Trash Total Maximum Daily Load

For
Revolon Slough and Beardsley Wash in the Calleguas Creek Watershed

March 20, 2007

California Regional Water Quality Control Board
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I. Introduction

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) has developed this total maximum daily load (TMDL) to attain the water quality standards for trash in Revolon Slough and Beardsley Wash in the Calleguas Creek Watershed. The TMDL has been prepared pursuant to state and federal requirements to preserve and enhance water quality for impaired waterbodies within Coastal Watersheds of Los Angeles and Ventura Counties.

The California Water Quality Control Plan, Los Angeles Region (Basin Plan) sets standards for surface waters and ground waters in the Coastal Watersheds of Los Angeles and Ventura Counties. These standards are comprised of designated beneficial uses for surface and ground water, numeric and narrative objectives necessary to support beneficial uses, and the state's antidegradation policy. Such standards are mandated for all waterbodies within the state under the Porter-Cologne Water Quality Act. In addition, the Basin Plan describes implementation programs to protect all waters in the region. The Basin Plan implements the Porter-Cologne Water Quality Act (also known as the "California Water Code") and serves as the State Water Quality Control Plan applicable to the waterbodies discussed above, as required pursuant to the federal Clean Water Act (CWA).

Section 305(b) of the CWA mandates biennial assessment of the nation's water resources, and these water quality assessments are used to identify and list impaired waters. The resulting list is referred to as the 303(d) list. The CWA also requires states to establish a priority ranking for impaired waters and to develop and implement TMDLs. A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates pollutant loadings to point and non-point sources.

The United States Environmental Protection Agency (USEPA) has oversight authority for the 303(d) program and must approve or disapprove the state's 303(d) lists and each specific TMDL. USEPA is ultimately responsible for issuing a TMDL, if the state fails to do so in a timely manner.

As part of California's 1996, 1998, and 2002 303(d) list submittals, the Regional Board identified Revolon Slough and Beardsley Wash in the Calleguas Creek Watershed as being impaired due to trash.

A consent decree between the USEPA, the Santa Monica BayKeeper and Heal the Bay Inc., represented by the Natural Resources Defense Council (NRDC), was signed on March 22, 1999. This consent decree requires that all TMDLs for the Los Angeles Region be adopted within 13 years. The consent decree also prescribed schedules for certain TMDLs. This TMDL for Revolon Slough Main Branch and Beardsley Channel fulfills Analytical Unit No. 9 of the Consent Decree.

This TMDL staff report and accompanying Basin Plan Amendment incorporate the numeric targets, Baseline Waste Load Allocations for point sources and Baseline Load Allocation for nonpoint sources, margin of safety and implementation and compliance schedules.

The Trash TMDL for Revolon Slough and Beardsley Wash will be implemented by Basin Plan Amendments and are therefore subject to Public Resources Code Section 21083.9 that requires California Environmental Quality Act (CEQA) Scoping and Analysis to be conducted for Regional Projects. CEQA Scoping involves identifying a range of project/program related actions, alternatives, mitigation measures, and significant effects to be analyzed in an EIR or its Substitute Environmental Documents (SEDs). On December 5, 2006 a CEQA Scoping meeting was held in the City of Camarillo to present and discuss the foreseeable potential environmental impacts of compliance with the Trash TMDL for Revolon Slough and Beardsley Wash in the Calleguas Creek Watershed. Notices of the CEQA Scoping hearing were posted in the Ventura County Star Newspaper on November 9, 2006 and on Regional Board's website. Electronic mails were also sent to interested parties including cities and/or counties with jurisdiction in or bordering the watersheds of concerns. Input from all stakeholders and interested parties was solicited for consideration in the development of the CEQA document.

This Trash TMDL is based on existing, readily available information concerning the conditions in the CWA 303(d) listed watershed in Southern California, as well as TMDLs previously developed by the State and USEPA.

II. Problem Statement

The problem statement consists of descriptions of the watershed, climate, beneficial uses, water quality objectives, and impairments caused by trash to Revolon Slough and Beardsley Wash.

A. Description of Revolon Slough and Beardsley Wash

Calleguas Creek and its tributaries, including Revolon Slough and Beardsley Wash, are located in the southeast Ventura County and a small portion of western Los Angeles County (Figure 1). Calleguas Creek drains an area of approximately 343 square miles from Santa Susana Mountains, South Mountain, and Oak Ridge at the northern side, and Simi Hills and Santa Monica Mountains at the south. Water within the Calleguas Creek watershed generally travels east-westerly 30 miles from northeast mountains toward southwest through Mugu Lagoon, empties into the Pacific Ocean.

Revolon Slough starts as Beardsley Wash at the Camarillo Hills with an elevation of 260 feet above MSL near South Mountain. Beardsley Wash continues into Pleasant Valley and becomes Revolon Slough in the Oxnard Plain. The wash flowing through residential neighborhoods, Sterling Hills Golf Club and mostly agricultural areas, is a rip rapped channel for almost 4 miles and runs into Revolon Slough at Central Avenue in Camarillo close to Highway 101. The Slough is concrete lined just upstream of Central Avenue and remains lined

for approximately 4 miles to Wood Road. From there, the slough resumes soft bottomed with rip-rapped sides. The lower mile to mile and a half of the slough to above Las Posas Road appears to be tidally influenced by inflows from Mugu Lagoon. Revolon Slough flows into Mugu Lagoon in a channel that runs parallel to Calleguas Creek near Pacific Coast Highway. The flows from Revolon Slough and Calleguas Creek only converge in the lagoon. All lands within Revolon Slough subwatershed are for agricultural use. The primary water sources for Beardsley Wash and Revolon Slough are agricultural and storm water.

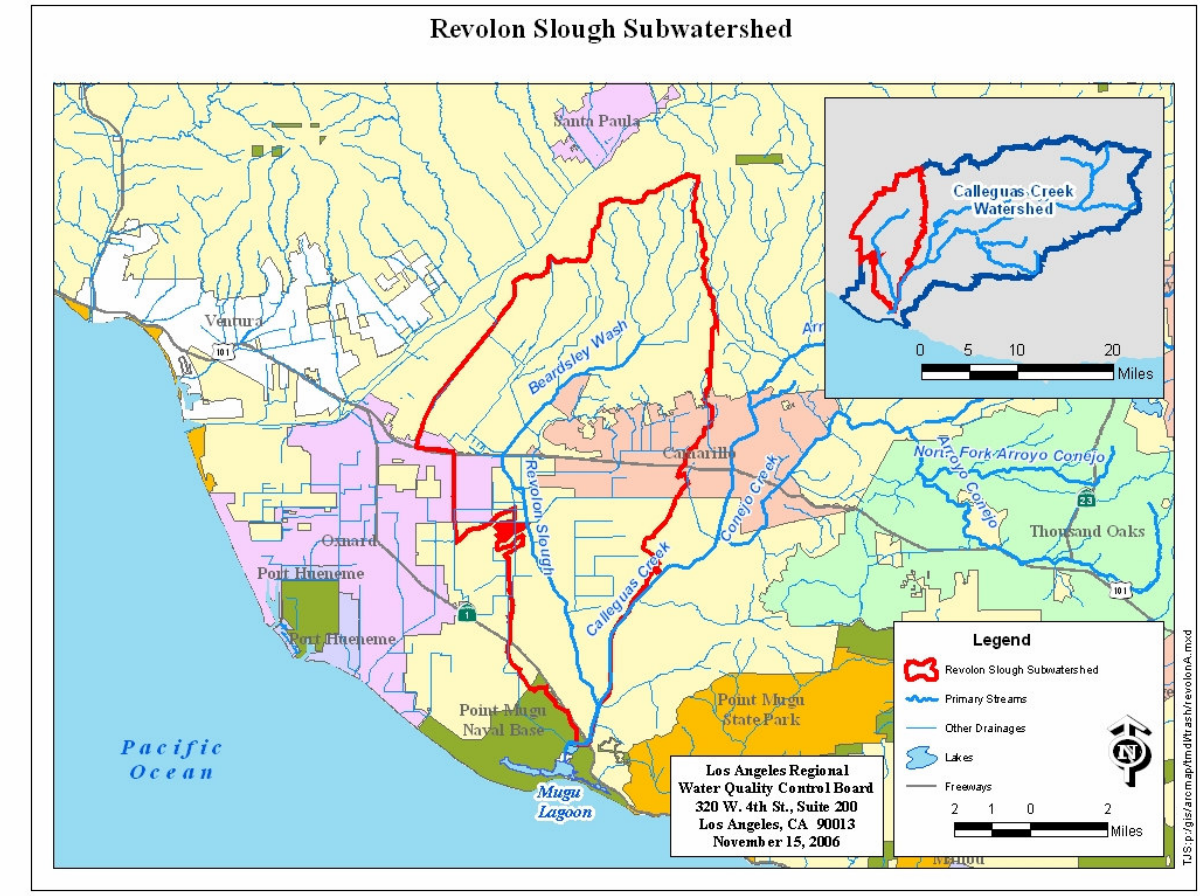

Figure 1. Beardsley Wash and Revolon Slough Subwatershed in the Calleguas Creek Watershed

B. Climate

The climate in the Calleguas Creek Watershed is typical southern California weather. Summers are relatively warm and dry and winters are mildly wet. Eighty-five percent of the rainfall occurs between November and March with most of the precipitation occurring during just a few major storms. Annual rainfall in Ventura County averages 15 inches and varies from 13 inches on the Oxnard Plain to a maximum of 20 inches in the higher elevation (USDA, 1995). Storm event concentrated in the wet-weather months produce runoff usually ranging in duration from one-half day to several days. Discharge during runoff from storm events is commonly 10 to 100 times greater than at other times. Storm events and the resulting high stream flows are highly seasonal, grouped heavily in the months of November through

February, with an occasional major storm as early as September and as late as April. Rainfall is rare in other months, and major storm flows historically have not been observed outside of the wet-weather season.

C. Beneficial Uses of Revolon Slough and Beardsley Wash

The various uses of waters in the Los Angeles Region, referred as beneficial uses, are designated in the Basin Plan. These beneficial uses are the cornerstone of the State and Los Angeles Water Board's effort to protect water quality, as water quality objectives are set at levels that will protect the most sensitive beneficial use of a waterbody. Brief descriptions of the beneficial uses most likely to be impaired due to trash in the watersheds or waterbodies of concern are provided in this section.

The *Basin Plan* for the Los Angeles Regional Board (1994) defines 10 types of beneficial uses for Revolon Slough and Beardsley Wash in the Calleguas Creek Watershed of Los Angeles County, which are rated as existing (E) or potential (P) as shown in Table 1.

Table 1. Beneficial Uses of Revolon Slough and Beardsley Wash

Surface Waters	Hydro. Unit #	MUN	IND	AGR	GWR	FRSH	REC1	REC2	WARM	WILD	WET
Revolon Slough	403.11	P*	P	E	E		E_q	E	E	E	E
Beardsley Wash	403.61	P*				E	E	E	E	E	
P = potential beneficial use											
E = existing beneficial use											
* = MUN designations are designated under State Board Regulation No. 88-63 and Regional Board Regulation No. 89-03. Some designations may be considered for exemptions at a later date.											
Footnotes "q" = Whenever flow conditions are suitable											

Revolon Slough and Beardsley Wash have potential beneficial uses of Municipal and Domestic Supply (MUN), and existing beneficial uses of Water Contact Recreation (REC-1), Non-contact Water Recreation (REC-2), Warm Freshwater Habitat (WARM) and Wildlife Habitat (WILD). Revolon Slough has an additional potential beneficial use of Industrial Service Supply (IND), and three existing beneficial uses of Agricultural Supply (AGR), Ground Water Recharge (GWR), and Wetland Habit (WET). Beardsley Wash has an additional existing Freshwater Replenishment (FRSH) beneficial use. The designated beneficial uses for Revolon Slough and Beardsley Wash are briefly described below. All beneficial uses must be protected.

Many waterbodies in California are designated with MUN as an existing or potential beneficial use. Since Beardsley Wash and Revolon Slough form the same tributary to Calleguas Creek, both share common existing beneficial uses of REC-1, REC-2, WARM and WILD. Land use varies between the two reaches, which is reflected in the remaining beneficial uses. Revolon Slough is surrounded by agriculture, and associated beneficial uses include IND, AGR, GWR, and WET, while FRSH is listed as a beneficial use for Beardsley Wash. Both reaches are accessible with trails at certain sections for activities of biking, jogging, walking, etc.

Principal wildlife supported by the habitat types in the watershed include numerous species of small mammals, songbirds, shorebirds, raptors and reptiles. Riparian habitats support several species of amphibians such as the Pacific treefrog, California Slender salamander and California newt. Within the Calleguas watershed, there are limited populations of native fish species, including the arroyo chub (Gila Orcutti). Despite the lack of fishery resources, flows in Calleguas Creek and Revolon Slough are important, as they are the main source of freshwater to Mugu Lagoon, an extensive salt marsh ecosystem.

The Calleguas Creek watershed contains about 51,000 acres of agricultural land and is increasing every year (about 50% of total land use (SCAG). The lower part of Beardsley Wash and the entire Revolon Slough are completely in the agricultural areas.

D. Water Quality Objectives

Water quality standards consist of a combination of beneficial uses, water quality objectives and the State's Antidegradation Policy. Regional Board staff finds that the narrative water quality objectives applicable to this TMDL are floating materials: "Waters shall not contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses" and solid, suspended, or settleable materials: "Waters shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses." The States' Antidegradation Policy is formally referred to as the Statement of Policy with Respect to Maintaining High Quality Waters in California (State Board Resolution No. 68-16).

E. Impairment of Beneficial Uses

Existing beneficial uses impaired by trash in Revolon Slough and Beardsley Wash are Water Contact Recreation (REC-1), Non-contact Water Recreation (REC-2), Warm Freshwater Habitat (WARM) and Wildlife Habitat (WILD). Revolon Slough has an additional three existing beneficial uses of Agricultural Supply (AGR), Ground Water Recharge (GWR), and Wetland Habit (WET). Beardsley Wash has an additional existing beneficial use of Freshwater Replenishment (FRSH). These beneficial uses in these reaches of Calleguas Creek are impaired by accumulations of suspended and settled debris. Common items that have been observed by Regional Board staff include styrofoam cups, styrofoam food containers, glass and plastic bottles, paper cartons, packaging materials, plastic bags, cans and discarded mattresses in drains tributary to Revolon Slough. Heavier debris can be transported during storms as well.

Trash in waterways causes significant water quality problems. Small and large floatables can inhibit the growth of aquatic vegetation, decreasing spawning areas and habitats for fish and other living organisms. Wildlife living in streams and in riparian areas can be harmed by ingesting or becoming entangled in floating trash. Except for large items, settleables are not always obvious to the eye. They include glass, cigarette butts, rubber, construction debris and more. Settleables can be a problem for bottom feeders and can contribute to sediment contamination. Some debris (e.g. diapers, medical and household waste, and chemicals) are a source of bacteria and toxic substances. Floating debris that is not trapped and

removed will eventually end up on the beaches or in the open ocean, repelling visitors away from our beaches and degrading coastal waters.

For aquatic life, buoyant (floatable) elements tend to be more harmful than settleable elements, due to their ability to be transported throughout the water body and ultimately to the marine environment. Persistent elements such as plastics, synthetic rubber and synthetic cloth tend to be more harmful than degradable elements such as paper or organic waste. Glass and metal are less persistent, even though they are not biodegradable, because wave action and rusting can cause them to break into smaller pieces that are less sharp and harmful. Natural rubber and cloth can degrade but not as quickly as paper (U.S. EPA, 2002). Smaller elements such as plastic resin pellets (a by-product of plastic manufacturing) and cigarette butts are often more harmful to aquatic life than larger elements, since they can be ingested by a large number of small organisms which can then suffer malnutrition or internal injuries. Larger plastic elements such as plastic grocery bags are also harmful to larger aquatic life such as sea turtles, which can mistake the trash for floating prey and ingest it, leading to starvation or suffocation.

Trash in water bodies can threaten the health of people who use them for wading or swimming. Of particular concern are the bacteria and viruses associated with diapers, medical waste (e.g., used hypodermic needles and pipettes), and human or pet waste. Additionally, broken glass or sharp metal fragments in streams can cause puncture or laceration injuries. Such injuries can then expose a person's bloodstream to microbes in the stream's water that may cause illness. Also, some trash items such as containers or tires can pond water and support mosquito production and associated risks of diseases such as encephalitis and the West Nile virus.

Leaf litter is considered trash when there is evidence of intentional dumping. Leaves and pine needles in streams provide a natural source of food for organisms, but excessive levels due to human influence can cause nutrient imbalance and oxygen depletion in streams, to the detriment of the aquatic ecosystem. Clumps of leaf litter and yard waste from trash bags should be treated as trash in the water quality assessment, and not confused with natural inputs of leaves to streams. If there is a question in the field, check the type of leaf to confirm that it comes from a nearby riparian tree. In some instances, leaf litter may be trash if it originates from dense ornamental stands of nearby human planted trees that are overloading the stream's assimilative capacity for leaf inputs. Other biodegradable trash, such as food waste, also exerts a demand on dissolved oxygen, but aquatic life is unlikely to be adversely affected unless the dumping of food waste is substantial and persistent at a given location.

Wildlife impacts due to trash occur in creeks, lakes, estuaries, and ultimately the ocean. The two primary problems that trash poses to wildlife are entanglement and ingestion, with entanglement the more common documented effect (Laist and Liffmann, 2000). Marine mammals, turtles, birds, fish, and crustaceans all have been affected by entanglement in or ingestion of floatable debris. Many of the species most vulnerable to the problems of floatable debris are endangered or threatened by extinction.

Entanglement results when an animal becomes encircled or ensnared by debris. It can occur accidentally, or when the animal is attracted to the debris as part of its normal behavior or out of curiosity. Entanglement is harmful to wildlife for several reasons. Not only can it cause wounds that can lead to infections or loss of limbs; it can also cause strangulation or

suffocation. In addition, entanglement can impair an animal's ability to swim, which can result in drowning, or in difficulty in moving, finding food, or escaping predators (U.S. EPA, 2001).

Ingestion occurs when an animal swallows floatable debris. It sometimes occurs accidentally, but usually animals feed on debris because it looks like food (e.g., plastic bags look like jellyfish, a prey item of sea turtles). Ingestion can lead to starvation or malnutrition if the ingested items block the intestinal tract and prevent digestion, or accumulate in the digestive tract, making the animal feel "full" and lessening its desire to feed. Ingestion of sharp objects can damage the mouth, digestive tract and/or stomach lining and cause infection or pain. Ingested items can also block air passages and prevent breathing, thereby causing death (U.S. EPA, 2001).

Common settled debris includes glass, cigarettes, rubber, construction debris and more. Settleables are a problem for bottom feeders and dwellers and can contribute to sediment contamination. Larger settleable items such as automobiles, shopping carts, and furniture can redirect stream flow and destabilize the channel.

In conclusion, trash in water bodies can adversely affect humans, fish, and wildlife. Not all water quality effects of trash are equal in severity or duration. The water quality effects of trash depend on individual items and their buoyancy, degradability, size, potential health hazard, and potential hazards to fish and wildlife.

The prevention and removal of trash from Revolon Slough and Beardsley Wash ultimately will lead to improved water quality and protection of aquatic life and habitat, expansion of opportunities for public recreational access, enhancement of public interest in the creeks and streams and public participation in restoration activities, and propagation of the vision of the watershed as a whole and enhancement of the quality of life of riparian residents.

F. Trash Impairments of Revolon Slough and Beardsley Wash

The following section summarizes data and staff observations regarding trash impairments of Beardsley Wash and Revolon Slough. Trash is a water quality problem in Beardsley Wash and Revolon Slough in the Calleguas Creek Watershed. The Regional Board has determined that current levels of trash exceed the existing Water Quality Objectives necessary to protect the beneficial uses of the river.

Cities along Beardsley Wash and Revolon Slough and Ventura County Watershed Protection District (VCWPD) have observed the presence of trash in the waterbodies. Documents indicate that trash could be carried by stormwater flushing over ground and may accumulate in the waterways[1]. Although Regional Board staff has not received any data chronically monitoring quantities of trash in these two reaches in the Calleguas Creek Watershed by municipalities, staff conducted site visits to confirm the trash problem.

[1] Memo: Summary of Basis for Trash Listings in Calleguas Creek by Larry Walker Associates 8/2/06, and VCWPD NPDES Water Quality Monitoring Summary 05-06

The site visit on October 25, 2006 encompassed residential and agricultural areas in the vicinity of Beardsley Wash and Revolon Slough. Inspections of the catch basins in the gated community near and along Beardsley Road in the northwest portion of the City of Camarillo found trash, such as pieces of paper and plastic beverage bottles, despite efforts by the City of Camarillo to stencil sidewalks with the emssage, "Do Not Dump, Drains to Creek". Similar types of trash also existed in other catch basins across from Sterling Hills Golf Club. Trash discovered in these catch basins may result from a combination of construction in this area and the mechanism of wind.

More plastic bags, Styrofoam convenience food and drink containers, food wraps, cigarette boxes and butts were found scattered on the concrete banks of Beardsley Wash next to the weir underneath Wright Road and on the street sides around the intersection of Beardsley Road and Wright Road. There is a hiking/walking trail along Beardsley Wash. Characteristics of the trash types indicate that frequent intentional or careless disposal directly by trespassing traffic may be the primary source of trash at this location.

Some agriculture related trash including fruit or vegetable packaging materials, plastic containers, plastic bags, and other common trash mentioned above were observed in the Revolon Slough, its adjacent open lands, and in the ditches discharging to the Slough. The photo below was taken at one of the ditches for agricultural use near Wood Road crossing over Revolon Slough. Agriculture and farming are the most dominant activities in the region, which utilize significant amount of plastic sheets for the high value products. These light weight plastic sheets, bags for fertilizers or pesticides, and packaging materials are subject to wind effect which is significant in this open land.

Figure 2. Trash observed in ditches discharging to Revolon Slough.

III.Numeric Target

The numeric target is derived from the narrative water quality objective in the Basin Plan for floating material:

> *"Waters shall not contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses";*

and for solid, suspended, or settleable materials:

> *"Waters shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses."*

The numeric target for the Revolon Slough and Beardsley Wash TMDL is 0 (zero) trash within Revolon Slough, Beardsley Wash and their tributaries. Regional Board staff has not found information to justify any value other than zero that would fully support the designated beneficial uses. Further, court rulings have found that a numeric target of zero trash is legally valid. The numeric target was used to calculate the Load Allocations for nonpoint sources and Waste Load Allocations for point sources, as described in the following sections of this Staff Report.

IV. Source Analysis

The major source of trash in these reaches of Calleguas Creek results from litter, which is intentionally or accidentally discarded in watershed drainage areas and in the vicinity of Revolon Slough and Beardsley Wash, and from storm drains which collect stormwater from urbanized and agricultural areas. These potential sources can be categorized as point sources and nonpoint sources depending on the transport mechanisms which include:

1. Storm drains: trash that is deposited throughout the watershed is carried to the various sections of Revolon Slough and Beardsley Wash during and after rainstorms through storm drains. This is a point source.

2. Wind action: trash can also blow into Revolon Slough, Beardley Wash and their tributaries. This is a nonpoint source.

3. Direct disposal: direct dumping or litter into Revolon Slough, Beardsley Wash and their tributaries. This is a nonpoint source.

According to the characteristics of the land uses which mainly are agriculture, low density residential, high density residential and open space and parks, approximately 80% of the entire areas of concern as defined, the nonpoint sources will be dominant in contributing the trash to Revolon Slough and Beardsley Wash, compared to point sources.

A. Point Sources

Trash conveyed by storm water through storm drains to Revolon Slough and Beardsley Wash is evidenced by trash accumulation at the base of storm drains and within open drainage ditches discharging to Revolon Slough and Beardsley Wash and catch basins which collect runoff from surrounding lands.

Based on reports and research on other watersheds, the amount and type of trash washed into the storm drain system appears to be a function of the surrounding land use. The City of Long Beach has recorded trash quantity collected at the mouth of the Los Angeles River; the result suggested that the total trash amount is somewhat linearly correlated with the precipitation (see Table 2 below). A similar conclusion was also found that the amount of gross pollutants entering the stormwater system is rainfall dependent but does not necessarily depend on the source (Walker and Wong, December 1999). The amount of trash which enters the stormwater system depends on the energy available to re-mobilize and transport deposited gross pollutants on street surfaces rather than on the amount of available gross pollutants deposited on street surfaces. Where gross pollutants exist, a clear relationship between the gross pollutant load in the stormwater system and the magnitude of the storm event has been established. The limiting mechanism affecting the transport of gross pollutants, in the majority of cases, appears to be re-mobilization and transport processes (i.e., stormwater rates and velocities).

Table 2. Storm Debris Collection Summary for Long Beach: Debris measured in Tonnage. (Signal Hill 2006)

Year	Trash (Tons)	Precipitation (inches)
95-96	4162	12.44
96-97	3993	12.4
97-98	9290	31.01
98-99	3091	9.09
99-00	3844	11.57
00-01	4437	17.94
01-02	1858	4.42
02-03	4630	16.42
03-04	2636	9.25
04-05	12225	37.25
05-06	1059	13.19

To estimate trash generation rates, research from other watersheds was analyzed by Regional Board staff. The most relevant watershed to the subwatershed of Revolon Slough and Beardsley Wash was done by the City of Calabasas for Continuous Deflective Separation (CDS) installed in December of 1998 for runoff from Calabasas Park Hills to Las Virgenes Creek. It is assumed that this CDS unit prevented all trash from passing through. The calculated area drained by this CDS Unit is approximately 12.8 square miles. The urbanized area estimated by Regional Board staff is 0.10 square miles. The result of this clean-out, which represents approximately half of the 1998-1999 rainy season, was 2,000 gallons of sludgy water and a 64-gallon bag about two-third full of plastic food wrappers. It is assumed that part of the trash accumulated in the CDS unit over roughly half of the rainy season had decomposed in the unit due to the absence of paper products. Given the CDS unit was cleaned out after slightly more than nine months of use, it was assumed that this 0.10 square

mile urbanized area produced a volume of 64 gallons of trash over one year. This data will be also be referenced at the consideration of Baseline Waste Load Allocation.

B. Nonpoint Sources

Nonpoint source pollution is commonly caused by a wide range of activities including urban development, agriculture, and recreation, and is identified as a parallel attribute to the trash problem at the Revolon Slough and Beardsley Wash. The location of these waterbodies immediately adjacent to agricultural areas, residential properties, and other open space, allows direct access to the waterbodies, and supports beneficial uses such as recreational activities. The trash deposited in the Revolon Slough and Beardsley Wash resulting from nonpoint sources is a function of transport mechanisms including wind and stormwater.

There are limited studies particularly to define the relationship between the strength of winds and movement of trash from land surface to a waterbody. Lighter trash with sufficient surface area to sail with wind, such as plastic bags, beverage containers, paper or plastic convenient food containers are easily lifted, and carried to waterbodies. Also, as described in the point source section, stormwater carries trash from banks to waterbodies. Transportation of pollutants from one location to another is determined by the energy of both wind and stormwater.

In consideration of transport mechanisms, existing trash in the environment nearby Beardsley Wash and Revolon Slough is the fundamental cause of nonpoint sources trash loading. Based on observation, land use can be generally divided into categories of agriculture, low and high density single-family residences and open space/parks areas. Residents and workers may accidentally discard trash in residential, commercial, industrial and agricultural areas initiates the transport of trash to waterbodies via wind or stormwater or drainage in tributaries. Different use of the open space/park may be responsible for different degrees of trash impairment.

Most of the nonpoint source trash along Beardsley Wash and Revolon Slough available to travel with wind or stormwater is the result of human activities. Records of cleanup days at Lake Erie in 2006 indicate that the top items found were cigarette butts, beverage containers, food wrappers/containers, caps and lids, and eating utensils (Pennsylvania, 2006). The findings are consistent with the items found around Beardsley Wash and Revolon Slough during site inspections. Other stakeholders in the watershed report findings of agricultural plastic and broken glass in the waterbodies, suggesting agricultural land uses as a significant source of trash.

V. Linkage Analysis

This TMDL is based on numeric targets derived from narrative water quality objectives for floating materials and solid, suspended, or settleable materials. The narrative objectives prescribe that waters shall not contain these materials in concentrations that cause nuisance or

adversely affect beneficial uses. Based on these targets, staff finds the capacity of Revolon Slough and Beardsley Wash to accumulate trash is zero.

VI. Waste Load and Load Allocations

Both point sources and nonpoint sources are identified as sources of trash in Revolon Slough and Beardsley Wash. For point sources, the strategy for attaining water quality standards focuses on assigning Waste Load Allocations (WLAs) to the California Department of Transportation (Caltrans) Permittees and Co-Permittees of the Ventura County Municipal Separate Storm Sewer System (MS4) Permit (hereinafter referred to as Permittees), including the Ventura County Watershed Protection District, the City of Camarillo, and the City of Oxnard. The WLAs will be implemented through permit requirements. For nonpoint sources, the strategy for attaining water quality standards focuses on assigning Load Allocations (LAs) to land owners and agencies in the vicinity of Revolon Slough and Beardsley Wash, including the County of Ventura, City of Camarillo, City of Oxnard, and Agricultural entities in the Revolon Slough and Beardsley Wash subwatersheds. The LAs will be implemented through regulatory mechanisms that implement the State Board's 2004 Nonpoint Source Policy such as conditional waivers. Final WLA and LA are zero trash.

WLAs and LAs are based on a phased reduction from the Baseline WLAs and LAs, estimated as the current discharge, over an eight-year period for the full capture compliance option and a five-year period for the MFAC compliance option, as discussed below. WLA assignees may comply with WLAs through implementing full capture systems on storm drains through a progressive implementation schedule or implementing a program for Minimum Frequency of Assessment and Collection in conjunction with a progressive trash reduction schedule. LA assignees may comply with LAs through implementation of a conditional waiver that implements a MFAC program or an alternative program subject to individual waste discharge requirements or an individual waiver thereof.

The Baseline WLAs for MS4 Permittees, and Baseline Load Allocations for nonpoint source responsible jurisdictions are based on data from recent trash generation studies from the City of Calabasas. The Baseline WLA for Caltrans is based on Caltrans' Litter Management Pilot Study. The Baseline LA for nonpoint sources is based on data from recent trash generation studies from the City of Calabasas. The Regional Board may revise the Baseline WLAs and LAs based on studies provided by Responsible Jurisdictions within the first two years of the TMDL implementation period.

A. Waste Load Allocations

Waste Load Allocations for point sources are assigned to the Permittees of MS4 and Caltrans. WLAs may be issued to additional facilities in the future under Phase II of the US EPA Stormwater Permitting Program. The Baseline Waste Load and Load Allocations allocation for Permittees may be revised with data collected during the Trash Monitoring Plan in the first two years of the implementation period.

Baseline Waste Load Allocations for MS4 Permittees

The Baseline Waste Load Allocation for the MS4 permittees is equal to 640 gallons of uncompressed trash per square mile per year based on the study by City of Calabasas. No differentiation is applied for different land uses in the Baseline Waste Load Allocation. Municipal stormwater permittees may implement a "Trash Monitoring Plan" to refine the Baseline Waste Load Allocation. The goal of the Trash Monitoring Plan is to derive a representative trash generation rate for various land uses from responsible permittees discharging stormwater to the waterbodies. The Baseline Waste Load Allocation for any single permittee is the sum of the products of each land use area multiplied by the Waste Load Allocation for the land use area, as shown below:

$$WLA = \sum \text{for each city} \left(\text{area by land uses} \bullet \text{allocations for this land use} \right)$$

SCAG classified Ventura County into twelve types of land uses for every city and unincorporated area in the watershed. The land use categories are: (1) high density residential , (2) low density residential , (3) commercial and services, (4) industrial, (5) public facilities, (6) educational institutions , (7) military installations, (8) transportation , (9) mixed urban , (10) open space and recreation , (11) agriculture , and (12) water. Given that the minimum mapping resolution is 2.5 acres, a non-critical land use unit may not be mapped if it is less than 2.5 acres in size. The details of land use categories are provided in the Appendix I.

Data collected during Trash Monitoring Plan will be used to establish specific trash generation rates per land use. The major land use categories relevant to Revolon Slough and Beardsley Wash are:

- Low density residential,
- High density residential,
- Agricultural,
- Commercial and industrial,
- Transportation,
- Mixed urban, and
- Open space and recreation.

Land uses for Public facilities, Educational Institutions, Mixed urban, Agriculture, and Water are assumed to have the same trash generation rate as that of public facilities and mixed urban. It also applies to transportation and industrial land uses, and agricultural and open space land uses. However, Waste Load Allocations for land uses of military and transportation will be address separately. Transportation land use under Caltrans' jurisdiction will be covered under Caltrans' permit. Caltrans will be required to submit a monitoring plan for that land use, and will be assigned a Waste Load Allocation. Major boulevards that are currently under Caltrans' jurisdiction, but are affected by trash generated on municipal sites will be addressed by the cities concerned.

Permittees may provide acreage of above mentioned land uses within their jurisdiction in order to refine their contributions from their assigned Baseline Waste Load Allocations. The Baseline Waste Load Allocations for the municipal permittees are is presented in Table 3. A more detailed breakdown along land uses is provided in Appendixes II and III. The values are uncompressed volumes, in gallons. The Appendixes contain a table which shows the square mileage for each land use for responsible jurisdictions in the watershed and a list of maps

showing land uses for each permittee. For permittees that are only partially located in the watershed, the square mileage indicated is for the portion in the watershed only.

Baseline Waste Load Allocations for Caltrans Stormwater Permit

Under the Los Angeles River TMDL, a Litter Management Pilot Study (LMPS) was conducted to evaluate the effectiveness of several litter management practices in reducing litter that is discharged from Caltrans storm water conveyance systems. The LMPS employed four field study sites, each of which was used to test a separate BMP. Each site included three replicate testing pairs, consisting of one site designed to measure the amount of trash produced when treatment was applied, and one control with no treatment site. The LMPS averaged the data collected at the control outfalls in order to obtain the annual litter loads. The average combined total loads for the three control outfalls at each site normalized by the total area of control catchments is presented in the following table, adapted from the LMPS report :

Table 3. Average Combined Total Loads for Control Outfalls at 3 Litter Management Pilot Study Sites

Site	Weight lbs/sq mi	Volume cu ft/sq mi
1E	10584.00	1312.97
1W	7479.36	971.73
6	7479.36	881.34
8	4374.72	404.51

The Baseline Waste Load Allocation for weight and volume load generation for freeways is arrived at by averaging weight and volume columns (Table 4). It is to be noted that control site 1E already had one BMP in place before testing of the other BMPs, as it was cleaned monthly through an "Adopt a Highway" program.

Table 4. Baseline Waste Load Allocation for Weight and Volume for Freeways

Weight lbs/sq mi	Volume cu ft/sq mi
7479.36	892.64

Baseline Waste Load Allocations for MS4 and Caltrans Permittees

The Baseline WLAs for all point sources, in gallons per year, are presented in Table 5.

Table 5. Revolon Slough and Beardsley Wash Trash TMDL Baseline Waste Load Allocations (gallons of uncompressed litter)

Responsible Jurisdictions	Point Source Area ($Mile^2$)	Baseline WLA (Gals/year)
Camarillo	4.95	3165.85
Oxnard	1.05	672.09
Ventura County	3.66	2343.65
Ventura County Watershed Protection District	0.1628	104.22
Caltrans	1.68	11215.45

B. Load Allocations

Load Allocations (LAs) for nonpoint sources also follow phased reduction from Baseline Load Allocations. According to the Porter-Cologne Act, Load Allocations may be addressed by conditional waivers of WDRs.

Responsible jurisdictions shall monitor the trash quantity deposited in the vicinities of Revolon Slough and Beardsley Wash as well as that on the waterbodies to comply with Baseline Load Allocation. Data collected through Trash Monitoring Plan may define the percentage of trash migrating from land to waterbodies.

The area adjacent to the waterbody, or defined as the nonpoint source area, is the composition of multiple land uses. There are parking lots, recreational areas, picnic areas, and hiking areas under the jurisdiction of the Cities of Camarillo and Oxnard. The County's land includes agricultural/farm areas, residential areas, commercial areas, public services, roads, and open space/park areas. Each sub-area described above may contribute different levels of trash to Beardsley Wash and Revolon Slough. By applying the similar concept that was applied for the Waste Load Allocation, the Load Allocation for any designated nonpoint source area is the sum of the products of each land use subarea multiplied by the Load Allocation for the land use subarea, as shown below:

$$LA = \sum \textit{for each Nonpoint source}\left(\textit{subarea by land uses} \bullet \textit{allocations for this land use}\right)$$

The boundary of the areas considered as point source and nonpoint source, surrounding Revolon Slough and Beardsley Wash is defined by using existing GIS subwatershed data in the Calleguas Creek Watershed for this TMDL (see Figure 3 below). Due to the transportation mechanism by wind and stormwater to relocate trash from land to waterbodies, the potential nonpoint source area may be smaller than the defined subwatershed. For the magnitude of surface area around Revolon Slough and Beardsley Wash, it may not be necessary to divide into parcels with different land uses. Appendix II also shows the surface areas of various types of land use considered potential nonpoint sources.

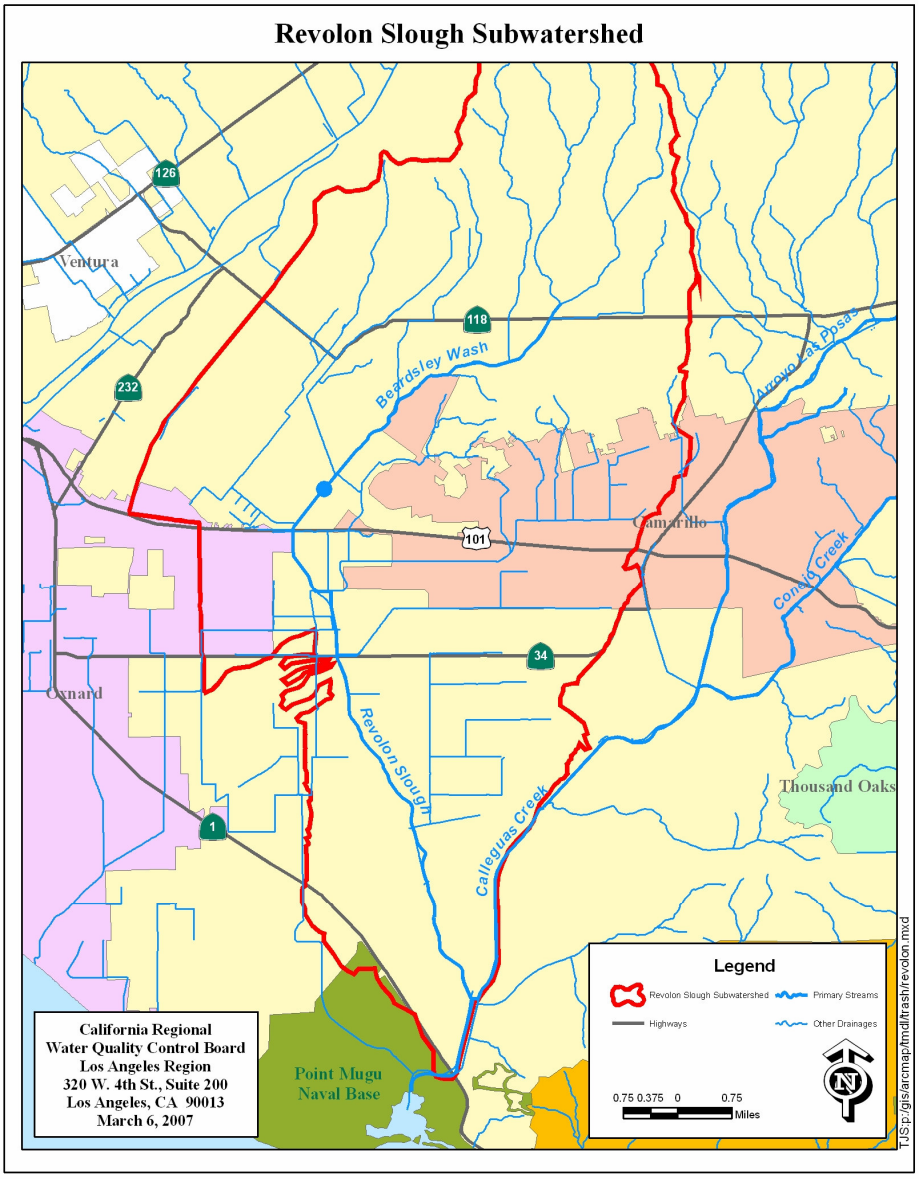

Figure 3. Areas used to determine Baseline Waste Load and Load Allocations for point and nonpoint sources of trash to Revolon Slough and Beardsley Wash

The trash generation rate from nonpoint sources areas, including agricultural areas, open space and parks areas, is assumed to be the same as data collected by the City of Calabasas. Therefore, the Baseline Load Allocation equals 640 gallons per square mile per year. Responsible jurisdictions shall develop a plan for nonpoint source trash monitoring in the Monitoring and Reporting Plan which needs to be approved by the Executive Officer of the Regional Board. Data collected shall include the trash in Revolon Slough, Beardsley Wash and their tributaries, and trash accumulated in the vicinities of Revolon Slough and Beardsley Wash which could possibly be carried directly to the surface water by stormwater, wind, or human activities. Analyzing data may define the relationship between the trash quantities in the water to that on the surrounding environment.

Assuming that trash within a reasonable distance from the waterbodies of concern has high potentiality to be in the waterbodies and excluding the areas addressed by NPDES or any other existing permits for point sources, the nonpoint source surface areas along the waterbody perimeter are calculated for the following categories:

- Agricultural, and
- Open space and recreation

Table 6 summarizes the area and the Baseline Load Allocations for responsible jurisdictions. Baseline Load Allocations may be updated if data collected from the Trash Monitoring and Reporting Plan indicate otherwise.

Table 6. Revolon Slough and Beardsley Wash Trash TMDL Baseline Load Allocations (gallons of uncompressed litter)

Responsible Jurisdictions	Nonpoint Source Area ($Mile^2$)	Baseline LA (Gals/year)
Camarillo	1.19	764.61
Oxnard	0.15	95.62
Ventura County	9.15	5854.62
Agriculture	39.06	25001.28

VII. Margin of Safety

A margin of safety (MOS) accounts for uncertainties in the TMDL analysis. The MOS can be expressed as an explicit mass load that is not allocated to responsible jurisdictions, or included implicitly in the WLAs and LAs that are allocated. Because this TMDL sets WLAs and LAs as zero trash, staff finds the TMDL includes an implicit MOS and that an explicit MOS is not necessary for this TMDL.

VIII. Critical Conditions

Critical conditions for the Revolon Slough and Beardsley Wash are based on two conditions that correlate with loading conditions:

- Major Storm (as proposed by permittees and responsible jurisdictions in the Trash Monitoring and Reporting Plan and approved by the Executive Officer);

- Wind advisories issued by the National Weather Service for the Oxnard area.

Critical conditions are used as a basis to establish the frequency of trash monitoring and collection to attain the final Load and Waste Load Allocations.

IX. TMDL Implementation and Compliance

This section describes TMDL implementation programs for compliance with the TMDL. Compliance with the TMDL is based on the Numeric Target and the Waste Load and Load Allocations which are defined as zero trash in Revolon Slough, Beardsley Wash and their tributaries. Consequently, compliance is based on implementing a program for trash assessment and collection, or alternatively for point source dischargers, full capture devices, to attain a progressive reduction in the amount of trash in Revolon Slough, Beardsley Wash and their tributaries. Dischargers who do not implement full capture devices shall propose a program for a Minimum Frequency of Assessment and Collection (MFAC). The MFAC program is required to attain a progressive reduction in the amount of trash collected from Revolon Slough, Beardsley Wash and their tributaries through implementation of BMPs. Dischargers may implement structural or nonstructural BMPs as required to attain a progressive reduction in the amount of trash in Revolon Slough, Beardsley Wash and their tributaries.

The TMDL Implementation Plan provides a schedule for responsible jurisdictions to implement full capture systems, MFAC programs, and BMPs to comply with the progressive trash reduction schedule. Key provisions of the Implementation Plan include:

- Baseline Waste Load and Load Allocations based on a reference/antidegradation approach;
- Trash monitoring to provide data to revise Baseline Waste Load and Load Allocations, assess effectiveness of BMPs and trash abatement programs, and assess levels of trash in Revolon Slough, Beardsley Wash and their tributaries
- A conditional waiver of waste discharge requirements for nonpoint source dischargers who implement MFAC programs; and
- TMDL Reconsideration by the Regional Board to revise Baseline Waste Load and Load Allocations and the Minimum Frequency of the MFAC program.

TMDL compliance is assessed in accordance with Dischargers' implementation of programs for full capture or MFAC and attainment of the progressive trash reductions in accordance with the schedules in Tables 9 and 10.

Baseline Waste Load and Load Allocations

The TMDL includes Baseline Waste Load and Load Allocations to ensure that trash amounts in Revolon Slough, Beardsley Wash and their tributaries do not increase during the Implementation Schedule and to evaluate progressive trash reductions. Baseline Waste Load and Load Allocations are based on a reference system/antidegradation approach using data from the City of Calabasas, normalized to the subwatershed area in the vicinity of Revolon Slough, Beardsley Wash and their tributaries. The "reference system/anti-degradation approach" means that on the basis of historical trash generation rates at an existing monitoring location most similar to Revolon Slough, Beardsley Wash and their tributaries, an amount of trash discharged to Revolon Slough, Beardsley Wash and their tributaries is permitted initially under the TMDL schedule. The allowable amount of trash is set such that (1) water quality at any site is at least as good as at the designated reference site and (2) there is no degradation of existing water quality based on existing amounts of trash.

Trash Monitoring

The TMDL includes monitoring based on a plan developed by responsible jurisdictions and approved by the Executive Officer of the Regional Board. Minimum requirements for trash monitoring include assessment and quantification of trash collected from the surfaces and shoreline of Revolon Slough, Beardsley Wash and their tributaries. The monitoring plan shall provide details of the frequency, location, and reporting of trash monitoring for each waterbody. Responsible jurisdictions shall propose a metric (e.g., weight, volume, pieces of trash) to measure the amount of trash in the waterbody and surrounding area. Responsible jurisdictions may include other metrics to provide data for revision of the Baseline Waste Load and Load Allocations, determine effectiveness of BMPs, and assess compliance with the TMDL. Responsible Jurisdictions may coordinate their trash monitoring activities for Revolon Slough, Beardsley Wash and their tributaries. Monitoring requirements are described in greater detail in Section X.

Reconsideration of Revised Baseline Waste Load and Load Allocations

Baseline Waste Load and Load Allocations are based on a reference approach. Data from a City of Calabasas study in which trash recovered from a continuous deflector system were quantified. Site-specific conditions at Revolon Slough, Beardsley Wash and their tributaries may differ from conditions of the Calabasas Study. Because the TMDL monitoring programs will provide site-specific trash quantification data, it is recommended that the TMDL include a reconsideration of the Baseline Waste Load and Load Allocations based on data provided by responsible jurisdictions. The Baseline Waste Load and Load allocations are used as the basis for the progressive reduction of trash in the waterbody for both point and nonpoint sources and represent the maximum amount of trash that can be discharged in conjunction with partial capture systems for point sources and the MFAC program for nonpoint sources.

Implementation of Load and Waste Load Allocations

TMDL implementation may require BMPs to meet the progressive trash schedule. BMPs may be implemented through stormwater permits or a conditional waiver from waste discharge requirements for nonpoint source dischargers. Point source dischargers will implement BMPs in accordance with Waste Load Allocations incorporated into MS4 permits. Point sources may alternatively implement full capture systems or a MFAC program to be deemed in compliance with Waste Load Allocations.

A. Implementation and Compliance for Point Sources

Discharge of trash from stormdrains to Revolon Slough, Beardsley Wash and their tributaries will be regulated through the Municipal NPDES Storm Water Permit for Ventura County and Caltrans (Table 7).

Table 7. Point Source Responsible Jurisdictions – Revolon Slough, Beardsley Wash and their tributaries

Watershed	Analytical Units	Responsible Jurisdictions
Calleguas Creek	Revolon Slough and Beardsley Wash	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains

There are two alternatives for responsible jurisdictions to achieve compliance with waste load allocations (Figure 4). As established in the Los Angeles River trash TMDL, point source dischargers can implement full capture systems to comply with the TMDL. Point source discharges may also implement a MFAC program.

1. Full Capture Treatment Systems

The amount of trash discharged to the waterbody by an area serviced by a full-capture system will be considered to be in compliance with the final Waste Load Allocation for the drainage area, provided that the Full Capture Systems are adequately sized, maintained and maintenance records are available for inspection by the Regional Board.

A full capture system is any single device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate Q resulting from a one-year, one-hour storm in the subdrainage area. Rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour, data collected by Ventura County Watershed Protection District may be referenced, available at www.vcwatershed.org/hydrodata/htdocs/static), and A= subdrainage area (acres).

Compliance with TMDL schedule for full capture systems will be based on a percentage of the Revolon Slough, Beardsley Wash and their tributaries subwatershed that are drained by storm drain systems (i.e., point source area). The TMDL Implementation Plan provides a total of eight years to install full capture systems (Table 9). Compliance with the final Waste Load Allocation will be assumed wherever Full Capture Systems are installed in the storm drains discharging to the waterbody. The installation of a Full Capture System by a discharger does not establish any presumption that the system is adequately sized, and the Regional Board will review sizing and other data in the future to validate that a system satisfies the criteria established in this TMDL for a Full Capture System.

2. Program for Minimum Frequency of Assessment and Collection (MFAC)

Compliance with the final waste load allocations may also be attained whenever the MFAC program is implemented by responsible jurisdictions in conjunction with implementation of BMPs that attain the Baseline waste load allocations. For the Revolon Slough, Beardsley Wash and their tributaries the minimum frequency is twice per week. Assessment will be conducted at locations approved by the Executive Officer. Collection is

defined as removing 100% of the trash found on the waterbody and adjacent land area and depositing it in a trash receptacle for proper disposal. If amount of trash collected exceeds Baseline Waste Load Allocations, then responsible jurisdictions must implement structural and/or non-structural BMPs to ensure that trash loaded to the waterbody is not increasing over time.

Progressive reductions in trash will be calculated as follows:

At the effective date of the TMDL, the Baseline Waste Load Allocations will apply based on data collected by City of Calabasas. The first compliance point will be at the end of the fourth year with Baseline Waste Load Allocations equal to a 10% reduction of the amount of trash in the initial Baseline Waste Load Allocation. Compliance thereafter will be evaluated at the end of each successive storm season with Waste Load allocations equal to successive 20% reductions of the Baseline Waste Load Allocations (Table 10).

Dischargers will be deemed in compliance with the final Waste Load Allocation upon results of the monitoring program demonstrating that any trash accumulating between MFAC events is not causing deleterious effects on the beneficial uses of Revolon Slough, Beardsley Wash and their tributaries. The amount of trash accumulated between MFAC events must progressively decline by 50% from the Baseline WLA over eight years. If the amount of trash accumulated does not progressively decrease, then responsible jurisdictions must implement additional structural and/or non-structural BMPs or increase frequency of MFAC to ensure reductions. The Regional Board may revise the TMDL schedule and the minimum frequency of the MFAC program based on the results of the TMDL monitoring program.

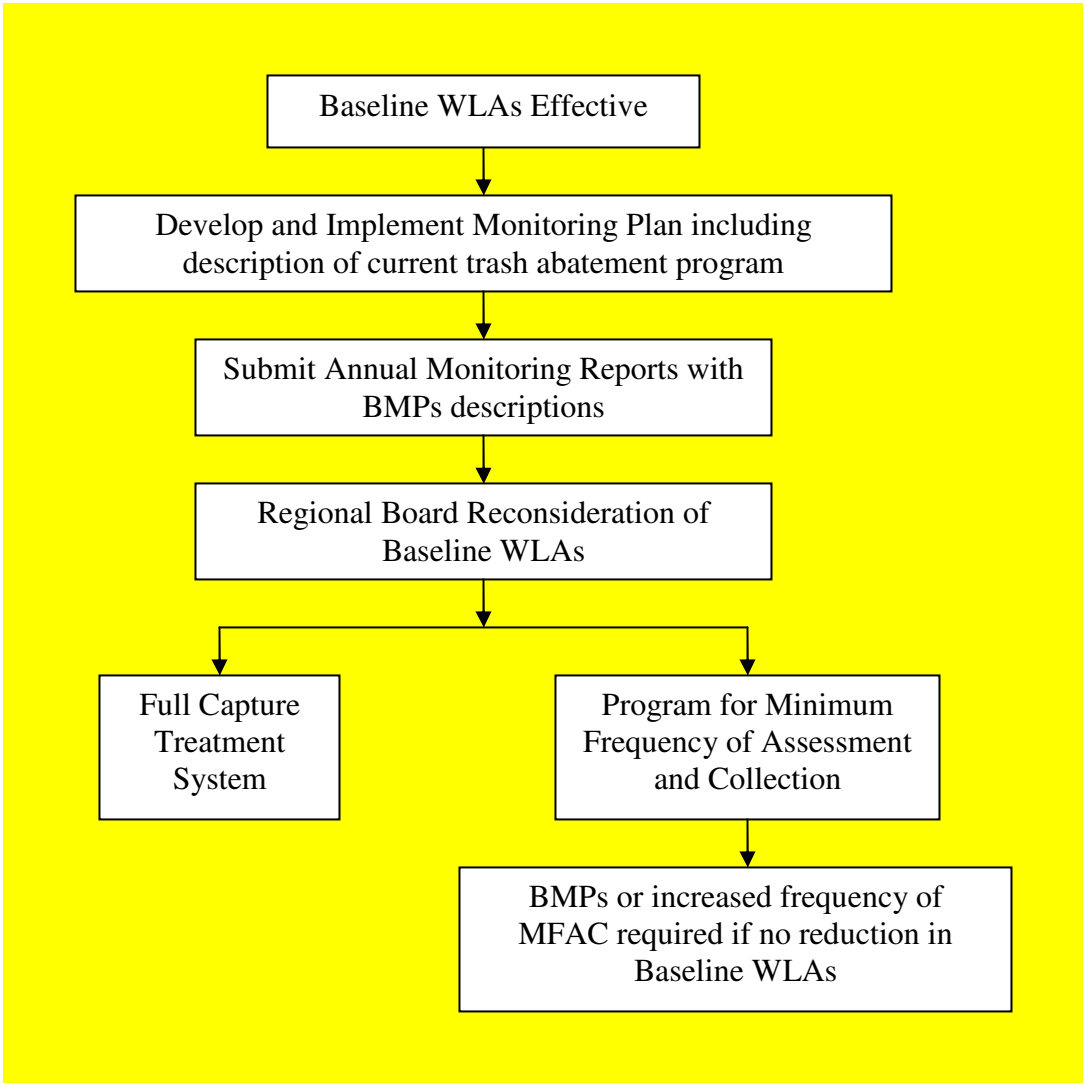

Figure 4. Implementation Flowchart for Point Sources

B. Implementation and Compliance for Nonpoint Sources

Two primary federal statutes establish framework in California for addressing nonpoint source (NPS) water pollution: Section 319 of the Clean Water Act (CWA) of 1987 and Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA). In accordance with these statutes, the state assesses water quality associated with nonpoint source pollution (NPS) and develops programs to address NPS. In 2004, The State Water Resource Control Board (SWRCB), in its continuing efforts to control NPS pollution in California, adopted the Plan for California's Nonpoint Source Pollution Control Program (NPS Program Plan). The NPS Program Plan prescribes implementation and monitoring of Best Management Practices to address nonpoint source pollution.

To implement this TMDL for nonpoint source dischargers, the Regional Board, with the adoption of this TMDL, waives waste discharge requirements for nonpoint source dischargers who submit a MFAC program for approval by the Executive Officer. The MFAC program

includes a trash assessment of trash on Revolon Slough, Beardsley Wash and their tributaries, collection of all visible trash that accumulates in Revolon Slough, Beardsley Wash and their tributaries, and implementation of BMPs to attain a progressive reduction of the amount of trash collected at each collection event. Conditional waivers identify areas where best management practices need to be upgraded to attain water quality objectives in receiving waters. The monitoring plan submitted by responsible jurisdictions (Table 8) will provide data to revise the Baseline Load Allocation. The annual reduction from the Baseline Load Allocation serves as the criteria of allowable trash to be collected from Revolon Slough, Beardsley Wash and their tributaries.

Table 8. Nonpoint Source Responsible Jurisdictions – Revolon Slough, Beardsley Wash and their tributaries

Watershed	Analytical Units	Responsible Jurisdictions
Calleguas Creek	Revolon Slough and Beardsley Wash	1. City of Camarillo 2. City of Oxnard 3. Ventura County 4. Agriculture

To achieve compliance with load allocations responsible jurisdictions can implement a MFAC program in conjunction with implementation of BMPs that attain the Baseline Load Allocations (Figure 5). For the Revolon Slough, Beardsley Wash and their tributaries TMDL, the minimum frequency is twice per week. Assessment will be conducted at areas and locations approved in the Monitoring and Reporting Plan. Collection is defined as picking up 100% of trash and depositing it in a trash receptacle for proper disposal. The amount of trash accumulated on the lake and lakeshore between MFAC events must progressively decline by 50% from the Baseline WLA over eight years. If the amount of trash accumulated does not progressively decrease by 50% over eight years, then responsible jurisdictions must implement structural and/or non-structural BMPs or increase frequency of MFAC to ensure that trash loaded to the lake is not increasing over time.

The Regional Board is adopting a Conditional Waiver for trash in Revolon Slough, Beardsley Wash and their tributaries at the same time as this TMDL. The Conditional Waiver provides a regulatory structure whereby continued monitoring and iterative BMPs are deployed to attain zero trash within the TMDL Implementation Schedule. Based on the results of monitoring at the end of the second year after the effective date of this TMDL, the Regional Board will consider revision of Baseline LAs (Table 10).

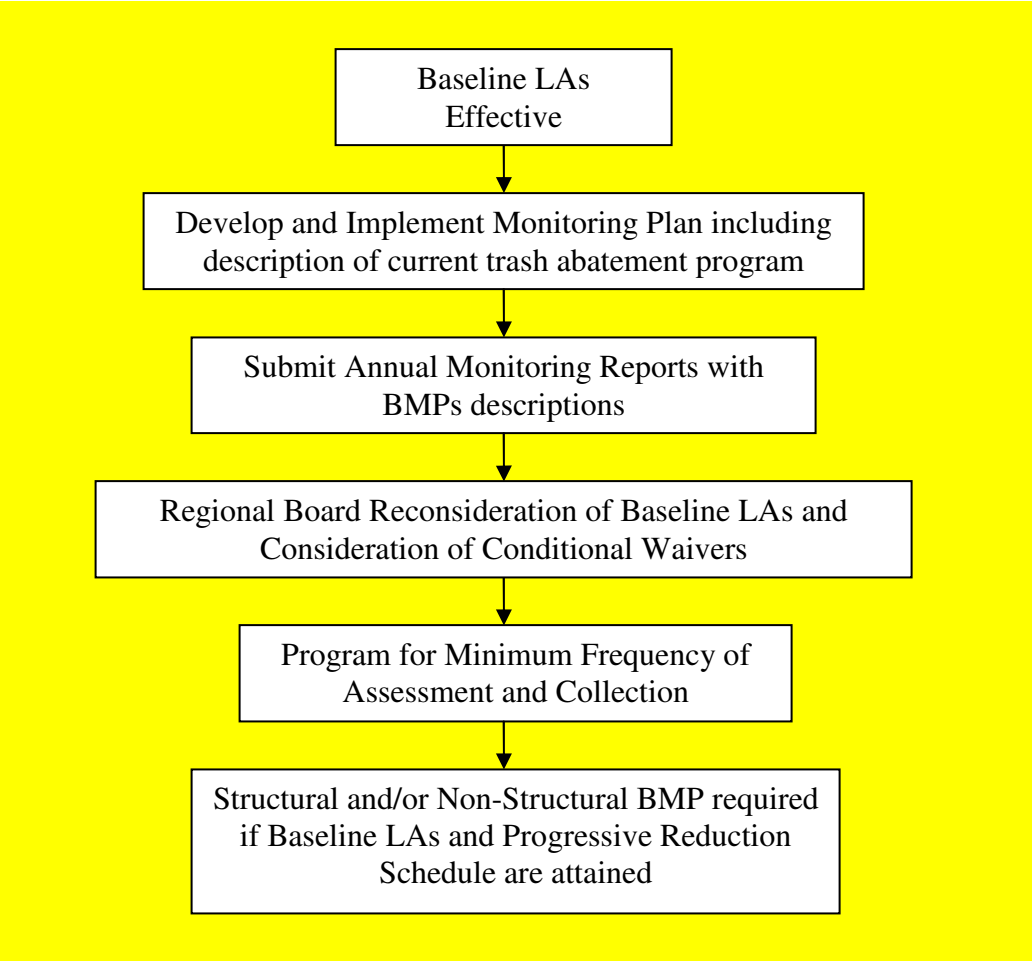

Figure 5. Implementation Flowchart for Nonpoint Sources

A Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Agricultural Waiver) was adopted by the Regional Board On November 3, 2005 (Order No. R4-2005-0080). The intent of this program is to attain water quality objectives in waters of the state by regulating discharges from irrigated lands in the Los Angeles region. Discharges may form groups or apply individually for coverage under the waiver. Discharger Groups or Individual Dischargers are required to conduct water quality monitoring as directed in the adopted Waiver. The general constituents to be monitored include pollutants associated with agriculture operations, such as nutrients, pesticides, and sediment. The frequency of monitoring is based on typical wet and dry weather sampling within our Region. The monitoring results will be compared to receiving water limitations listed in the adopted waiver. In the case that the monitoring results show an exceedance of these limitations the Discharger Group or Individual Discharger would prepare a Water Quality Management Plan (WQMP). The WQMP is expected to identify the source of the exceedance and determine the impact of the impairment through follow up monitoring, if necessary. Once the source is identified best management practice will be installed and maintained to reduce or eliminate the impairment to water quality.

Trash generated from agricultural sources can be regulated and reduced by adding trash in list of constitutes of concern in the existing agricultural waiver program. Currently trash is not listed in the constitutes of concern; however, the waiver program could be reconsidered and revised in the future to include trash in the monitoring program.

Once trash is listed in the agricultural waiver program, dischargers will be required to monitor trash discharged from irrigated lands, and install and maintain best management practice to reduce or eliminate the impairment of trash to water quality. Since agricultural waiver is an existing program, adding trash in the program is considered feasible and is expected an effective way to reduce trash from agricultural sources.

C. Coordinated Compliance

Responsible jurisdictions for this TMDL include both point source and nonpoint source dischargers. Compliance with the TMDL may be based on a coordinated Monitoring and Reporting work plan that outlines TMDL responsibilities for each responsible jurisdiction. Dischargers interested in coordinated compliance shall submit a Coordinated Monitoring and Reporting Compliance plan that outlines BMPs that will be implemented and the schedule for implementing the BMPs and MFAC program.

D. Non-Structural BMPs

A wide variety of methods possibly alleviating trash impairment to Revolon Slough, Beardsley Wash and their tributaries are listed below. Responsible jurisdictions shall propose the monitoring plan as well as the mitigation measures incorporating an individual method or combinations to progressively reduce nonpoint source trash. Non-structural BMPs may provide advantages over structural full capture systems in areas that are not extensively drained by municipal separate stormwater sewer systems. Foremost, institutional controls offer other societal benefits associated with reducing litter in our city streets, parks and other public areas. The capital investment required to implement non-structural BMPs is generally less than for full capture systems.

Litter Control

It is noted that ordinances prohibiting littering are already in place in the areas of Revolon Slough, Beardsley Wash and their tributaries. For example, Ventura County Ordinance 6963 states:

> "No Person shall throw, deposit, leave, maintain, keep, or permit to be thrown, deposited, kept, or maintained, in or upon any public or private driveway, parking area, street, alley, sidewalk, or component of the Storm Drain System or any Watercourse, any refuse, rubbish, garbage, litter, or other discarded or abandoned objects, articles, accumulations, and/or Pollutants so that the same may cause or contribute to pollution. Any Owner or Occupant of the property or responsible Person who fails to remove Pollutants within a reasonable time, as determined by the Director, may be charged with a violation of this Chapter.

The existing litter laws shall be posted in prominent locations for residents, visitors, and workers to understand the regulations. Patrolling or designated personnel shall have authorities to illustrate, execute, and enforce the litter laws. The effectiveness of enforcement should be monitored.

Trash Receptacles

Most of the trash disposed of on the ground may result from the lack of trash receptacles. Installing trash receptacles can reduce nonpoint trash loadings. The receptacles shall be visible and conveniently reachable. Receptacles shall equip with lids to prevent the wildlife browsing through or the wind re-mobilizing the trash inside. Receptacles may be decorated but shall not cause visual intrusion to the background environment. Varieties of land uses determine the proper locations and necessary density of the trash receptacles. Sanitation should be maintained to avoid nuisances.

Street Sweeping

Street sweeping is one of most effective methods to keep debris, vegetation wastes, and trash away from catch basins. Although the correlation between street sweeping frequency and amount of trash collected in the waterbody is not confirmed in the Revolon Slough, Beardsley Wash and their tributaries, it is convincing that more street sweeping will allow less trash to be flushed by stormwater to the catch basins, and to be discharged to waterbodies of concern. Most municipalities have an existing street sweeping program.

Public Education

Public education refers to posting information, giving presentation, or conducting direct or indirect communication with individuals. This outreach should be applied to public entities such as city halls, schools, community centers, senior centers, and to private meeting/activity locations.

The educational materials should include the relevant ordinances, the importance of protecting environment, possible environmental and biological impacts from pollution, and the necessary response if pollution occurs.

Community Involvement

Involving communities may be more effective in promoting the importance of protecting water quality and environment. The bonding between residents and community makes the community more influential in educating residents of right concepts. Communities can organize activities to illustrate that environmental protection involves every individual's continuous efforts.

Recycling Program

A Recycling program shall be developed to minimize trash sources in the vicinity of the waterbody of concern.

Reporting System

Patrol personnel or residents should report accumulation of trash or illegal disposal of trash to the waterbodies and their adjacent areas. Information with a toll-free number and communication devise shall be conveniently available near the waterbodies for timely reporting. The supervising agencies, after receiving reports, should conduct inspections to formulate proper cleanup actions.

Stencil

Stencils are to remind the residents of the importance of maintaining water quality and of the existing ordinances. Signs should be placed in prominent locations where most people

will view them, and should contain appropriate symbols as well as clear written messages, and cite the appropriate federal, state and county codes including the largest possible penalty amount for violation of codes.

Imposition of Trash Tax

The trash often discovered on or adjacent to the waterbodies is convenient paper or plastic food or beverage containers, plastic bottles, paper plates, aluminum cans, or plastic bags. This trash shares the same characteristics as packaging utilized in the fast food stores. The evidence of trash causing the waterbody impairment may be used to justify an increase in retail price of disposable food or beverage packaging to compensate the potential environmental impacts. The additional tax income can contribute to preventive or cleanup actions for the designated waterbody of concern.

Cooperation of Potential Sources of Trash

Stores carrying goods considered potential sources of trash to the waterbody or its adjacent areas can advise their patrons to handle the packaging, residuals or any trash parts in a environmentally friendly manner. Similar to the stencils, signs with clear language containing ordinances, and a penalty of violation should be posted near the cashier, exit and parking lot.

Tax Benefit by Adopting Waterbodies

This concept is adapted from the "adopt a highway" program. The participation from industries in the vicinity of lakes, rivers, or creeks, will help the responsible jurisdictions to maintain the cleanliness of the environment, and increase the cleaning frequency. Industries or any entities that contribute resources, time, or efforts to keep the environment clean could be encouraged by having tax benefit.

E. Implementation Schedule

The TMDL Implementation Schedule is designed to provide permittees and responsible jurisdictions flexibility to implement structural and non structural BMPs to address trash impairments of Revolon Slough, Beardsley Wash and their tributaries. Implementation consists of development of monitoring plans by permittees and responsible jurisdictions and implementation of the Executive Officer approved trash monitoring plan.

Table 9. Full Capture Implementation Schedule

Task No.	Task	Responsible Jurisdiction	Date
1	Baseline Waste Load Allocations in Effect	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Effective Date of TMDL

Task No.	Task	Responsible Jurisdiction	Date
2	Submit Monitoring and Reporting Plan	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Sixty days from receipt of Order from Regional Board Executive Officer
3	Implement Monitoring and Reporting Program	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Sixty days from receipt of letter of approval from Regional Board Executive Officer
3	Regional Board Reconsideration of Baseline Waste Load Allocations.	Regional Board	Two years from effective date of TMDL
4	Installation of BMPs to achieve 20% reduction of trash from Baseline WLA*	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Four years from effective date of TMDL
5	Installation of BMPs to achieve 40% reduction of trash from Baseline WLA*	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Five years from effective date of TMDL
6	Installation of BMPs to achieve 60% reduction of trash from Baseline WLA*	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Six years from effective date of TMDL
7	Installation of BMPs to achieve 80% reduction of trash from Baseline WLA*	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Seven years from effective date of TMDL
8	Installation of BMPs to achieve 100% reduction of trash from Baseline WLA*	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with storm drains	Eight years from effective date of TMDL

*Compliance with percent reductions from the Baseline WLA will be assumed wherever full capture systems are installed in corresponding percentages of the storm drain system discharging to the lake.

Table 10. Minimum Frequency Assessment and Collection Implementation Schedule

Task No.	Task	Responsible Jurisdiction	Date
1	Conditional Waiver in Effect	City of Camarillo; City of Oxnard; Ventura County; Agriculture; Ventura County Watershed Protection District; Caltrans; Local land owners with storm drains	Regional Board adoption of TMDL
2	Baseline Waste Load and Load Allocations in Effect	City of Camarillo; City of Oxnard; Ventura County; Agriculture; Ventura County Watershed Protection District; Caltrans; Local land owners with storm drains	Effective Date of the TMDL
3	Submit Notice of Intent to Comply with Conditional Waiver of Discharge Requirements, including Minimum Frequency Assessment and Collection (MFAC) Program Plan	City of Camarillo; City of Oxnard; Ventura County; Agriculture; Ventura County Watershed Protection District; Caltrans; Local land owners with storm drains	Sixty days from effective date of TMDL
4	Implement MFAC Program	City of Camarillo; City of Oxnard; Ventura County; Agriculture; Ventura County Watershed Protection District; Caltrans; Local land owners with storm drains	Sixty days from receipt of Notice of Acceptance from Regional Board Executive Officer
5	Regional Board Reconsideration of Baseline WLAs and LAs.	Regional Board	Two years from effective date of TMDL
6	Installation of BMPs to achieve 10% reduction of trash from Baseline WLA and LA	City of Camarillo; City of Oxnard; Ventura County; Agriculture; Ventura County Watershed Protection District; Caltrans; Local land owners with storm drains	Three years from effective date of TMDL
7	Installation of BMPs to achieve 30% reduction of trash from Baseline WLA and LA	City of Camarillo; City of Oxnard; Ventura County; Agriculture; Ventura County Watershed Protection District; Caltrans; Local land owners with storm drains	Four years from effective date of TMDL
8	Installation of BMPs to achieve 50% reduction of trash from Baseline WLA and LA	City of Camarillo; City of Oxnard; Ventura County; Agriculture; Ventura County Watershed Protection District; Caltrans; Local land owners with storm drains	Five years from effective date of TMDL.

F. Reasonably Foreseeable Environmental Impacts from TMDL Implementation

An accompanying CEQA Substitute Environmental Document (SED) analyzes the potential negative environmental impacts of compliance with the trash TMDL based on the implementation strategies discussed above. According to municipalities implementing previous Trash TMDL requirements by installing catch basin inserts and vortex separation devices, it was found the most significant environmental impacts result from construction activities associated with installation and maintenance activities. The primary construction impacts are caused by concrete and electrical work, and in some areas, earth work associated with structural improvements. The environmental impacts are resulting from maintaining, removing and disposing trash from structural treatment systems. Both constructional and environmental impacts may be mitigated by available technologies.

Regarding cumulative impacts, it is noted that both the construction and maintenance activities are in small, discrete, discontinuous areas over a short duration. Consequently, cumulative impacts are not significantly exacerbated from the sum of individual project impacts. Project level environmental analysis for implementation of structural methods will likely be conducted by municipalities and responsible jurisdictions under notices of exemption. Categorical exemptions will be based on the nature of the projects including:

-Minor alteration of existing public structures involving negligible expansion of an existing facility.
-Modifications of existing storm drain system and addition of environmental protection devices in existing structures with negligible or no expansion of use.
-Modifications to sewers constructed to alleviate a high potential or existing public health hazard.

The analysis concludes that the implementation of this TMDL will result in water quality improvement in Revolon Slough, Beardsley Wash and their tributaries, but may be associated with temporary or permanent localized adverse impacts to the environment. While specific projects employed to implement the TMDL may have significant impacts, these impacts may be limited, short-term or mitigated through effective design and scheduling. Under circumstances that none of alternatives or mitigation measures is available to mitigate the environmental impact caused by implementation of this Trash TMDL, implementing this Trash TMDL would outweigh the unavoidable adverse environmental effects because the minimum foreseeable environmental impacts shall be addressed by project level planning, construction, and operation methods as described in the CEQA SED.

X. Monitoring

Assessment and monitoring of trash are key components of the TMDL. The goal of trash monitoring is to collect representative data from across the watershed that can be used to refine Baseline Load and Waste Load Allocations, effectively site and design BMPs, including full capture systems, and determine compliance with Waste Load and Load

Allocations. Monitoring activities and results, including implementation and effectiveness of BMP implementation, will be reported and submitted to the Regional Board on an annual basis. Responsible jurisdictions will be required to propose and implement a Trash Monitoring and Reporting Plan approved by the Executive Officer.

The Monitoring and Reporting work plan will describe the methodologies that will be used to assess and monitor trash in Revolon Slough, Beardsley Wash and their tributaries, and if applicable, land areas in the vicinity of Revolon Slough, Beardsley Wash and their tributaries. Regional Board staff find that monitoring protocols prescribed by the Rapid Trash Assessment are appropriate for this TMDL. Elements of the TMDL monitoring plan are described below.

- Monitoring Plan. Responsible jurisdictions will submit a Trash Monitoring and Reporting Plan with the proposed monitoring sites and at least two additional alternate monitoring locations. The Work Plan must include maps of the drainage and storm drain data, and locations where most trash accumulated on the waterbody and on the vicinities for nonpoint sources for each proposed and alternate monitoring location. The monitoring plan(s) will be submitted to the Regional Board according the TMDL Implementation Schedule. The Regional Board's Executive Officer will have full authority to review the monitoring plan(s), to modify the plan, to select among the alternate monitoring sites, and to approve or disapprove the plan(s).

- Jurisdiction. Allocations will be permitted through storm water permits or by a Conditional Waiver. For this reason, each responsible jurisdiction must provide the Regional Board list of entities located within their municipal boundaries that are outside of their jurisdiction including state or federal lands and facilities.

- Data Collection. Baseline data may be collected over a period of two years. Although the amount of trash deposited into the waterbodies through storm drains or from nonpoint sources may depend on rainfall patterns and winds, monitoring will include dates in both the rainy season and the dry season. The Ventura County MS4 permit defines the rainy season as spanning from October 1 to April 15.

- Unit of Measure. Data will be reported in a single unit of measure that is reproducible and measures the amount of trash, irrespective of water content (e.g., compacted volume based on a standardized compaction rate, dry weight, etc.). The responsible jurisdictions may select the unit. The unit of measure used during Baseline Monitoring also will be used during Implementation for determining compliance with Waste Load Allocations and Load Allocations.

- Vegetation. The responsible jurisdictions may exclude vegetation from their reported discharge except where there is evidence that the vegetation is the result of the illegal discharge of yard waste. However, all monitoring data must be reported uniformly (either with or without vegetation). If the permittees include vegetation in the discharges reported during Baseline Monitoring, they will be obligated to include natural vegetation in their reports of discharge during Implementation.

- Disposal of Collected Trash. Trash captured during the monitoring plan must be disposed of in accordance with all applicable laws and regulations.

- Location. Trash monitoring in the vicinity of Revolon Slough, Beardsley Wash and their tributaries shall be focus on visible trash at representative and critical locations determined by the Discharger and approved by the Executive Officer in the Trash Monitoring and Reporting Workplan. Locations for trash assessment shall include, but not be limited to locations where trash enters and exits Revolon Slough, Beardsley Wash and their tributaries and areas of recreational access and wildlife habitat. Trash assessment shall include the type of trash, amount of trash according to a metric proposed and approved in the Monitoring and Reporting Workplan.

- Representative Data. In an effort to provide representative data in deriving Baseline Waste Load Allocation and Baseline Load Allocation, the minimum requirements to establish the Trash Monitoring and Reporting Plan include:

  - The plan would provide representative data from across the watershed.
  - The plan would provide data in units that were easily reproducible and would be comparable with data to be collected during the Implementation Phase.
  - The Baseline Waste Load Allocation and Baseline Load Allocation may be revised from data generated from the plan.

- Land Use Areas. Responsible jurisdictions may propose trash monitoring according to Land Use Areas in the vicinity of Revolon Slough, Beardsley Wash and their tributaries. Monitoring data can be used to establish specific trash generation rates per land use for siting and design of BMPs. The land use categories that can be monitored are:

  - Low density residential,
  - High density residential,
  - Agricultural,
  - Commercial and industrial,
  - Transportation,
  - Mixed urban, and
  - Open space and recreation.

The requirements and milestone dates related to the Trash Monitoring and Reporting Plan are summarized in Table 11.

Table 11. Trash Monitoring and Reporting Plan Due Dates

Task	Completion Date
Submit Trash Monitoring and Reporting Plan.	60 days after receipt of the Executive Officer's request as authorized by Section 13267 of Porter-Cologne.
Implement Trash Monitoring and Reporting Plan	60 days after receipt of letter or approval from Executive Officer and annually thereafter.
Submit Trash Monitoring Report	Two years after the effective date of Trash TMDL and annually thereafter.

In addition to the general monitoring requirements, two TMDL Monitoring Strategies are outlined below for the proposed compliance options.

1. Monitoring of full capture devices.

Monitoring of full capture devices focuses on description and quantification of trash collected by the full capture devices and assessment of full capture device effectiveness in reducing trash in the vicinity of Revolon Slough, Beardsley Wash and their tributaries. The Monitoring and Reporting Plan will describe how trash collected from full capture devices will be quantified and how trash reductions in the lake and on the lakeshore will be assessed.

2. Minimum Frequency of Assessment and Collection

Responsible jurisdictions must identify at least 5 monitoring locations within the vicinity of Revolon Slough, Beardsley Wash and their tributaries, including two (2) locations where trash was always present according to the records. The plan should describe how proposed monitoring locations will demonstrate how all visible trash on the lake and lakeshore can be assessed and collected. These observation locations must be inspected twice per week.

An additional 5 locations in the vicinity of Revolon Slough, Beardsley Wash and their tributaries that are suspected to have the most trash deposited on the ground shall also be checked twice per week. Responsible jurisdictions must collect 100% of the trash accumulated at the monitoring locations between MFAC events.

The report submitted for Regional Board's review must contain information, including but not limited to dates of inspection, descriptions of trash types, estimate of trash quantity if weighting is not available, and immediate action of trash removal. At least one photo at each designated observation location per month must be taken and attached in the report to support the observation.

XI. Future Growth

Ventura County accounts for slightly more than 2% of the state's residents with a population of 753,197 (US Census Bureau, 2000). According to the Southern California Association of Governments (SCAG), growth in Ventura County averaged about 51% per decade from 1900-2000; with growth exceeding 70% in the 1920s, 1950s, and 1960s (**Error! Reference source not found.**).

YEAR	POPLN	INCREASE
1900	14,000	--
1910	18,000	28.6%
1920	29,000	61.1%
1930	55,000	89.7%
1940	70,000	27.3%
1950	115,000	64.3%
1960	199,000	73.0%
1970	376,000	88.9%
1980	529,000	40.7%
1990	669,000	26.5%
2000	753,000	12.6%

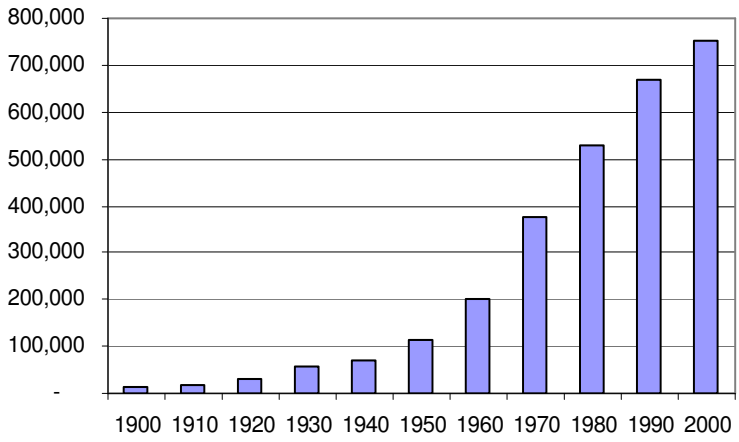

Figure 6. Population growth in Ventura County, 1900-2000 (SCAG, 2004)

Ventura County has been actively involved in growth management for several decades and continues to implement a range of growth management measures, such as: urban growth boundaries, ballot-initiative approved zoning, and encouragement of higher density and mixed-use development. The Save Open Space and Agricultural Resources initiative (SOAR) that was passed in 1998 is one such growth management policy. Ventura County's SOAR initiative aims to preserve farmland, open-space and rural areas by establishing a City Urban Restriction Boundary beyond which urban development is tightly controlled. County voter approval is required before any land located outside the City Urban Restriction Boundary can be developed for non-agricultural purposes. Within Ventura County, there is a county-wide ordinance and a number of city ordinances.

It is reasonably foreseeable that as the population density in areas near Ventura Estuary increases, the trash loads to the lakes will also increase. The TMDL addresses potential increased trash loading from future growth through several mechanisms including a numeric target of zero trash, WLAs and LAs of zero trash, and TMDL compliance mechanisms such as full capture systems and a specified minimum frequency of patrolling and trash collection.

XI. Cost Considerations

Porter-Cologne Section 13241(d) requires staff to consider costs associated with the establishment of water quality objectives. The TMDL does not establish water quality objectives, but is merely a plan for achieving existing water quality objectives. Therefore cost considerations required in Section 13241 are not required for this TMDL.

The purpose of this cost analysis is to provide the Regional Board with information concerning the potential cost of implementing this TMDL and to addresses concerns about costs that have been raised by responsible parties. This section takes into account a reasonable range of economic factors in fulfillment of the applicable provisions of the California Environmental Quality Act (Public Resources Code Section 21159.)

An evaluation of the costs of implementing this Trash TMDL amounts to evaluating the costs of preventing trash from getting from the storm drain to Revolon Slough and Beardsley Wash. This brief report gives a summary overview of the costs associated with the most likely ways the responsible jurisdictions will achieve the required reduction in discharges to the storm drain system. Such an analysis would be incomplete if it failed to consider the existing cost that presently is transferred to "innocent" downstream communities. There is an unquantified cost to aquatic life within Revolon Slough and Beardsley Wash.

Cost of Implementing Trash TMDL

The reference provided by Los Angeles County indicated that it cost more than 4 million dollars to clean trash from 31-mile beaches annually. City of Long Beach, at the mouth of the Los Angeles River, also spent almost 1 million dollars annually for storm debris accumulated in the Long Beach Harbor. These expenses should be taken into consideration while calculating the potential cost of implementing Trash TMDL.

The cost of implementing this TMDL will range widely, depending on the method that the responsible jurisdictions select to meet the Waste Load and Load Allocations. Arguably, enforcement of existing litter ordinances could be used to achieve the final Waste Load Allocations at minimal or no additional cost. The most costly approach in the short-term is the installation of full capture systems on all discharges to Revolon Slough and Beardsley Wash.

Most of the information presented herein consists of catch basin inserts, structural vortex separation devices and end of pipe nets. We are considering the costs associated with preventing the disposal of trash into the waterbodies of concern.

Regardless of the method(s) used, costs associated with the gradual decrease of the amount of trash in the waterbodies, and the maintenance of the Revolon Slough and Beardsley Wash and its tributaries free of trash include monitoring and implementation costs. Any device chosen for monitoring trash or removing trash from storm drain, regardless of its installation costs, will also be associated with labor costs.

We are looking at several methods separately, from retrofitting all the catch basins in the urbanized portion of the watershed, to using solely structural full capture methods.

1. Catch Basin Inserts

At a cost of around $800 per insert, catch basin inserts are the least expensive structural treatment device in the short term. However, because they are not a full capture method, they must be monitored frequently and must be used in conjunction with street sweeping.

Due to the lack of numbers of catch basins in the vicinity of Beardsley Wash and Revolon Slough, the average density of 123 catch basin per square miles based on the reference provided by Los Angeles County Department of Public Works was applied to this subwatershed.

Approximately 1491 catch basins are estimated in this subwatershed. Assuming all catch basin insert will be installed in five years after the effective date of this TMDL, and the operation and maintenance expense is 50% of the installation cost, the costs in Table 12 are calculated.

Table 12. Costs of retrofitting the catch basin inserts (Dollars in thousands)

Number of years in the program	1	2	3	4	5	6	7	8
Operations and Maintenance (yearly, cumulative)	$119.3	$238.6	$357.8	$477.1	$596.4	$596.4	$596.4	$596.4
Capital Cost (yearly)	$238.6	$238.6	$238.6	$238.6	$238.6			
Annual Costs per year (Capital + Operation and Maintenance)	$357.8	$477.1	$596.4	$715.7	$835.0	$596.4	$596.4	$596.4

2. Full Capture Vortex Separation Systems (VSS)

Permanent structural devices can be used to trap gross pollutants for monitoring purposes as well as implementation. Among those "litter control devices" are structural vortex separation systems (VSS), floating debris traps, end-of-pipe nets and trash racks. VSS units appear to be among the best alternatives to evaluate or remove the amount of trash generated throughout a particular drainage area.

An ideal way to capture trash deposited into a storm drain system would be to install a VSS unit. This device diverts the incoming flow of storm water and pollutants into a pollutant separation and containment chamber. Solids within the separation chamber are kept in continuous motion, and are prevented from blocking the screen so that water can pass through the screen and flow downstream. This is a permanent device that can be retrofitted for oil separation as well. Studies have shown that VSS systems remove virtually all of the trash contained in the treated water. The cost of installing a VSS is assumed to be high, so limited funds will place a cap on the number of units which can be installed during any single fiscal year.

The point sources area is approximately 7,751 acres. The following table provides capacities and the associated costs of various sizes of VSS. Staff assumes the cost of yearly servicing of a VSS unit to be $2000.

Table 13. Costs Associated with VSS

Capacity	Acres (average)	Unit Capital Cost	Number of devices needed on urban portion of watershed	Capital costs	Yearly costs for servicing all devices
1 to 2 cfs	5	$12,800	1550	$19,840,000	$3,100,000
6 to 8 cfs	30	$45,000	258	$11,610,000	$516,000
19 to 24 cfs	100	$90,000	77	$6,750,000	$150,000

Table 14 and 15 compare the estimated costs of retrofitting the point source areas with low capacity VSS (1 to 2 cfs) and large capacity VSS (19 to24 cfs), given that VSS will be installed within the first five years after the effective date of this TMDL.

Table 14. Costs Associated with Low Capacity Vortex Gross Pollutant Separation Systems (Dollars in thousands)

Number of years in the program	1	2	3	4	5	6	7	8
Units Installed	310	310	310	310	310			
Operations and Maintenance (yearly, cumulative)	$620	$1,240	$1,860	$2,480	$3,100	$3,100	$3,100	$3,100
Capital Cost (yearly)	$3,968	$3,968	$3,968	$3,968	$3,968			
Annual Costs per year (Capital + Operation and Maintenance)	$4,588	$5,208	$5,828	$6,448	$7,068	$3,100	$3,100	$3,100

Table 15. Costs Associated with Large Capacity Vortex Gross Pollutant Separation Systems (Dollars in thousand)

Number of years in the program	1	2	3	4	5	6	7	8
Units Installed	15	15	15	15	15			
Operations and Maintenance (yearly, cumulative)	$30	$60	$90	$120	$150	$150	$150	$150
Capital Cost (yearly)	$1,350	$1,350	$1,350	$1,350	$1,350			
Annual Costs per year (Capital + Operation and Maintenance)	$1,380	$1,410	$1,440	$1,470	$1,500	$150	$150	$150

Outfitting a large drainage with a number of large VSS systems may be less costly than using a larger number of small VSS systems. Maintenance costs decrease dramatically as the size of the system increases. Topographical and geotechnical considerations also should come into play when choosing VSS systems or other structural systems or devices.

3. End of Pipe Nets

"Release nets" are a relatively economical way to monitor trash loads from municipal drainage systems. However, in general, they can only be used to monitor or intercept trash at the end of a pipe and are considered to be partial capture systems, as the nets are usually sized at a 1/2" to 1" mesh. These nets are attached to the end of pipe systems. The nets remain in place on the end of the drain until water levels upstream of the net rise sufficiently to release a catch that holds the net in place. The water level may rise from either the bag being too full to allow sufficient water to pass, or from a disturbance during very high flows. When the nets release they are attached to the side of the pipe by a steel cable and as they are washed downstream (a yard or so) are tethered off so that no pollutants from within the bags are washed out.

Preliminary observations suggest that the nets rarely fill sufficiently to cause the bags to release. And therefore, if they are cleaned after a storm event, the entire quantity of material is captured and can be measured for monitoring purposes using two bags per trap. This makes it easy to replace the full or partially full bag with an empty one, so that the first bag can be taken to a laboratory for analysis without manual handling of the material it contains.

The nets are valid devices because of the ease of maintenance and also because the devices can be relocated after a set period at one location (provided the pipe diameters are the same). With limited funding, installation could be spread over several land uses and lead to valuable monitoring results.

Because the devices require attachment to the end of a pipe, this can severely reduce the number of locations within a drainage system that can be monitored. In addition, these nets cannot be installed on very large channels (7 feet in diameter is the maximum). Thus costs shown in Table 16 are given per pipe, and no drainage coverage is given.

Table 16. Sample Costs for End of Pipe Nets

Pipe Size	Release nets (cost estimates)
End of 3 ft pipe	$10,000
End of 4 ft pipe	$15,000
End of 5 ft pipe	$20,000
In 3 ft pipe network	$40,000
In 4 ft pipe network	$60,000
In 5 ft pipe network	$80,000

4. Cost Consideration – Minimum Frequency of Trash Assessment and Collection

This section provides a brief estimate of costs to comply with the MFAC Program for nonpoint source responsible jurisdictions. The cost estimate is based on the minimum frequency of twice per week.

It is also assumed that the personnel for trash assessment and collection will be employed by one of the agencies that provide services to the area of Revolon Slough and Beardsley Wash. As such, equipment and vehicles are available and costs for these items are assumed to be included in the estimate below. It is also assumed that a single person can conduct the complete trash assessment and collection in four hours at each cleanup. Consequently, the total time per year to conduct the MFAC is 52 days.

Assuming a burdened hourly rate of $37.50 per hour, the estimated annual costs to the MFAC is $15,600 for Revolon Slough and Beardsley Wash.

5. Cost Comparison

A comparison of costs between strategies based on catch basin inserts (CBIs), low capacity VSS, high capacity VSS systems, and enforcement of litter laws is presented in Table 17. This comparison was completed for a trash TMDL in the Los Angeles River watershed. Staff assumes the relative magnitude of the costs for the different options is applicable for the Revolon Slough and Beardsley Wash TMDL, with an addition of the cost resulting from MFAC.

Table 17. Cost Comparison (amounts in millions)

	CBI only	Low capacity VSS Units	Large capacity VSS Units	Minimum Frequency Trash Assessment and Collection	Enforcement of Litter Laws[2]
Cumulative capital costs over 8 years	$1.19	$19.84	$6.75	$0.12	$0
Cumulative maintenance and capital costs after 8 years	$4.77	$38.44	$7.65	$0.12	$0
Annual servicing costs after full implementation	$0.60	$3.10	$0.15	$0.02	$0

Trash abatement in the Revolon Slough and Beardsley Wash system will differ depending on the options selected by the responsible jurisdictions.

[2] Revenues from fines assessed to offset increased law enforcement cost. The cost of a database system used to calculate trash discharges estimated to be less than $250,000.

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XIII. Appendix I

The land use classification was developed by Aerial Information Systems as a modified Anderson Land Use Classification and originally included 104 categories. The land use coverages were donated for GIS library use by Southern California Association of Governments (SCAG), and show land use for 2005. The coverages were map-joined into a single coverage by Teale Data Center. The Regional Board layers were aggregated from the TDC coverage into the land uses shown above.

Critical land uses were mapped regardless of resolution limits. Critical land use units below 1 acre in size were mapped as 1-acre units.

Land Uses	Description and subcategories of Each Land Use
High Density Residential	High density single family residential and all multi family residential, mobile homes, trailer parks and rural residential high density.
Low Density Residential	Under 2 units per acre.
Public Facilities	government centers, police and sheriff stations, fire stations, medical health care facilities, religious facilities large enough to be distinguished on an aerial photograph, libraries, museums, community centers, public auditoriums, observatories, live indoor and outdoor theaters, convention centers which were built prior to 1990, communication facilities, and utility facilities (electrical, solid waste, liquid waste, water storage and water transfer, natural gas and petroleum)
Education	Preschools and daycare centers, elementary schools, high schools, colleges and universities, and trade schools, including police academies and fire fighting training schools.
Transportation	Airports, railroads, freeways and major roads (that meet the minimum mapping resolution of 2.5 acres), park and ride lots, bus terminals and yards, truck terminals, harbor facilities, mixed transportation and mixed transportation and utility.
Mixed Urban	Mixed commercial, industrial and/or residential, and areas under construction or vacant in 1990.
Open Space and Recreation	Golf courses, local and regional parks and recreation, cemeteries, wildlife preserves and sanctuaries, botanical gardens, beach parks.
Agriculture	Orchards and vineyards, nurseries, animal intensive operations, horse ranches.
Water	Open water bodies, open reservoirs larger than 5 acres, golf course ponds, lakes, estuaries, channels, detention ponds, percolation basins, flood control and debris dams.

XIV. Appendix II

This table shows the square mileage for "high density residential", "low density residential", "commercial", "industrial", "public facilities", "education", "transportation", "mixed urban", "open space", "agriculture", "water" and "recreation" land uses for every city and incorporated areas in the watershed. The "water" land use of water is itself a nonpoint source of trash, and will therefore receive a combined Load Allocation. For cities that are only partially located on the watershed, the square mileage indicated is for the portion located in the watershed.

SQUARE MILEAGE ESTIMATED FOR EACH LAND USE FOR CITIES IN THE WATERSHED, AND FOR UNINCORPORATED AREAS.

Responsible Jurisdiction	High Density Residential	Low Density Residential	Commercial	Industrial	Public Facilities	Education	Military	Transportation	Mixed Urban	Open Space and Parks	Agriculture	Water	Total for all classes
Camarillo	3.20	0.71	0.69	0.18	0.16	0.21	0.01	1.14	0.02	1.09	1.19	0.11	8.70
Oxnard	0.01	0.02	0.27	0.62	0.03	0.00	0.00	0.14	0.10	0.15	0.89	0.00	2.23
U.S. Military	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.02	0.00	0.00	0.00	0.01	0.24
Ventura County	**0.79**	**2.36**	**0.01**	**0.18**	**0.20**	**0.08**	**0.26**	**0.37**	**0.12**	**8.48**	**36.98**	**0.66**	**50.51**

XV. Appendix III

This table shows the Waste Load and Load Allocations for trash per land use in each city base on square mileage. Waste Load Allocations are assigned to point source areas including high and low density residential, commercial, industrial, public Facilities, education, transportation and mixed urban land uses. Others of open space, agriculture, water and recreation land uses are considered as nonpoint sources and assigned with Load Allocation. For cities that are only partially located on the watershed, the square mileage indicated is for the portion located in the watershed.

WASTE LOAD ALLOCATIONS FOR TRASH PER LAND USE IN EACH CITY (GALLONS OF UNCOMPRESSED VOLUME)

Responsible Jurisdiction	High Density Residential	Low Density Residential	Commercial	Industrial	Public Facilities	Education	Military	Transportation	Mixed Urban	Open Space and Parks	Agriculture	Water	Total for all classes
Camarillo	2050.35	451.53	438.44	112.29	102.25	134.69	5.74	7633.06	10.99	696.31	762.46	68.31	12466.41
Oxnard	3.68	10.66	174.14	399.75	21.99	0.00	0.00	952.09	61.87	93.51	569.19	2.10	2288.99
U.S. Military	0.00	0.00	0.00	0.17	0.00	0.00	133.32	141.48	0.00	0.00	0.00	7.19	282.17
Ventura County	**2054.03**	**462.19**	**612.59**	**512.21**	**124.24**	**134.69**	**139.06**	**8726.63**	**72.86**	**789.82**	**1331.65**	**77.61**	15037.57

XVI. Definitions

The definitions of terms as used in this TMDL are provided as follows:

Beneficial Uses. Beneficial Uses form the cornerstone of water quality protection under the Basin Plan. Once beneficial uses are designated, appropriate water quality objectives can be established and programs that maintain or enhance water quality can be implemented to ensure the protection of beneficial uses. The designated beneficial uses, together with water quality objectives (referred to as criteria in federal regulations), form water quality standards. Such standards are mandated for all waterbodies within the state under the California Water Code. In addition, the federal Clean Water Act mandates standards for all surface waters, including wetlands. Beneficial uses for waterbodies of Revolon Slough and Beardsley Wash are listed and defined below:

Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to , drinking water supply.

Industrial Service Supply (IND) - Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

Industrial Process Supply (PROC) - Uses of water for industrial activities that depend primarily on water quality.

Agricultural Supply (AGR) - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

Freshwater Replenishment (FRSH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-contact Water Recreation (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping,

boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Warm Freshwater Habitat (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Wildlife Habitat (WILD) - Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Rare, Threatened, or Endangered Species (RARE) - Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Best Management Practices (BMPs). BMPs are the practice or combination of practices that are determined to be the most effective, practicable means of preventing or reducing the amount of pollution generated by point and nonpoint sources to a level compatible with water quality goals (including technological, economic, and institutional considerations). BMPs are defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. In this TMDL, two general categories of structural BMPs and non-structural BMPs are discussed as possible means to reach "zero" trash goal.

Full Capture Device. A full capture system is any single device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate Q resulting from a one-year, one-hour storm in the subdrainage area. Rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour, as determined per the rainfall isohyetal map in Figure A),[3] and A= subdrainage area (acres).

Baseline Load Allocation. The Baseline Load Allocation is analogous to the Baseline Waste Load Allocation for point sources, instead it is for nonpoint sources. Baseline Load Allocation is derived from the existing data, i.e. trash types and quantities, collected by municipalities for various land uses. The progressive reductions in the Load Allocation will be determined based on the Baseline Load Allocation.

Baseline Waste Load Allocation. The Baseline Waste Load Allocation is the Waste Load Allocation assigned to a permittee before reductions are required. The progressive reductions in the Waste Load Allocations could be based on a percentage or variable

[3] The isohyetal map may be updated by the Los Angeles County hydrologist to reflect additional rain data. Updates published by the Los Angeles County Department of Public Works are prospectively incorporated by reference into this TMDL and accompanying Basin Plan amendment.

percentages of the Baseline Waste Load Allocation. The Baseline Waste Load Allocation was calculated based on the annual average amount of trash discharged to the storm drain system from a representative sampling of land use areas, as determined during the Trash Monitoring Plan.

Monitoring Entity. The Monitoring Entity is the permittee or one of multiple permittees and/or co-permittees that has been authorized by all the other affected permittees or co-permittees to conduct baseline monitoring on their behalf.

Nonpoint Source. It refers to diffuse, widespread sources of pollution. These sources may be large or small, but are generally numerous throughout a watershed. Nonpoint Sources include but are not limited to urban, agricultural, or industrial areas, roads, highways, construction sites, communities served by septic systems, recreational boating activities, timber harvesting, mining, livestock grazing, as well as physical changes to stream channels, and habitat degradation. NPS pollution can occur year round any time rainfall, snowmelt, irrigation, or any other source of water runs over land or through the ground, picks up pollutants from these numerous, diffuse sources and deposits them into rivers, lakes, and coastal waters or introduces them into ground water.

Permittee. The term "permittee" refers to any permittee or co-permittee of a stormwater permit.

Point Source. The term “point Source” means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Trash. In this document, we are defining “trash” as man-made litter, as defined in California Government Code Section 68055.1(g):

> “Litter means all improperly discarded waste material, including, but not limited to, convenience food, beverage, and other product packages or containers constructed of steel, aluminum, glass, paper, plastic, and other natural and synthetic materials, thrown or deposited on the lands and waters of the state, but not including the properly discarded waste of the primary processing of agriculture, mining, logging, sawmilling or manufacturing."

For purposes of this TMDL, we will consider trash to consist of litter and particles of litter, including cigarette butts. These particles of litter are referred to as “gross pollutants” in European and Australian scientific literature. This definition excludes sediments, and it also excludes oil and grease, and vegetation, except for yard waste that

is illegally disposed of in the storm drain system. Additional TMDLs for sediments[4] and oil and grease may be required at a later date.

Urbanized Portion of the Watershed. For the purposes of this TMDL, the urban portion of the watershed includes the sum of total areas of the incorporated cities and the partial unincorporated portion, which comprise of high and low density residential, commercial, industrial, mixed urban areas in Los Angeles County.[5] The estimated areas of the "urbanized" portion of the watershed are summarized in the Appendix II.[6] The remainder of the watershed is made up of the Angeles National Forest, agriculture and other open space.

[4] Sediments which may be addressed in a separate TMDL are natural particulate matters such as silt and sand. Sediments result from erosion and are deposited at the bottom of a stream. Sediments do not refer to the decomposition of settleable litter into small particulate matters, which this TMDL is trying to prevent.
[5] The Regional Board recognizes that some areas within the unincorporated sections of Los Angeles County are actually suburban or rural.
[6] As determined by the Regional Board from GIS mapping. (Other minor differences in figures are due to rounding.)