/leidy.pdf. Accessed November 16, 2009.

Michel, S.M. 2000. Defining Hydrocommons Governance along the Border of the Californias: A Case Study of Transbasin Diversions and Water Quality in the Tijuana-San Diego Metropolitan Region. Natural Resources Journal, Vol. 40 pp. 931-970.

U.S. Fish and Wildlife Service. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*. Portland, Oregon. xxvi + 606 pages. http://www.fws.gov/endangered/recovery/index.html#plans. Accessed November 16, 2009.

U.S. Fish and Wildlife Service. 2005. Habitat Conservation Plans Section 10 of the Endangered Species Act. http://www.fws.gov/endangered/pdfs/HCP/HCP_Incidental_Take.pdf. Accessed November 30, 2009.